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THE
TRANSACTIONS
OF
THE LINNEAN SOCIETY
OF
LONDON.

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EXTRACTS

FROM THE MINUTES OF THE COUNCIL

OF

THE LINNEAN SOCIETY OF LONDON.

November 2, 1830.

Aylmer Bourke Lambert, Esq., V.P. in the Chair.

The Draft of an Address, proposed to be presented to His Majesty, was read and approved of, as follows:

"To The King's Most Excellent Majesty,

"The humble Address of the President and Fellows of the
"Linnean Society of London.

"Most Gracious Sovereign,

"We, Your Majesty's most dutiful and loyal subjects, the "President and Fellows of the Linnean Society of London, "beg leave to tender to Your Majesty our most cordial "congratulations on Your Majesty's accession to the Throne "of these Realms.

"Whilst expressing our sincere satisfaction at this auspicious "event, we are anxious also to offer our condolences, with "those of our fellow subjects, to Your Majesty, on the de- "cease of our late August Monarch, Your Majesty's Royal

" Brother, the glory of whose reign, and whose protection of " all the Sciences and useful Arts, must be gratefully remem- " bered by an enlightened nation. From the paternal and bene- " ficent feelings which YOUR MAJESTY has evinced towards all " descriptions of your people, we venture to hope for a con- " tinuance of the same gracious patronage to our Corporate " Body, which it experienced from YOUR MAJESTY's lamented " Predecessor; and we earnestly pray that Divine Providence " may vouchsafe to bless with a long and happy life both " YOUR MAJESTY and Your Royal Consort THE QUEEN, " whose conspicuous example in the practice of all those vir- " tues which improve society and adorn domestic life, reflects " lustre on the Throne, whilst it insures the admiration, respect, " and affection of your people."

Ordered—That a Letter be written to the President, requesting him to take THE KING's Pleasure as to the time and manner of receiving the Address and becoming the Patron of the Society.

December 21, 1830.

ROBERT BROWN, Esq., V.P. in the Chair.

The Vice-President read a Letter addressed to the President, from Sir Robert Peel HIS MAJESTY's Principal Secretary of State for the Home Department, as follows:—

" My Lord, Whitehall, Nov. 18, 1830.

" I have had the honour to lay before THE KING the loyal and dutiful Address of the President and Fellows of the Linnean Society of London, which accompanied your Lordship's Letter of the 15th of November, which HIS MAJESTY was pleased to receive in the most gracious manner.

" And

"And I have the satisfaction to inform your Lordship, that His Majesty has been pleased to signify his consent to be the Patron of the Linnean Society of London.

"I have the honour to be,

"My Lord,

"Your Lordship's very obedient Servant,

(Signed) "Robert Peel."

"The Lord Stanley, M.P.
&c. &c. &c."

His Majesty having been thus graciously pleased to declare himself the Patron of the Society, a Deputation, consisting of the President, Dr. Maton (Vice-President), Mr. Forster (Vice-President), and the Secretary, waited upon His Majesty by appointment on December 14th, for the purpose of receiving His Majesty's Signature, declaratory of his Royal pleasure; when His Majesty was graciously pleased to inscribe his Name in the Society's Charter-Book.

TRANSACTIONS

OF

THE LINNEAN SOCIETY.

I. *Remarks on the Comparative Anatomy of certain Birds of Cuba, with a view to their respective Places in the System of Nature or to their Relations with other Animals. By W. S. MacLeay, Esq., M.A., F.L.S. Communicated by the Zoological Club of the Linnean Society.*

Read Nov. 21, 1826; *and April* 17, 1827.

THE day is now happily gone past when zoologists thought that the infinite variety of animals which inhabit this globe owed their origin to the unsuccessful efforts of Nature before she could attain the human structure as her term of perfection. Nor is the grand object of comparative anatomy now conceived to be the reference of every animal structure to man,—a mode of viewing Nature that tends to point out distinctions rather than affinities,—but to be the formation of such a collection of recorded facts of comparative organization, as may determine in some degree the use of the various organs; and above all, may lead us to the better knowledge of the natural arrangement of the animal kingdom. For comparative anatomy, independently of its pathological or medical relation to the human frame, has these two most important objects; namely, either the ascertainment of the variations of a general plan of structure with reference to the particular exigencies of the species to which such variations are applied, or the study of the variations of general plans of structure with reference to the great plan of creation. English writers on comparative anatomy have rarely looked beyond the first of these objects; and yet the last is not only the more important of the two, but involves in it the former as a minor consideration or mean by which we may arrive at its attainment. And thus we find, that an anatomist may laboriously investigate the structure and use of an organ, without having the least idea of ascertaining the place held in nature by the animal to which this organ belongs: but no zoologist can be satisfied that he has ascertained the place of an animal in nature, without fully investigating the structure and use of its various organs; since on this structure and on this use depends all his knowledge of its place. It is therefore to be regretted, that in England the arrangement, or consequence, is so often separated from the facts from which that consequence is, or ought to be drawn; that, in short, while in one place we see the zoological consequence without the facts from which it has been deduced; in another we observe the bare statement of anatomical facts, without the great consequences to which these lead, and indeed too often without any view beyond the possible use of the various organs to the particular animals dissected*.

With comparative anatomy, as it may tend to elucidate human pathology or medical science, naturalists perhaps have little to

* Such works indeed as Paley's *Natural Theology*,—a book most valuable not for its physiological facts, but for its mode of reasoning upon them,—have another object; to wit, the proof of the existence of design in particular structures by the tracing of effects to their respective causes.

do:

do: but as, to say the least, it is somewhat oracular to advance positions of arrangement without deigning to state the observed facts on which they are grounded, I trust that not merely zoology, but moreover that species of comparative anatomy upon which zoology must always rest as its firmest basis, lies peculiarly within the province of the Linnean Society. A good authority on this subject has said: "L'histoire naturelle d'un animal est la connaissance de tout l'animal. Sa structure interne est à lui autant et peut-être plus que sa forme exterieure*.—Depuis que l'histoire naturelle prend enfin la Nature pour base de ses distributions, ses rapports avec l'anatomie sont devenus plus intimes. L'une de ces sciences ne peut faire un pas sans que l'autre en profite. Les rapprochemens que la première etablit indiquent souvent à l'autre les recherches qu'elle doit faire†." If, however, some comparative anatomists will lose sight of the connexion between the two sciences, and thus of the grand object of their art, thereby subjecting themselves to that imputation of dryness and contraction of ideas, which has been (I should hope, rather hastily) applied as well to the English zoologists as comparative anatomists‡, let the zoologist at least free himself from the charge; and by the union of the one science, which affords facts, with the other, that teaches us the mode of arranging them, let him endeavour to approach "cette methode naturelle *unique* qui doit faire le but de tous les naturalistes."

I have been led to these remarks, because, subject in a particular degree to error as an individual like myself must always be, who has not had the benefit of a regular anatomical education, I venture to lay before the Linnean Society some observations on the anatomy of birds,—less indeed in the expectation that they can merit attention in themselves, than in the hope

* Cuvier, *Leç. d'Anat. Comp.* vol. 3. p. xxii.

† *Ibid.* vol. 1. p. xvii.

‡ *Ibid.* vol. 1. p. xvii.

that they may induce others, whose opportunities of anatomical research may have been more extensive, to lay the results of their respective investigations also before this Society. Nor, little versed as I am in the study of vertebrated animals, would I even now venture upon this subject, did not my residence in an intertropical climate afford me facilities for examining particular genera, which the more experienced naturalist at home must in vain hope for. And as to restricting our dissections in the present state of natural history to a few European animals, it has been admirably observed, that one solitary species neglected may serve to unfold an exception sufficient to destroy the most plausible system. The following observations, therefore, crude as they are, may derive some portion of value from being linked with the more accurate and scientific researches of ornithologists on European birds; my aim being to enter upon the description and anatomy of such birds only as present structures peculiar to intertropical countries, comparing them with other birds, which, from being inhabitants of Europe, are better known. I shall not, however, attempt to describe new genera, or name new species, as well on account of my deficiency in the requisite ornithological knowledge, as on that of my inability to refer to large museums and extensive libraries, both of which are indispensably necessary for such undertakings. I need scarcely say, that this department of ornithology is in every respect capable of being infinitely better executed at home.

The general view taken of ornithology by Mr. Vigors in the last volume of the *Linnean Transactions* may easily be conceived to be too interesting to me as an individual not eventually to have made it a most important question with me, as a naturalist, to ascertain the accuracy of his various positions. As, however, I cannot help fearing, that in the course of the investigation he has

has been swayed in no small degree by warmth of friendship,—perhaps, for this very reason, I am the more incapacitated from coming to any correct decision on the merits of his paper. I shall consequently say little on the subject; except that, if any remarks of mine may have withdrawn his attention from the old method of first classifying organs or particular parts of structure, and then arranging animals according to this arbitrary division, and may have induced him, on the contrary, to consider the mode in which the structures of animals vary,—it must be confessed that he has developed, with reference to that mode, one class of animals much further than I have done. Birds now form the only class in zoology which has been arranged according to the variation of structure; that is to say, it is the only class of animals in which a naturalist has attempted, if I may be allowed the expression, to work out the place of every genus hitherto discovered. Every other class of animals, whether vertebrated or unvertebrated, requires still to be *wrought out* in a similar manner; and each genus not only to be placed with reference to its affinities and analogies, but, moreover, the reasons to be given in detail for this position. The great multitude of annulose forms that exist in nature, has given me small hope of ever being able to say that I know the natural position of every described genus in entomology; but I have endeavoured, both in the *Horæ Entomologicæ* and in the first number of the *Annulosa Javanica*, to ascertain the place of some of the genera which constitute the natural group of *Mandibulata*,—a group of the same rank as that of birds.

As to new views or principles in natural history, this mode of studying the variation of structure in different animals, in preference to classing them according to an arbitrary division of organs, is perhaps the only one to which I can justly lay full claim. It is possible, indeed, that Hermann in his very remarkable

able work, entitled *Tabula Affinitatum Animalium*, and published in 1783, may have intended to keep some such principle as this in view: but as with him, unfortunately, the slightest analogy constituted an affinity, we may understand how he found it impossible to trace the mode in which structures vary, and much more so to apply the maxim of variation to arrangement. On a cursory glance at the principles of arrangement laid down by Aristotle* at the commencement of his *Historia Animalium*, he

* It can scarcely be doubted that Aristotle would have followed this principle, as well as have made the proper distinction between affinity and analogy, if he had looked less to the differences of particular organs and more to the affinities of general structures. Indeed he appears to have had a glimpse of the two great principles of natural arrangement, and was only ignorant of the proper mode of using them. His views of the subject are really curious when compared with our modern notions of zoology. The parts of animals, he says, either agree with or differ from each other in four principal ways.—Now here, at the opening, lies the grand cause of his not thoroughly understanding the matter: for if he had said, that Animals themselves, instead of their organs, may be arranged by four methods, it will be manifest, from the enumeration of his four methods, that he could not have failed to arrive at the truth.

1. Organs, he says, may be arranged, first, according to the natural groups (*κατα το γενος*, or *κατ' ειδος*), which, as for instance Birds or Fishes, depend on a similar construction of parts. That relation, he proceeds to state, which the whole bears to the whole, the group being the same, the part must bear to the part. Now this is an axiom which, however true with respect to quantity, will not hold good with respect to structure: for were it true, it would follow that, in the natural group of *Aves*, for instance, a frugivorous bird could not have the same form of beak as a bird of prey; whereas we know the contrary. The fact is, that if Aristotle had said that animals and not their parts are to be arranged according to their natural groups, he would have expressed the great principle of natural affinity: but a mathematical axiom made him unluckily think, that the classification of organs was the same thing with the classification of the animals to which they belong.

2. Secondly, he says, Organs may be arranged according to their excess and defect. (*καθ' ὑπεροχην και ελλειψιν*). This being entirely a consideration of quantity, and not of form, his mathematical axiom comes into play. His opinion is accordingly correct, that animals are capable of a binary distribution, depending entirely on the excess or defect of particular organs; as where he instances birds being divisible into those with long

he may also be supposed by some to have understood this doctrine of variation in animal structure; but it is easy to show, that although this extraordinary man understood it to a certain degree, he confined himself in the passage in question to the division of organs,—a course of reasoning that led him quite away from the conclusions he would indubitably have arrived at, had he followed the variation of general structure. Still I shall not be surprised if the originality of even this principle be some

long and those with short beaks, into those with crests and those without crests, &c. &c. This is the most arbitrary, and therefore, I suppose, the oldest of all modes of arrangement; and, as Aristotle expressly says, it is so easy, that any one may adopt it. I have said a few words on its merits in the *Horæ Entomologicæ*, p. 188; but the truth is, that proceeding entirely on the notion of division, and not of affinity, it is a method which is applicable to all sciences whatsoever, as much as to zoology. It has nothing to do with the natural system, which must of course depend upon affinities.

3. Thirdly, Organs may be arranged according to their analogies (κατ' αναλογιαν), as, for example, when we compare the claw with a hoof, or the feather of a bird with the scale of a fish: for, says he, what a feather is to the bird, a scale is to the fish. Had he said, that animals instead of their organs may be arranged according to their analogies, it is evident that he would have then distinguished relations of analogy from those of affinity, Aristotle being too profound a logician to use the one word for the other. But the instances given by him to explain his doctrine, prove that the word αναλογια in this place signifies *comparison of form* rather than *resemblance in form*. So that the proper translation of the passage is, that similar organs may be arranged according to their difference of structure, as when we compare a claw with a hoof, or, as he himself does in another part of his work, the wing of a bird with the fore-foot of a quadruped. It does not appear in this place very clear, whether Aristotle intended to apply his mathematical axiom, and to say, that organs being arranged in this manner, the animals may also. Although such a mode of reasoning will not lead to any false conclusions, it is far from being an obvious mode, at that early period of natural history, for him to have adopted. If he did not intend to call his axiom into action, he only stopped at the resting-place of comparative anatomists in general, who often trace the modifications of an organ without ever thinking of their use towards natural arrangement. If, on the other hand, he did intend to apply it, my claim to the priority of arranging animals by their variation of structure, would at first sight seem to be in danger. But it remains to be considered, whether in this event his zoological arrangement (making allowance for

some day disputed with me; for when the question was asked, "Is there any thing whereof it may be said, See, this is new?"—the answer was, "It hath been already of old time which was before us." And certain it is, that the doctrines of quinary distribution, of the circular progression of a series of affinity, and of analogies, as distinct from affinities, have all been in some measure advanced by authors prior to the publication of the *Horæ Entomologicæ*. Indeed it would add little to our conviction of these being great natural truths, to find that only one writer had observed them, and that others had taken them for granted upon his assertion. Accordingly we learn, that the number five has had an importance in the construction of the

for the difference in point of information) would have been similar to that of the "*Règne Animal distribué après son Organization;*" that is, a description of animals according to a set of groups founded on a difference of structure; or whether it would have been an arrangement of animals according to their gradual change of structure. The *Historia Animalium* is conducted on the first plan, not on the last.

4. Fourthly, Organs may be arranged according to their situation (κατα την θεσιν); as, for instance, animals having pectoral mammæ, in opposition to those which have them abdominal. Here again his axiom, that the relation which the whole bears to the whole the part must bear to the part, would fail him, if indeed he intended to apply it; for two tribes of animals widely asunder from each other, may yet have a similar situation of parts. Yet the variation of position of similar parts is one of the most important considerations in zoology, as may be imagined from its being the very principle upon which the *Philosophie Anatomique* of M. Geoffroy Saint Hilaire is grounded.

Apt as we are to adopt methods of arrangement, without investigating the principles by which we are guided, we must always reap advantage from examining the mode of reasoning pursued by one who, although among the earliest of naturalists, was so much in the habit of scrutinizing his ideas. He was aware that animals may also be divided according to their scenes of action, their economy, &c.; and he has, in fact, given us sketches of such classifications: but he had entered too deeply into zoology not to perceive that these considerations depend on the structure of their organs. He therefore thought, that the best arrangement of animals must depend on that of their organs;—and so far he was right. I only go a little further than he did, in saying, that this arrangement ought to depend not on that of the organs, but on their variation of structure.

universe

universe given to it from the days of Plato and Cicero*, that Linnæus, Pallas and Desfontaines, have mentioned certain analogies in nature as distinct from affinities†; and that one of the most distinguished zoologists of the present age and a foreign member of this Society, Professor Gotthelf Fischer of Moscow, has stated the progression of certain series of affinity being in circles‡. I can safely say, however, that as I arrived at the knowledge

* The ancient authors on this subject, however, really deserve but little attention; for they all arrived at their conclusions by the *à priori* mode of argument,—a mode totally inapplicable, nay even injurious, to a science like Natural History, which must always depend upon experience and observed facts.

† Aristotle in the *Historia Animalium,* lib. ii. c. 1. says, when speaking of animals generally, *Τα μεν κατ᾽ αναλογιαν αδιαφορα μονον, τῳ γενει δε ἑτερα.* Now if this passage be taken literally, we must give him full credit for making the distinction between affinity and analogy. But I confess, that on looking at the context, and above all, at his explanation of an arrangement *κατ᾽ αναλογιαν,* as above mentioned, I suspect that his idea of analogy did not reach beyond the comparison of organs: as when we say the wing of a bird represents the hand of a man; which comparison, however necessary to the full understanding of the analogies between different beings, is very far from expressing the whole of them. However this may be, it is curious to observe that so little attention should have been paid to this observation of the father of natural history, that "some animals, which agree in analogy, are yet different from each other in affinity."

‡ It seems to me to be quite unnecessary to discuss in this place what Plato meant by saying, that in nature all things terminate in their contraries,—an expression which Linnæus borrowed in his *Diary,* and appears to have attached meaning to as connected with the number five. Such disquisitions are as little likely to prove satisfactory, as those arguments drawn from the first chapter of Ezekiel, which led a Northern writer, Mr. Macnab, to declare a circle to be the plan of Nature, long before I attained the knowledge of the fact by observation. Naturalists have nothing to do with mysticism, and but little with *à priori* reasoning. I have therefore infinitely less hesitation in citing the following passage from Hermann:—"Neque enim ad affinitatem indicandam per omnem chartæ latitudinem diducere lineam placuit, sed inter nomen et chartæ marginem posuimus asteriscum qui flexâ in orbem chartâ incidit in similem alium cujus ope duo in utrâque extremitate posita corpora inter se conjunguntur, unde mirè implicitæ et concatinatæ inque circulum redeuntes affinitates tanto

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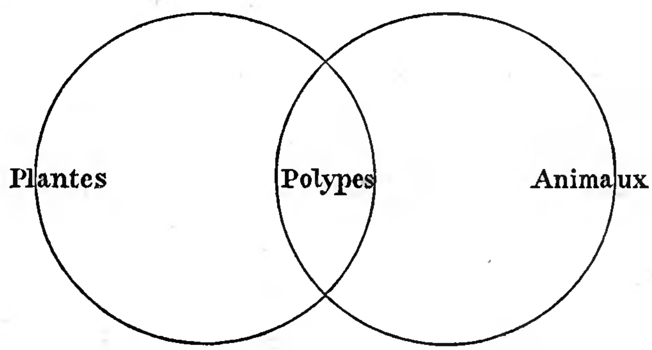
ledge of these several truths by the observation of Nature alone; so I first saw their dependence upon each other, their general application, and their necessary derivation, from the practice of studying the method in which animal structures vary. How far shadowy and unconnected notions on the above subjects may affect the claims of the *Horæ Entomologicæ* to public attention I shall not pretend to determine; but it is my duty, on the other hand, to say, that I was surprised on looking lately among the notes and explanations of the plates (page 181), at the end of a work published at Moscow in 1808 by Professor Fischer, and entitled "*Tabulæ Synopticæ Zoognosiæ in usum Auditorum editæ,*" to find the following remarks: "L'auteur trouve dans la Nature organisée une opposition remarkable qui pourroit être exprimée par deux cercles en mouvement, qui se touchent ou qui se croisent en deux endroits.



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magis patescunt."—*Tab. Aff. Anim.* p. 37. Such are the words of a naturalist consummately versed in the observation of facts, as well as in the speculations of philosophy; but whose learned work is a singular example of the consequences of mistaking relations of analogy for those of affinity, inasmuch as it presents us at the same time with an inexhaustible mine of information, and an almost inextricable mass of confusion. I ought in this place further to mention, that Hermann (p. 8.) cites the following words from Eusebius Nieremberg, *Nat. Hist.* lib. iii. c. 3.—" Scilicet per contextum Natura assurgit paulatim et sine saltu velut continuâ procedit tramâ. Nullus hiatus

Les deux points des cercles* qui se touchent, designent deux termes extrêmes, deux circonstances inexplicables pour le naturaliste. 1. La moisissure produite par la corruption des matières animales; 2. L'origine des animaux infusoires par celle des matières vegetales. Les bornes de cet ouvrage ne permettent pas un developpement plus ample de cette idée qui presente une verité à poursuivre." Again, in page 184 is the following passage:—"Il ne faut pas croire que la serie des Mammifères soit à considerer dans une direction droite comme une suite. J'ai fait voir à mes élèves qu'elle forme une galerie ou l'observateur se trouve au milieu, ayant les espèces d'animaux de ces côtes. C'est-à-dire, l'auteur s'imagine que chaque serie de la première division dont les doigts ou pieds ne sont reunis par une membrane, trouvera des analogues parmi les animaux de la seconde division, dont les doigts ou pieds sont reunis par une membrane. Une representation des gènres de Mammifères en cercles entourant le centre ou est placé l'homme, et se touchant mutuellement, suivant que les proprietés de differens

hiatus est, nulla fractio, nulla dispersio formarum, invicem connexæ sunt velut *annulus annulo.*" Another quotation from Hermann, which, although it relates only to a particular case of the circle, I cannot refrain from giving, as it corroborates the view I take of Reptiles in the *Horæ Entomologicæ,* p. 263, is as follows:—"Demum per Serpentes in circulum quasi per amphibiorum ordinem rediens affinitas deduci iterum ad primum genus potest, Testudinem. *Testudo serpentina* L. cui caput serpentis, cauda etiam longa quasi serpens inter testudines testas traductus esset. Caudæ apex ungue incurvo armatus quem Testudo scorpioides ostendit in serpente aliquo redit." p. 270.

* It is rather curious to compare this figure with those which I have given, *Horæ Entomologicæ,* p. 212. and *Linn. Trans.* vol. xiv. p. 65. This, indeed, I believe to be the first instance of a diagram being employed to express the relations existing between natural objects; for Hermann's Table, as given at the end of his work, is any thing but a diagram: it is more confused than the *Mappa Geographica* of Linnæus, or the *nets* more lately devised,—both of which have expressed analogies as if they had been affinities.

animaux se ressemblent seront peut-être la plus conforme à la Nature*."

On the appearance of Mr. Vigors's View of Ornithology, I naturally became anxious to know whether the affinities there stated held good; and on my arrival in Cuba resolved to examine anatomically those forms which, from being extra-European, had been little studied.—My observations on the subject I propose to lay before the Society from time to time, as I may have it in my power to make them; and for the present, I shall preface the description and anatomy of two birds having rather peculiar forms with a few remarks on the affinities of *Vertebrata*, and the comparative anatomy of Birds in general.

Mr. Vigors in his paper has very fully discussed the external structure of this charming class of animals; and by following carefully the variation of their external structure, he has arrived at an arrangement which will be valid to demonstration as the natural one, if by watching the variation of the internal structure we can obtain the same result: for be it always borne in mind, that a natural arrangement will stand any test. It is not that by tracing the variation of one organ we are led to a natural system, and by tracing that of another we are led to an artificial one; since in fact every organ, although not equally convenient, when viewed with reference to the changes it may undergo, leads to the same result, and the variation of all organs is expressed by the natural system†. If it be well said by M. Cuvier,

* In these few sentences we find the first dawn of so many truths; and as they do not profess to give us more than the dawn, it is unnecessary in this place to state the points in which I differ from Professor Fischer. I owe it to him, however, both as a naturalist and a friend, that I should make the above quotations from a work, which I only became acquainted with last year, when I purchased it at the sale of the library of a lamented member of this Society, Mr. Thomas Smith,—a library well known to naturalists as rich in almost every department of their science.

† See *Horæ Entom.* p. 454.

M. Cuvier, that the natural history of an animal is the knowledge of every thing that regards that animal,—then Natural History, as a science, is only studied in effect when we are engaged in the pursuit of the natural system. It is not, therefore, so much the difference between organs, that we ought to lay stress upon, as the mode in which they vary; from which truth arises another, namely, that in those groups where the variation of an organ is at its maximum,—or, in other words, where the differences between the various states of an organ are the most,—there such an organ is of less consequence as a principle of division characterizing large groups; for it is the mode of variation that we ought to attend to. Thus in the *Natatores*, the number of cervical vertebræ is at its maximum of variation; in the *Grallatores*, the form of the beak is at its maximum of variation; in the *Rasores*, the number of lumbar vertebræ; in the *Insessores*, the economy and nature of food;—and so on. The primary divisions, therefore, of these several large groups of birds, will not depend upon the above respective circumstances, although by tracing the variation of them we are enabled to apply corrections to the place that may have been assigned each species from other considerations, as close to its next of kin in natural affinity.

Generally speaking, *Mammalia* have more vertebræ in their spine than Birds: but this is scarcely to be imagined a mark of their superior perfection; for man, undoubtedly the chief of *Mammalia*, has one of the lowest numbers of vertebræ that the class presents. The variation of the number of vertebræ in *Mammalia* is not at all conducted on the same principles as that in birds: in the latter class this number varies in every possible way, yet on the whole is tolerably regular in its variation. In *Mammalia* the number in some respects, such as that of the vertebræ of the cervix, is almost constant; and yet with respect

to

to the whole spine, the irregularity of the number of vertebræ is so great, that even neighbouring species,—such as the dog and wolf, the camel and dromedary, the horse and quagga,—differ widely in number. Nay more, the same species sometimes presents a variety of number in the vertebral joints. The difference, moreover, between the maximum numbers of vertebræ in *Mammalia* and birds, as hitherto observed, is 17 in favour of *Mammalia*; while the difference between their respective minimum numbers, as hitherto observed, is 9,—*Mammalia* having also the least. Hence, according to what has been said, the differences of the number of vertebræ in *Mammalia* is of much less consequence, as connected with natural arrangement, than those in birds.

Now let us watch the general variation of the number of spinal vertebræ in birds; for which purpose I must construct my tables upon the data afforded by those which are given by M. Cuvier in his *Leçons d'Anatomie Comparée*, although I am far from conceiving them to be correct.

Orders.	Number of species examined.	Maximum number of vertebræ in the spine.	Minimum number of vertebræ in the spine.	Extent of variation.	Observations.
1. Raptores . .	8	40 Pandion.	36 Bullo.	4	
2. Insessores .	21	42 Pica.	33 Loxia.	9	The common Sparrow is not here taken into account, because Cuvier does not give the number of coccygian vertebræ.
3. Rasores . .	7	55 Struthio.	37 Meleagris.	18	
4. Grallatores	13	46 Scolopax.	39 Numenius.	7	Hæmantopus is excluded, because Cuvier does not give the number of vertebræ in the coccyx.
5. Natatores .	12	56 Cygnus.	39 Larus.	17	The Petrel is not included, because Cuvier does not give the number of sacral vertebræ.

Hence,

Hence, so far as we are authorized by these data, we learn, that the variation in the number of vertebræ is least in the *Raptores* and greatest in the *Rasores:* yet, singular as it may appear, there is evidently some species of relation existing between these two orders; which relation made Brisson, in his General Arrangement, and Hermann in his *Tabula Affinitatum*, place them next each other in affinity. The *Phasianidæ* and *Vulturidæ* have been observed to agree in various respects by Buffon, Humboldt, and other naturalists*; and whether we regard the general agreement of the respective orders to which they belong, in the naked cheeks, cera, or form of beak, or of some species in the number of vertebræ, there can be little doubt of the reality of some connexion between them.

Again, on looking at the above table, we find that the number of vertebræ is greatest in the Ostrich and Swan, of all birds; in the former the number of articulations being 55, in the latter

* See *Humb. Obs. Zool.* on *Vultur gryphus,* Pl. VIII.—It is a story current in the Island of Cuba, that when the Havana was taken by Lord Albemarle in 1762, the English soldiers seeing the *Gallinaza Aura* Vieill. feeding, as it is often accustomed to do, among the domestic fowls in a farm-yard, took them for Black Turkeys; and were only undeceived by the disgustingly putrid odour which these voracious birds emit on being handled. The name under which the bird is known to all our English colonists, namely *Turkey-Buzzard,* and M. Vieillot's generic name *Gallinaza,* adopted from the Spanish as mentioned by Acosta, have both reference to the relation which this Vulture undoubtedly bears to the *Rasores.* See also *L'Histoire du Nouveau Monde,* 1640, p. 145. Hermann says, p. 167:—"Gallinarum cum Accipitribus affinitatem aliquam illud indicare poterit, quod animalis cibi cupidinem qui in cohortatibus nostris Gallinis conspicitur, domesticæ forte vitæ debitum urgeat Buffonius, aut quod incurvum accipitrino subsimile rostrum et magna statura *Tetraonis Urogalli,* vel *Meleagridis Gallopavonis* forma colorque et denudatum caput quibus comparare illi *Vulturem Auram* itineratores solent rapacium avium ideam aliquam revocare possit." Aristotle, who seems also to be aware of this relation between the two orders, distinguishes the *Rasores* as *πολυγονα,* and the *Raptores* as *ολιγογονα.* Pliny says, "Alterum Tetraonum genus Vulturum magnitudinem excedit, quorum et colorem reddit:" alluding, probably, to the *Capercailzie.*

latter 56. Now there is also some relation indubitably existing between these two birds, which may serve to account in some degree for that general connexion which almost every observer must have remarked between the *Anatidæ* and Gallinaceous birds*. On comparing the Ostrich and the Swan, we notice, that different as they are in their economy, in the structure of their feet, and even general form, they nevertheless present an approximation in the length of neck, form of beak, vegetable food, enormous crop, muscular gizzard, long cæcums, and, finally, in the structure of the male organs of generation†, so different from those of all other families of birds. These two similar relations existing between the *Raptores* and *Rasores* on the one hand, and between the *Natatores* and *Rasores* on the other, may appear extraordinary: but it would be inconsistent with what I believe to be the general plan of Nature, did they not obviously occur to us; for the opposite points of a circle of affinity always exhibit such alliances, as I first observed in the approximation of the genus *Hybosorus* to *Ægialia*, and of *Euchlora* to *Areoda*‡.

Let us now form another table of the cervical vertebræ, from the same data that enabled us to produce the last; previously to which, however, I may remark, that it is a curious characteristic of the *Mammalia*, that, with the exception of one species, (where it is 9,) the number of cervical vertebræ throughout the class

* "Facies nuda papillosa *Anatis moschatæ* quæ præ aliis mansuescit et chortalis fit videtur Anatis genus ad Gallinas diducere posse."—Herman. *Tab. Aff.* p. 160. A number of concordances in organization between them may be found detailed in the *Leçons d'Anat. Comp.*

† *Règne Animal,* vol. i. p. 299.

‡ See also *Horæ Entom.* p. 319 and p. 403, where this relation is more developed. It is the *Affinity of Transultation* of M. Agardh (see *Linn. Trans.* vol. xiv. p. 50.), which Mr. Vigors has so well applied to account for the relation existing between the Fissirostral and Scansorial tribes of *Insessores.* (See *Linn. Trans.* vol. xiv. p. 432).

is

is constantly 7. In birds on the other hand, of all the vertebræ, the cervical vary the most in number; and indeed, on the length and flexibility of the neck, which in this class are generally produced by an increase in the number of joints, depends much of the economy of the species.

Orders.	Number of species examined.	Maximum number of cervical vertebræ.	Minimum number of cervical vertebræ.	Extent of variation.	Observations.
1. Raptores . .	8	14 Pandion.	11 Buteo.	3	‡ I have added one Rasorial bird, *Columba passerina*, to the number examined by Cuvier, because I find that it presents the minimum number of cervical vertebræ yet observed in the order of *Rasores*.
2. Insessores .	22	13 Corvus.	9 Fringilla.	4	
3. Rasores . .	8	18 Struthio.	12 Col. passerina ‡.	6	
4. Grallatores	14	19 Grus.	12 Hæmantopus.	7	
5. Natatores .	13	23 Cygnus.	12 Larus.	11	

Here then, we first observe that the two Normal groups have the least number of cervical vertebræ, and the three Aberrant the greatest. In the next place, we see that the variation in the number of cervical vertebræ is least in the *Raptores*, and greatest in the *Natatores*. Unfortunately, however, the numbers in two very remarkable genera, *Gypogeranus* and *Tachypetes**, are not known. The

* Although this bird has only been of late years well known, the important affinity existing between the *Raptores* and *Natatores* was known to Hermann, who says, p. 145:—"*Cataractes* genus à cl. Brunnichio conditum præcipuè cerâ rostri basin tegente differt assimilis hâc in re Falconibus. Poterit adeò qui velit cum istis avibus conjungere, et e Falconibus præcipuè cum *F. leucocephalo,* qui simili ferè modo congeneris *Haliæti* parasitus est: de quâ re vid. Catesby, et *Cataractem Skuam* haud secùs ac Falcones rapacem esse terrestremque rapinam exercere et anates gallinas imò agnos prædari Sibbaldus, Willughbeius, Brunnichius fidem faciunt." And again,

 p. 154,

The following table relates to the variation in number of the dorsal vertebræ, or those to which the ribs are attached.

Orders.	Number of species examined.	Maximum number of dorsal vertebræ.	Minimum number of dorsal vertebræ.	Extent of variation.	Observations.
1. RAPTORES . .	8	8 Pandion.	7 Vultur.	1	
2. INSESSORES .	22	9 Fringilla.	6 Loxia.	3	
3. RASORES . .	7	11 Casuarius.	7 Meleagris.	4	
4. GRALLATORES	14	9 Grus.	7 Ciconia.	2	
5. NATATORES .	13	11 Cygnus.	7 Pelecanus.	4	According to Mr. Burton in the *Linnean Transactions*, *Tachypetes Aquilus* has seven ribs.

Here the variation is least in the *Raptores*, and greatest in the *Rasores* and *Natatores;* where again, by the bye, it is worth noticing, that the Swan and Cassowary agree in possessing the maximum number of ribs which the whole class of birds presents.

We now come to a table of the variation in number of the sacral vertebræ, founded on the same data; which table, however, is less perhaps to be depended upon than the others, in

p. 154, in speaking of the genera *Diomedea* and *Phaeton,* he observes, that they appear "non inter se modò cognati ob longissimas alas, altissimum volatum et vivendi rationem, sed et *Pelecano Aquilo* conjuncti eandem ob causam, unde in eâdem tabulæ lineâ juxta-positi et cum *Falcone Haliæto* simili modo in pisces quibus victitat ex alto irruente conjuncti." I was much pleased, when off the coast of Martinique, to behold the *Tachypetes* floating over the Diamond Rock just like an eagle. The sailors assured me, that he often seizes his prey with his talons; and on referring to the *Histoire Naturelle et Morale des Iles Antilles de l'Amerique,* published in 1658, where there is a very detailed account of the *Fregates,* I find the following passage:—" Ils se placent si bien du costé ou les poissons volans doivent faire leur saillié que dez qu'ils sortent de l'eau ils les reçoivent en leur bec ou en leurs serres." p. 148.

consequence

consequence of these vertebræ being in birds always soldered together, and therefore very difficult to count.

Orders.	Number of genera examined.	Maximum number of sacral vertebræ.	Minimum number of sacral vertebræ.	Extent of variation.	Observations.
1. Raptores . .	8	12 Bubo.	10 Buteo.	2	
2. Insessores .	22	13 Corvus.	8 Alcedo.	5	
3. Rasores . .	7	20 Struthio.	10 Meleagris.	10	
4. Grallatores	14	15 Hæmantopus.	7 Fulica.	8	
5. Natatores .	12	15 Anas.	10 Sterna.	5	The Petrel is not taken into consideration, as Cuvier does not mention the number of its sacral vertebræ.

Here we see that the two Normal groups have the least number of sacral vertebræ, and the three Aberrant the greatest. We see also that the number varies the least in the *Raptores*, and most in the *Rasores*.

The fifth and last table that I shall offer relates to the vertebræ of the coccyx.

Orders.	Number of genera examined.	Maximum number of coccygian vertebræ.	Minimum number of coccygian vertebræ.	Extent of variation.	Observations.
1. Raptores . .	8 Aquila.	8 Aquila.	7 Pandion.	1	
2. Insessores .	22	9 Hirundo.	6 Loxia.	3	
3. Rasores . .	7	9 Struthio.	5 Meleagris.	4	
4. Grallatores	13	8 Ciconia.	7 Grus.	1	*Hæmantopus* is not taken into consideration, because Cuvier does not give its number of coccygian vertebræ.
5. Natatores .	13	9	7 Anser.	2	

 On

On reviewing the above five tables, we find that the amount of variation in each order respectively may be expressed by the following numbers:

Normal	Raptores	11
	Insessores	24
Aberrant	Rasores	42
	Grallatores	25
	Natatores	39

Hence we learn, that the whole number of vertebral joints varies most in the three Aberrant groups, and least in the two Normal; that it varies much less in the *Raptores* than in all the other orders; that it varies the most in the *Rasores;* and that the degree of variation is nearly alike in the *Rasores* and *Natatores*, and in the *Insessores* and *Grallatores*. We also perceive from the first of the five tables, that the least number of vertebræ occurs among the *Insessores*, and the greatest among the *Natatores;* the difference between the maximum in *Cygnus* and the minimum in *Loxia* being no less than 23 vertebræ.

Among the *Mammalia* the minimum number hitherto observed is in the genus *Pteropus*, and the maximum among the *Cetacea;* both thus showing a parallelism of analogy with birds. The minimum number is 24, the maximum 73, the difference 49.

I have entered into this subject at some length, not merely because it affords us a curious test of the accuracy of Mr. Vigors's general arrangement of the orders, but also in the idea that it might help to solve a problem of great difficulty; namely, which two of the five orders of Birds lead us to the contiguous classes of *Mammalia* and *Reptilia?* The argument may be thus stated:—The vertebral axis is the great characteristic of the sub-kingdom *Vertebrata*, to which all these three classes belong. In Birds, as a class, moreover, we find the number of vertebræ to to vary much less than in *Mammalia;* and consequently, to merit in them more attention as a ground of division. Finally therefore, we may conclude, that in that order of Birds where this great principle of structure varies the most, there Nature is—if I may use the expression—looking out for the structure of some other class.

This mode of reasoning is, I am fully aware, not without its defect; but if it can be admitted to possess any value, it follows, that we must look among the *Rasores* and *Natatores* for the outlets from the class. And as there cannot be the least doubt of the *Natatores** approaching to the Chelonian reptiles, we must consequently look among the *Rasores* for the approach to *Mammalia.*

Now this agrees with theory, inasmuch as it is from the two extremes of the three Aberrant groups that we should expect to pass into the contiguous classes.

But this question is of such extreme importance to zoology, that it ought not to be dismissed slightly. I trust, therefore, that I shall scarcely be deemed to trespass upon the time of the Society, if I here attempt to investigate three subjects, which have exercised the ingenuity of naturalists from the earliest periods of their science, and which are as follows:

1. The true analogies existing between the orders of Birds and those of *Mammalia.*

2. The connection of the various orders of *Mammalia* in their own series of affinity†.

3. The point of nearest approach made by *Mammalia* to Birds,

* Bonnet on this account divided the order into *Aves Aquaticæ* and *Aves Amphibiæ.* See on this subject *Horæ Entomologicæ,* p. 263, et seq.

† I ought here to acknowledge, that the subject of the natural division of the *Mammalia* has been taken up by a writer in the *Annals of Philosophy* for November 1826. This gentleman not only shows much acquaintance with the class in detail, but has ingeniously developed a number of natural approximations. Unfortunately, however, first

Birds, and the point of nearest approach made by Birds to *Mammalia*.

In the discussion of these subjects I must not be expected to produce any original facts. This, indeed, would not answer my purpose; since, in all similar questions, the instrument which is at once safest for the wielder, and most forcible against those for whom it is intended, is the *argumentum ad verecundiam*.

First, as to the orders of *Mammalia*:—there is one to which we must all look with peculiar interest, as being that of which Man forms the type. Great as is the gulf between Man and the Ourang Outang, between the *Bimana* and *Quadrumana* of Cuvier, it is impossible not to see, with Linnæus, that they possess many characters in common*, and consequently impossible not to agree with him, that they form one group, which may be distinguished from all others by the general structure of their

first by not carefully investigating the value of the analogies on record, and then by trusting to the theory of parallelism in preference to the less fallible guide of affinity, he has produced a series, which, in the conclusion, he himself discovers not to be valid. Whether the affinities of his minor groups be of superior value he does not enable us to judge, as no reasons whatever are given for them. This mode of proceeding is the more to be regretted, from his evidently being conversant with the various forms of *Mammalia*, and from his having pointed out the orders in a very lucid manner; from which I have not failed to derive advantage. This much, I fear, cannot be said of the contents or affinities of these orders; and therefore, as he has done me the honour of referring to my views of the subject (and his paper, indeed, purports to be a quinary distribution of the class), I may, perhaps, be allowed to express a hope that the question may be followed up. One thing is sure, that nothing can be easier than to make five groups, provided we do not conceive it necessary to prove them to be natural. Having, therefore, stated his propositions, he will be expected to prove them either by original observations of his own, or the recorded ones of others. At present his paper proves nothing, ascertains nothing; but leaves every affinity to be pointed out. I need scarcely say, that without some such proofs in detail of the connection between the component parts of the group, and thus of its unity, his propositions must remain dubious, and all new names without authority.

* *Amœn. Acad.* vol. v. p. 67 *et seq.*

skull,

skull, teeth, fingers, nails, organs of generation, and pectoral mammæ. It is the only order of *Mammalia* that has not been pointed out and named by Aristotle*; but as he has subdivided it, and shown the affinities of the principal groups composing it, it is easy to imagine, that if he could have sacrificed the natural pride of philosophy so much as to class himself with any inferior species of animal, he would have named this group also. Ray may be said to have perceived it, from calling the group πλατυωνυχα, which evidently includes Man; but by some mistake, he has forgotten to make any mention of Man in his system. This order was aptly termed by Linnæus PRIMATES; and the natural construction of it was the most original as well as important fact that he ever demonstrated in the natural history of *Mammalia*.

Another natural group which all zoologists have perceived,

* Notwithstanding the number of ancient and modern writers who have employed themselves in commenting on the *Historia Animalium* of Aristotle, I am not aware that any tabular view has ever been given of this naturalist's arrangement of *Mammalia* and Birds, unless that given by Ælian, lib. xi. c. 37. ed. Schneid. be so considered. This is owing to Aristotle's commentators, with the exception of Ray, Scaliger, and Schneider, being all ignorant of the science. As for Ælian, he was not merely ignorant of natural history, but, moreover, without capacity to understand it, as appears from the manner in which he filled the common-place book, which has come down to us. Aristotle's work is, on the other hand, invaluable. The astonishing talent he possessed for observation and generalization, not merely appears by comparing him with his followers among the ancients, but also when he is compared with the most profound of modern zoologists. The following tabular view of his arrangement, where his own nomenclature is given, will best show the truth of this opinion. How far he has been improved upon either in arrangement or nomenclature, may thus be easily understood. The Table ought in particular to be compared with that given, p. 60 of the *Synopsis* of our great countryman Ray, who perhaps was the most original zoologist, after Aristotle, that ever existed. In mentioning this subject, I do not refer to Pliny, because the few passages of his entertaining work that relate to arrangement are borrowed from Aristotle; and not having been understood in the original, are miserably deteriorated in the translation. Natural History is, perhaps, the last of all sciences that a mere compiler ought to meddle with.

Systema

[Note continued.]

Systema Aristotelicum Mammalium et Avium Cuvieriano Linnæanoque comparatum.

Exempl.

- Τα ΖΩΑ.
  - ΕΝΑΙΜΑ. Vertebrata *Lam.*
    - ΖΩΟΤΟΚΑ. Vivipara *Auct.* Mammalia *Linn.*
      - ΔΙΠΟΔΑ . . . . *ευθυωνυχα, τα δε τους οδοντας τους προσθιους εχει οξεις, τους δ' εντος πλατεις* Bimana *Cuv.* . . . . Homo.
      - ΤΕΤΡΑΠΟΔΑ. QUADRUPEDA *Auct.*
        - 1. *Τα δε αμφοδοντα και τας ωνυχας εχοντα* UNGUICULATA *Ray.*
          - 1. *Τα δε τους οδοντας τους προσθιους εχει οξεις, τους δ' εντος πλατεις*
            - *Πιθηκοειδα* Quadrumana *Cuv.* Primates *Linn.* . . Simia.
            - *Δερμαπτερα* Cheiroptera *Cuv.* . . . . Vespertil[io].
          - 2. *Τα δε μη καρχαροδοντα διον τα γενη Μυων πολλα* Rodentia *Cuv.* Glires *Linn.* . . . . Mus.
          - 3. *Τα δε καρχαροδοντα*
            - *Γαμψωνυχα* . . . . Carnivora *Cuv.* . . . . Leo. (Feræ *Linn.*)
            - *Πεπηρωμενα* . . . . Amphibia *Cuv.* . . . . Phoca. (Feræ *Linn.*)
        - 2. *Τα δε ουκ αμφοδοντα και τας χηλας εχοντα* UNGULATA *Ray.*
          - 4. *Πολυσχιδη* . . . . Pachyderma Proboscidea *Cuv.* . . . . Elephas. (Bruta *Linn.*)
          - 5. *Δισχιδη*
            - *Ακερα*
              - *Χαυλιοδοντα* Pachyderma Ordinaria *Cuv.* . . . . Sus. (Bruta *Linn.*)
              - *Τα δε μη χαυλιοδοντα διον ὁ καμηλος* . . . . Camelus. (Pecora *Linn.*)
            - *Κερατοφορα, τα δε λεγεται μηρυκαζειν* Ruminantia *Cuv.* . . . . Bos. (Pecora *Linn.*)
          - 6. *Ασχιδη* *ανεπαλλακτα* . . . . Solipeda *Cuv.* Belluæ *Linn.* . . . Equus.
      - ΑΠΟΔΑ . . . . *Τα κητωδη* . . . . Cetacea *Cuv.* Cete *Linn.* . . . . . Balæna.
    - ΩΟΤΟΚΑ. Ovipara *Auct.*
      - ΠΤΕΡΩΤΑ. Aves *Auct.*
        - *Διδακτυλα* . . . . Brevipennes *Cuv.* . . . . Struthio. (Rasores *Vigors.*)
        - *Τετραδακτυλα.*
          - 1. *Πληκτοφορα* . . . . Gallinæ *Linn.* . . . . Phasianu[s]. (Rasores *Vigors.*)
          - 2. *Μακροσκελεις* . . . . Grallæ *Linn.* Grallatores *Vig.* . Ardea.
          - 3. *Στεγανοποδα* . . . . Anseres *Linn.* Natatores *Vig.* . . Anas.
          - 4. *Βραχυσκελεις*
            - *Τρεις δακτυλοι εις το εμπροσθεν* . . . Passeres *Cuv.* . . . . Fringilla. (Insessores *Vig.*)
            - *Δυο δακτυλοι εις το εμπροσθεν* . . . . Scansores *Cuv.* . . . . Psittacus. (Insessores *Vig.*)
          - 5. *Γαμψωνυχα* . . . . Accipitres *Linn.* Raptores *Vig.* . . . Aquila.
      - ΦΟΛΙΔΩΤΑ vel Reptilia.
      - ΛΕΠΙΔΩΤΑ vel Pisces.
  - ΑΝΑΙΜΑ . . Invertebrata *Lam.*

και τα ΦΥΤΑ *επισυναπτομενα αλληλοις.*

is the καρχαροδοντα of Aristotle, the *Carnivora* of Ray, and *Feræ* of Linnæus. Their claws, their abdominal mammæ, and their organs of generation, separate the FERÆ from the former order.

Another natural group is distinguished from the preceding under the title of τα μη καρχαροδοντα by Aristotle; who did not, however, seize its true character*. This remained in obscurity until Ray described certain animals as "Quadrupeda vivipara pede multifido herbivora binis prælongis dentibus anterioribus in utrâque maxillâ seu Leporinum genus†." Linnæus saw the truth of the order as thus characterized, from all others; but changed the name to *Glires*, which has given way among the disciples of Illiger to the clumsy appellation of *Prensiculantia*, and among those of Cuvier, to the very applicable one of *Rongeurs* or *Rodentia*. A Member of the Linnean Society may, however, be permitted to retain the name of GLIRES.

Another most natural group was pretty well understood and characterized by Aristotle under the name of τα μεν ουκ αμφοδοντα, all other viviparous quadrupeds being αμφοδοντα,—that is, furnished with cutting-teeth or incisors in both the upper and under jaw‡. He also described them as not furnished with claws but with hoofs, which occasioned Ray, who understood the value of the group, to call it *Ungulata*, all other quadrupeds being *Unguiculata*. Somehow or other, Linnæus unfortunately lost sight of this group, and contented himself instead with

* It is not clear whether Aristotle placed this group among the αμφοδοντα or not. My only reason for thinking he did so is, that he places them in opposition to the καρχαροδοντα. If, however, the word αμφοδοντα means *circumdentata*,—a signification that it will bear,—then it is clear that he could not have meant the *Glires* to be included in this group.

† *Raii Syn.* p. 204.

‡ Αμφοδων, utrinque dentatus.

some of Aristotle's subdivisions of it, which are all excellent. The group of Ungulata has not, however, escaped the eye of M. Cuvier.

The last order we have to mention is the *κητωδη* of Aristotle, *Cetaceum genus* of Ray, *Cete* of Linnæus, and *Natantia* of Illiger. It is in truth a group which cannot fail to strike the most ordinary observer, from the limbs taking the form of fins, and the whole animal the form as well as habits of a fish.

Every Mammiferous animal may be reduced to these five orders; that is, may be assimilated, in a greater or less degree, to one or other of the following typical forms; viz. Man, the Lion, the Horse, the Whale, and the Mouse.

I shall show hereafter how these five orders form a continued series returning into itself, so as to be a natural group. In the mean time, I must recall to the attention of the reader the orders of Birds as defined and arranged by Mr. Vigors*; and to which definitions and arrangement I have just applied so severe a test, only to corroborate their accuracy and to make them display additional harmony.

When we have heard the Parrot or Mainate speaking; when we have witnessed the former feeding itself as it were with a hand; when, in short, we have reflected on the remarkable intelligence and development of brain throughout the whole order of *Insessores*, to which both birds belong,—there has been no one, perhaps, dull enough not to compare them to *Primates*. Ælian† says: "Τα *μεν αλλα των ωδικων ορνεων ευστομει, και τη γλωττη φθεγγεται, δικην ανθρωπου.*" I allow, indeed, that it is difficult to follow the opinion of the great naturalist of France, who, igno-

* *Linn. Trans.* vol. xiv. p. 406, *et seq.*

† Ed. Schneid. lib. I. c. xx. With respect to the particular case of Parrots, I cannot do better than refer to the ample collection of classical quotations given on this subject in the *Zoological Journal,* vol. ii. p. 40, &c.

rant

rant of the true nature of relations of analogy, imagined that the Psittaceous tribe of Birds ought to occupy the first step in the scale of nature below Man: but we cannot help adopting the notion of Linnæus in the *Systema Naturæ*,—that although not near him in construction, they are yet analogous to him in various important respects. And, adopting this notion, we must place the whole order of *Insessores*, to which *Psittacus* belongs, opposite to the *Primates*, of which Man forms the type.

The analogies existing between Birds of Prey and Carnivorous Quadrupeds having been noticed by Aristotle, who called both groups γαμψώνυχα, were enlarged upon by Plutarch*. Among a host of moderns who have been struck with the resemblance, I may particularly mention Linnæus, who in his *Systema Naturæ* has expressly called his Accipitres "*Feris analogi;*" and Buffon†, who has treated the subject at length and with his usual eloquence. I conceive, therefore, that no one can object to the propriety of my placing the *Feræ* opposite to the *Raptores*.

The analogy between Aquatic Birds and Aquatic Mammalia scarcely requires the mention of the authority of Linnæus to make it be granted. It is indeed so evident, that Hermann, according to his custom, takes it for a relation of affinity‡. In both orders the anterior appendages of the vertebral axis dwindling into fins, and the two undivided posterior appendages being placed so far behind on the axis as to show that both were intended for motion in the water rather than on land, are circumstances of themselves sufficient to authorize the placing of the *Cetacea* opposite to the *Natatores*.

Two orders still remain in each class to be considered: the *Glires* and *Ungulata* among the *Mammalia*; and among Birds,

* On this subject, see *Zool. Journ.* vol. i.

† Vol. i. p. 37.

‡ *Tab. Aff. Anim.* p. 153.

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the *Rasores* and *Grallatores*. The relations of analogy pointed out by Linnæus between *Mammalia* and Birds are, as Hermann has observed, not always correct; and his errors have arisen from the misfortune of his not detecting the natural group of Aristotle and Ray, which the latter has called *Ungulata*. Having only been able to seize Aristotle's subdivisions of *τα μεν ουκ αμφοδοντα*, he lost the parallelism of analogy, and fell, as I shall hereafter show, into very glaring mistakes. In the *Systema Naturæ*, however, he has mentioned that very striking analogy which appears between his groups of *Grallæ* and *Bruta*; that is, according to the parallelism of analogy, between the orders of *Grallatores* and *Ungulata*, since the *Bruta*, as we have seen, do not form an order, but only a natural subdivision of the *Ungulata*. That this analogy is demonstrably true, I deduce from the following facts. Of their respective classes, the orders of *Ungulata* and *Grallatores* contain examples of the longest legs in proportion to the body,—witness *Camelopardalis* and *Hæmantopus*. Both orders present us, in groups not exactly aquatic, with instances of the toes being soldered together, as the Horse; or connected together by a web, as the Flamingo. Both orders present us with the greatest elongation of muzzle or facies,—witness *Myrmecophaga*, or *Antilope** and *Scolopax*; and also with the most depressed form of muzzle,—witness *Hippopotamus* and *Platalea*, which genera also afford us the truest specimens of Wading *Vertebrata*. In both orders we have the most elongated claws,—witness *Megalonyx* and *Parra*. Both orders afford us the swiftest animals in running,—as the Horse and *Tachydromus*; and the most pugnacious on account of love,—as the Bull and *Machetes*. The Bull moreover and the *Butor* (or *Bostaurus*, for hence comes the bird's name), afford us the loudest and hoarsest voice of their respective orders: where we have

* Particularly *A. bubalus* L.

also

also the most remarkable instances of the upper and under mandibles touching each other merely at their base and point; as *Myrmecophaga*, or the whole of the τα μεν ουκ αμφοδοντα of Aristotle, and *Anastomus** Illig. Both orders exhibit ornamental appendages to the head,—as the antlers of the Stag and the crown of the Crane; and both afford us the only instances of true horns, —as *Bos* or *Rhinoceros*, and *Palamedea* L. To see a hundred such instances of resemblance it is only necessary to walk into a museum. I shall therefore only further say, that both orders contain polygamous animals, are generally gregarious, and more graminivorous than granivorous, being essentially inhabitants of marshes and savannahs. Thus then, with Linnæus, I place the *Bruta*, or rather the whole order of *Ungulata* to which they belong, opposite to the *Grallatores*.

Four orders in each class being now disposed of, it follows by parallelism of analogy, that the *Glires* ought to be placed opposite to the *Rasores*. But setting theory wholly aside,—is this position true in fact†?

Linnæus, from the above-mentioned error in his series of affinity, considered the *Rasores* to be analogous to his group of *Pecora*. But this group, according to Aristotle and Ray, is only a subdivision of *Ungulata*, which have, I consider, been now proved to be analogous to the *Grallatores*. If, therefore, Linnæus be right in making his *Bruta* analogous to the order of Wading Birds, it follows that his *Pecora* must be so also.

* The genus *Aramus*, which I have killed in this island, also presents the peculiarity of the mandibles not meeting towards the middle of the beak.

† The ancient name of *Struthio Camelus*, as well as the form and habits of the Ostrich, show indeed a relation of analogy to the Camel; but then we are to recollect, in the first place, that the Ostrich is at the osculant point or confines of the orders of *Grallæ* and *Rasores*; and secondly, that such slight variations of the parallelism of analogy often appear, although, as has been said, *Horæ Entom.* p. 403, I think it possible that even these are subject to rule.

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The analogy of the *Rasores* to the Ruminating Animals was first, I believe, mentioned by Linnæus in the *Systema Naturæ*. It has since his days been copied and copied, until now it almost becomes a sort of heresy to inquire into its accuracy. I am not, however, aware that any reason for this analogy has ever been assigned, beyond the fact,—that one order affords the principal part of those birds which are domesticated by man for purposes of food; and the other, the principal part of quadrupeds which are destined to the same purpose. Now, granting even this domestication not to be the work of art, but to be an analogy really existing in nature, I would observe,—setting the whole family of *Anatidæ* aside,—that the *Glires* afford us many eatible or domesticated animals, such as the *Capromys* and Rabbit; and the *Grallatores* afford us similar instances in the Snipe and *Psophia*. If some *Rasores* be said, like the *Pecora*, to have ornamental appendages to the head, so it must be remembered has the Crowned Crane; whereas no rasorial bird is truly horned, like the *Palamedea*. But it may be worth while to take into consideration successively the grand characteristics of the *Rasores*, as given by ornithologists to distinguish them from all other birds.

The *Rasores* are, properly speaking, frugivorous birds; by which I do not mean eating fruits only, but all manner of seeds or grain. Now this character of being frugivorous applies much more to the *Glires* than the *Ungulata*, which are truly herbivorous, and only feed on grain in an artificial or domesticated state. To begin, then, with the rasorial or scratching powers of gallinaceous fowls; these are certainly the most burrowing of frugivorous birds: now the most burrowing of frugivorous quadrupeds are certainly not the *Ungulata*, but the *Glires*. These birds are characterized by the shortness of their wings and the weakness of their pectoral muscles. Now if we inquire whether it is among the

the *Glires* or *Ungulata* that we find the corresponding appendages of the vertebral axis,—that is, the fore-feet most shortened, —the answer will be, certainly not among the *Ungulata;* where, on the contrary, the Giraffe has them extraordinarily lengthened: but among the *Glires* we have the Jerboa, in this respect almost a bird. In general, moreover, this latter order is distinguished, like the *Rasores*, by the strength of those muscles of the two posterior appendages of the vertebral axis or hind-feet, that contribute to locomotion. Gregarious habits distinguish the most of the *Rasores;* so they do in a still more extraordinary manner the *Glires.* Many are insectivorous in both orders, and some omnivorous. The muzzle or facies of *Glires* is short and round, very like that of *Feræ*, there being a direct relation between the two orders. The facies of *Rasores* is also short and round, very like that of *Raptores* (the order analogous to that of *Feræ*); and there is also a direct relation between these two orders. Many *Rasores* perch and nestle on trees; so do many of the *Glires.* The *Rasores* generally feed on hard grain, which they pick up with their hooked beak, and masticate in a triturating gizzard: the *Glires* feed also on hard substances, which they gnaw with their strong hooked incisors, and masticate with their grinders. In both orders the thumb is very often rudimentary. In both orders the tail varies from an extraordinary length, as in the Squirrel and Pheasant, to being very short, as in the Hare and Partridge. Mentioning these two last animals together, we are reminded of a beautiful analogy, stated thus by Hermann, p. 167. "Tetrao Lagopus, ut et hîc aliquam cum Mammalibus analogiam adducamus, triplici respectu Lepori analogus quòd digitos subtus lanatos habet, et quòd Leporis variabilis more hyeme colorem mutat, et quòd carnis sapore et colore leporinam refert." No orders in their respective classes present the tail so spread out and flattened as the *Glires* and *Rasores*,—witness the Beaver

and

and Peacock. In both orders the sense of hearing is much developed. In both orders we find animals, such as Squirrels and Pigeons, with their toes perfectly free; and others, as *Hydromys* and *Phasianus*, which have them united at the base by a membrane. *Castor* is an aquatic animal, having some relation to *Cetacea; Struthio* is a terrestrial animal, approaching to *Natatores*. And so on relation comes so fast upon relation, that I know not how we can for a moment hesitate to place the *Glires* opposite to the *Rasores*.

I conceive it now to be demonstrated, that, so far as relates to the analogies existing in nature between the orders of *Mammalia* and *Aves*, we ought to place them thus:

	Animals typically.	
1. FERÆ	carnivorous	1. RAPTORES.
2. PRIMATES	omnivorous	2. INSESSORES.
3. GLIRES	frugivorous	3. RASORES.
4. UNGULATA	frequenting the vicinity of water	4. GRALLATORES.
5. CETACEA	aquatic	5. NATATORES.

The above series of Mammiferous orders is only adapted analogically to that of Birds, as given by Mr. Vigors*, and founded by him on relations of affinity. I now, therefore, come to the examination of the second subject; namely, The Connection of the above Orders of *Mammalia* in their own Series of Affinity. And commencing with the *Primates*, as the universally acknowledged point of departure, I find Hermann in 1783 writing of Monkeys as follows:—" Ex alterâ parte minutissimæ istæ Americanæ et delicatulæ species quas Sagoinos vocant, unguibus acutioribus et magìs in arcum curvatis, mintriente voce et omnia arrodendi instinctu, ipsâ demùm corporis exilitate Glirium familiæ sunt conterminæ. Si enim à *S. argentatæ* capite recedas, nonne

* *Linn. Trans.* vol. xiv. p. 406.

et

et forma et cauda et ipse quoque pollex tuberculum nonnullorum glirium pollicare referens, muris alicujus majoris esse videtur? Ipsum gliribus nonnullis solenne superius labium fissum redit in *Simiâ Midâ:* sed omnium maximè ultimam et gliribus magìs vicinam *Simiam Jacchum* putaverim, quæ et ipsâ caudæ prolixâ hirsutie et scandendi more *Sciuro* propior est." p. 62. Accordingly we learn that Sonnerat discovered an animal in Madagascar, which was described by Gmelin as *Sciurus Madagascariensis;* which was by Geoffroy made the type of the genus *Cheiromys*, or Handed Rat; and by Illiger in his *Prodromus* placed next to the genus *Galago*, which is one of the *Primates*. In the *Règne Animal* of M. Cuvier, p. 208, however, this Monkey-Squirrel goes back to its old place among the *Rongeurs*, with a mere hint of its affinity to the *Quadrumana;* which affinity, however, is again reckoned so strong by M. de Blainville, that in the third table of his *Comparative Anatomy* we discover it occupying a place among the *Primates*, as the type of a group to which he gives the name of *Myspitheques* or Ape-Mice. Hence I conclude it allowable to pass from the *Primates* to the *Glires*.

Again: on looking among the *Glires* of Linnæus in the *Systema Naturæ*, ed. 12, I find an animal called *Cavia Capensis*, which obtained this place and name from Pallas, and retained them with Erxleben and Hermann, although the latter says: "E densâ summè affinium animantium turbâ eligemus *Caviam Capensem*, anomalum illud animal, quod ob privam incisorum dentium formam ac situm, inferiorumque quaternarium numerum et totam interiorem structuram separatum ut constituat genus Linnæo et Schrebero promereri visum est, ast alio multo respectu Caviis Americanis, præeunte Pallasio, conjungi dignum. Sed connexum præterea voluimus cum *Bradypode*, cui nescio qui habitus formaque corporis contracta, digiti connati, magnusque costarum numerus cognatam faciunt."

unt." p. 83. Hermann finally gave it the generic name of *Hyrax*, which Illiger adopting, placed the animal itself in his *Prodromus*, p. 95, as the link between the *Cavies* and the *Bruta* of Linnæus. In the *Règne Animal*, we discover this puzzling genus forming together with the Rhinoceros one small group of the *Ungulata*, with the observation that, "en les examinant bien on trouve qu'à la corne près ce sont en quelque sorte de Rhinoceros en miniature." (vol. i. p. 240.) Hence it is allowable, I conceive, to pass from the *Glires* to the *Ungulata*.

When Dampier and Ray assigned the name of Sea Cow to the Manati of the West Indies, they probably gave the hint of that anatomical affinity to *Ungulata*, which has been followed up and proved by subsequent zoologists. Accordingly, Linnæus went so far as to place the Manati among his *Bruta*. And M. de Blainville, trusting entirely to the principle of division, and ignorant of the maxim of variation, has said* that, "le Lamantin appartient au groupe qui contient les Elephans dont il n'est qu'une modification propre à vivre dans l'eau." Now, though it is difficult to look at a Manati or Dugong, and call it an Elephant, it is impossible to deny that it is a modification of the Pachyderm form; and therefore we cannot refuse our assent to the accuracy of M. Cuvier in making the Herbivorous *Cetacea* follow the *Ungulata* in the arrangement of the *Règne Animal*.

Arrived thus, then, among those enormous *Mammalia*, which Nature points out to us as the direct medium of her transition from the Quadruped form to that of Fish, we proceed in the series of *Mammalia* to the genera *Trichecus* and *Phoca*. It is true indeed, that M. Cuvier, from the artificial plan of the *Règne Animal*, is obliged to deny this affinity, or at least to make no mention of it in the work: but it has been noticed

* *Dict. d'Hist. Nat.* Art. *Mammifère*, p. 141.

from

from the earliest ages, and by the most profound as well as ordinary observers. Among the ancient naturalists, Aristotle, and among the moderns, Linnæus, Buffon, Hermann, and Illiger, may be especially mentioned as expressing this affinity: and the following words of Hermann are too apposite not to be quoted.—" Trichecorum ultimus utique esse videtur Manatus, cui jam palmæ in digitos non distinctæ nec unguibus armatæ, nullique posteriores pedes sunt; sed Rosmarus plantarum præsentiâ Phocis propior exsertis dentibus de reliquo cum Hippopotamo conjunctus." *Tab. Aff.* p. 127.

Our business is to represent faithfully affinities and analogies as they occur, leaving it to time to smooth away difficulties. Although this affinity, therefore, does not coincide with the plan of the *Règne Animal*,—and we cannot refute the assertion that there exists a direct relation between the *Trichecus Manatus* and *Trichecus Rosmarus* of Linnæus,—we must on the other hand grant to M. Cuvier, that *Trichecus Rosmarus* comes most nearly to *Phoca*. But does this admission interfere in the least with our plan? Quite the reverse. Our only object is to keep close within the road of affinities; and our advantage in thus following the variation of structure is, that every natural relation, mentioned even by such authors as Hermann, may thus be expressed; and none need be denied merely because they do not fall in with our systems of division.

We thus, therefore, arrive from the *Cetacea* among the Carnivorous Quadrupeds or *Feræ;* for since the time of Aristotle, who placed the Seal among his καρχαροδοντα, naturalists have never denied this order to be its proper place. Hermann, indeed, places *Phoca* among that group of *Compeda* in which he ranges the Whale; but then he does not the less make it the direct link between that group and the *Feræ**.

* *Tab. Aff. Anim.* p. 115.

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Being now legitimately arrived among the essentially carnivorous animals, I may be charged with having omitted to express that most evident affinity which all authors have remarked between the *Primates* and *Feræ*. This affinity, it will be said, must be granted to exist in nature, whether with Linnæus we place the Bats among the *Primates*, or whether with M. Cuvier we range them at the head of this naturalist's group of *Carnivores*. It is equally true, whether with Schreber, Hermann, and Illiger we pass from *Lemur* to *Didelphis*[*], or whether with Linnæus and Erxleben, we place the Opossums among the *Feræ*.

But if by carefully following the progression of affinity, we have thus returned to the order of *Primates*, from which we departed, the group is a natural one[†]; and the following series, connected by affinity, harmonizes perfectly with that arrangement which we before acquired by comparing them analogically with Mr. Vigors's series of Birds.

1. *Normal Group*[‡]. Teeth of three kinds, and forming a continuous series. AMPHODONTA *Arist.*	1. FERÆ. 2. PRIMATES.
2. *Aberrant Group.* Teeth not of three sorts, or not forming a continuous series. ANAMPHODONTA *Arist.*	3. GLIRES. 4. UNGULATA. 5. CETACEA.

On reviewing this series, we must recollect that there is an universally acknowledged connection between the *Feræ* and the *Glires* by means of the Marsupial Animals, or *Marsupiaux* of

[*] See on this subject particularly, *Tab. Aff. Anim.* p. 63.

[†] See *Linn. Trans.* vol. xiv. p. 55.

[‡] The Normal and Aberrant groups were distinguished and named by Aristotle in his *Historia Animalium*, but have not to my knowledge appeared again in any work, until Mr. Gray had the honour of reviving them in the *Annals of Philosophy*.

Cuvier,

Cuvier*; some, such as *Dasyurus cynocephalus*, having the dentition as well as habits of the *Feræ;* while others, such as *Phascolomys*, present us with the structure of a *Rongeur*. There is also some sort of relation existing between the *Glires* and *Cetacea*, as Hermann† mentions in alluding to the Beaver and Manati. Hence we get two affinities of transultation or species of relation, which are exactly parallel to those which we have seen existing in Birds between the *Raptores* and *Rasores*, and between the *Rasores* and *Natatores*.

It is a fact as extraordinary in itself, as humiliating for the modern zoologist, that not one of the principal groups of Birds, as given to us in the *Règne Animal*, escaped the keen eye of Aristotle; nay, there is not one of the orders that has not been named by him. It must still give us a more ample notion of the ancient naturalist's skill in zoology to find, that not one of Cuvier's principal groups of *Mammalia* was unknown to him, except the *Marsupiaux* and *Edentés*. And, independently of these curious animals being principally natives of the New World, we may conclude that he never saw an example of either group; else, from the attention he paid to the system of generation and of dentition in the animals he has described, these groups could not have escaped him.

The *Edentata* have always been reckoned to be a very anomalous group of animals, and yet they appear essentially necessary for the fulfilment of the general plan of Nature. These interesting quadrupeds are divided by M. Cuvier into three smaller groups, of which the types may be considered to be the Sloth, the Armadillo, and the Duck-Bill or *Ornithorhynchus* of New Holland. Now, with respect to the *Bradypodæ*, Hermann says, p. 64: "Primatibus cognatum est genus *Bradypodis* mammis pectoralibus et aliquali habitu ob quem quondam Linnæus

* *Règne Animal*, vol. i. p. 170.

† *Tab. Aff.* p. 37.

cum

cum Primatibus conjunxit, cæterum moribus et ingenio immensum distans." M. Cuvier also, alluding to the remarkable structure of the arteries in the limbs of the Sloth, says: "Cette structure se rencontrant aussi dans les *loris* dont la démarche n'est guère moins paresseuse, il serait possible qu'elle exerçât quelque influence sur la lenteur des mouvemens*." Having thus established an affinity in the Sloth to the genus *Stenops* among the *Primates*, we find Hermann again saying, in the same page, "Anomalum *Bradypodis* genus cum *Pecoribus* connecterem ob quatuor ruminantes ventriculos:" and we find Cuvier in the *Règne Animal* alluding to the same relation†. Hence I conceive that the *Bradypodæ* will be allowed to connect the *Primates* and *Ungulata*. But Hermann, p. 64, connects the *Bradypodæ* with *Myrmecophaga*, as well on account of the strong nails reflexed under the palm and incapable of separate motion, as of their deficiency of incisors. In this opinion he is followed by Desmarest, Blainville, and Cuvier. Indeed, as Desmarest says, the fossil animal *Megalonyx*‡ makes the direct transition from the Sloth to the Ant-Eater; while on the other hand, the genus *Echidna*, which was described first by Shaw as a *Myrmecophaga*, and then by Home as an *Ornithorhynchus*, is universally now allowed to be the link between these two genera. A number of circumstances have made naturalists consider the *Ornitho-*

* M. de Blainville, both in the *Bull. de la Soc. Phil.* 1816, and in the 3rd table of his *Principes d'Anatomie Comparée*, calls them, *Quadrumanes Anomaux organisés pour grimper*.

† In the *Leçons d'Anatomie Comparée*, M. Cuvier makes his family of *Tardigrades* to be the means of transition from the *Edentés* to his *Pachydermes*. In the *Règne Animal*, he places them among the *Edentés*, with the remark, that the whole of this group are furnished with "de gros ongles qui embrassent l'extremité des doigts, et se rapprochent plus ou moins de la nature des Sabots." Linnæus, as it is well known, placed them among his *Bruta*, with the Elephant and Rhinoceros.

‡ See Art. *Megatherium*, Dict. d'Hist. Nat.

rhynchus

rhynchus as approaching the quadruped Reptiles much more than Birds. Thus, being arrived at an Oviparous animal (or at least one that is close to the oviparous structure) and a Reptile form, we detect a connection between the opposite points of the circle of *Vertebrata;* that is, between the *Mammalia* and *Reptilia*, analogous to those relations we have already seen in groups of lower rank existing between the *Raptores* and *Rasores*, between the *Feræ* and *Glires*. Aristotle and Ray had both some vague idea of a relation between Viviparous and Oviparous quadrupeds. But Hermann, although the *Ornithorhynchus* was unknown to him, has positively expressed it in the following words: "Ab iis autem (i. e. à *Myrmecophagæ* et *Dasypodis* generibus) transitus est ad Lacertas et Testudines, quarum illas squamis suis *Manes* has scuto *Dasypodes* referunt."

The following series, therefore, forms as it were a diameter of the circle of Vertebrated Animals*, passing from the *Mammalia* to the *Reptilia*.

$$\left.\begin{array}{l}\text{Primates}\\ \text{Ungulata}\end{array}\right\}\text{Bradypodæ—Dasypodæ—Monotremes } \textit{Cuv.}\text{—Reptilia.}$$

I am far, however, from wishing it to be supposed that I think the *Edentata* do not all, or at least in some degree, enter into the group of *Ungulata*. Although this order requires still to be *wrought out*,—until which be done, nothing can be considered as ascertained on the subject,—I see an evident analogy between certain *Edentata* and the genus *Hystrix*, which for the present I can only attribute either to their being in contiguous orders, or to the circumstance of distinct relations of analogy existing between the group of *Dasypodæ* Gray, and of *Talpidæ* Gray, which last are certainly Carnivorous animals. To explain what I mean by the last of these alternatives, I shall first cite

* See diagram, *Horæ Ent.* p. 318.

the

the following words of Hermann:—"Sed *Dasypodis Manisque* armatum corpus et in globum sese contrahendi instinctus ex eâdem *Mammalium* classe statim Erinaceum revocant *Dasypodi* connexum quique non modò proximè distantes *Sorices Talpasque* sed et interjectâ *Hystrice* omnem *Glirium* familiam post se trahit." I shall next, in compliance with this hint, place the principal animals of the three groups in such a way as that the zoologist can determine for himself, whether any or what relations of analogy exist between them.

EDENTATA Cuv.	*GLIRES* Linn.	*INSECTIVORA*.
Echidna* *Cuv.*	Echimys *Geof.*	Mygale *Cuv.*
Ornithorhynchus *Bl.*	Spalax *Guild.*	Talpa *L.*
Myrmecophaga *L.*	Sciurus *L.*	Tupaia *Raff.*
Chlamyphorus *Har.*	Hydrochœrus *Erx.*	Centenes *Ill.*
Dasypus *L.*	Hystrix *L.*	Erinaceus *L.*

I do not attempt to dilate upon this very important subject, because I have not yet bestowed upon it the attention which it requires. The zoologist is left therefore to form his own conclusions, when he may have studied those very interesting pages of Hermann†, in which this learned naturalist gives his reasons at length (unfortunately too long to quote here) for the existence of relations between *Erinaceus* and *Hystrix*, between *Sorex* and *Mus*, between *Sorex* and *Elephas*, between *Mygale* and *Castor*, *Sorex* and *Talpa*, and finally, between *Spalax* and *Talpa*. If these relations be true in nature, they are all analogical and expressed in the above table, except the relation between *Sorex* and *Talpa*, which is one of affinity.

In some such manner as this would it appear that Nature,

* *Echidna* is, according to Cuvier, connected with *Myrmecophaga* by means of its extensible tongue and habits. *Myrmecophaga* is connected with *Dasypus*, according to the same authority, by means of the singular genus *Orycteropus*.

† *Tab. Aff. Anim.* p. 78 et seq.; p. 90 et seq.

passing

passing from the viviparous quadruped structure, approaches to that of the oviparous quadrupeds. And it would be an interesting subject of inquiry to know, whether the affinity of transultation in the sub-kingdom of *Annulosa* takes place in a similar way. In Annulose animals, all relations of this kind are usually concealed by Nature under the mask of metamorphosis, as I have shown in the *Horæ Entomologicæ*, p. 403; but the remarkable relation existing between the larvæ of *Neuroptera*, such as *Myrmeleon*, has not escaped the notice of naturalists.

The circumstance most deserving of remark in *Mammalia*,—although it may possibly be the same in all the typical groups of the sub-kingdoms,—is, that the affinities of transultation, which are only visible in smaller groups by means of one or two species, become here visible by means of whole groups of animals. This, instead of rendering, as might have been expected, such intricate relations more easily understood, has in fact been the great obstacle to the natural arrangement of the class.

We are by this time, I trust, in some degree enabled to discuss the third subject: namely, what *Mammalia* make the nearest approach to Birds, and what Birds make the nearest approach to *Mammalia?*

There are three kinds of quadrupeds that possess the power of flight,—Bats, Marsupial Animals of the genus *Petaurus*, and Glirine Animals of the genus *Pteromys*. We have seen that the Marsupial Animals do not enjoy any distinct form*, but serve merely

* "Les *Marsupiaux* que nous rangeons à la fin des carnassiers, comme une quatrième famille de ce grand ordre, pourraient presque former une ordre à part, tant ils offrent de singularités dans leur économie. Malgré une ressemblance générale de leurs espèces entre elles, tellement frappante, que l'on n'en a fait long-temps qu'un seul genre, elles diffèrent si fort par les dents, par les organes de la digestion, et par les pieds, que si l'on s'en tenait rigoureusement à ces caractères, il faudrait les répartir entre divers ordres. Ils nous font passer par nuances insensibles des carnassiers aux rongeurs." *Règne Animal*, vol. i. p. 169 & 170.

merely as a group connecting the *Feræ* and *Glires* by the affinity of transultation. A *Petaurus* approaches closely to a *Pteromys*. In the inquiry, therefore, as to the order of *Mammalia* which approaches most nearly to Birds, we have only to consider the *Cheiroptera* and genus *Pteromys*. It is clear, that any animal supporting itself in the air so well as a Bat does by means of wings, must not only have strong pectoral muscles, but a crista to the sternum for their attachment. Herein consists all the analogy which the Bat bears to the Bird. Here ends all connection between them; and the rest of the order to which the Bat belongs have nothing in common with Birds. Let us turn therefore to the *Glires*. On looking at this order, we perceive that here, at least, a remark made by Buffon holds perfectly true. "Quoique tous les Animaux Quadrupedes tiennent entr'eux de plus prés qu'ils ne tiennent aux autres êtres, ils s'en trouvent neanmoins qui font des pointes au dehors, et semblent s'élancer pour atteindre à d'autres classes de la nature*:" Now, although the *Pteromys* or Flying Squirrel is perhaps, with respect to powers of flight, not so much of a Bird as a Bat, the order of *Glires*, to which it belongs, makes several attempts as it were to attain the structure of the class of Birds. Indeed, of all *Mammalia*, we find in this order the greatest number of concordances with Birds; so that if we cannot specify any particular genus as nearest, we can on the other hand say, that the whole order comes nearest to that class. *Dipus* gives us the legs and feet of a Bird†; *Sciurus*, the feathers‡; *Hystrix* the quills§; and *Pteromys*, the wings of a Bird. In *Cheiromys* the thumb is, as generally in birds, opposed to the other fingers. Birds have but one exterior opening for the intestinal canal and the organs of generation:—no more has the

* *Hist. Nat.* tom. xiii. p. 330. ed. 4.

† Herm. *Tab. Aff. Anim.* p. 117.

‡ Cuv. *Règne Anim.* i. 204.

§ Herm. *Tab. Aff. Anim.* p. 118.

Beaver.

Beaver. Birds make nests; and the *Glires* are the only quadrupeds that do the same. But relations of this last kind depending upon economy are to be suspected; and therefore I would lay more stress on those of structure which,—the sternal crista of Bats being excepted,—are all in favour of the greatest approach to Birds being made by the *Glires*. *Hydrochœrus* and *Struthio* are similarly situated with respect to the disappearance of toes. Of Birds, the *Rasores* exhibit the most beautiful developments of tail; and of *Mammalia*, the *Glires*, among which, —as was before alluded to,—the Squirrel is furnished with distichous hairs constructed like feathers. There can be little doubt of the family of *Struthionidæ* containing those Birds which make the nearest approach to *Mammalia**. This is a point, indeed, which we may consider as proved by Buffon and Hermann. So that, if the order of *Glires* makes the nearest approach to Birds, and the order *Rasores* makes the nearest approach to *Mammalia*, we can imagine the future occurrence of some animal that will render this connexion complete.

The Society will, I trust, excuse this long digression, not merely as an inquiry connected with the accuracy of Mr. Vigors's paper, but also with what is usually reckoned the most interesting branch of Natural History. I believe that I have not stated one relation of affinity or analogy without giving my authority for it. If such relations, when thus all presented to the view, agree most harmoniously with what has been observed in other branches of nature, we scarcely ought to be surprised; for we have too long and too eagerly scrutinized Nature, not to be convinced that the grand work of creation, so far from having been, as some fancy, in its origin a mass of confusion, even still

* "Grandissimi et penè bestiarum generis Struthio cameli Africi vel Æthiopici." *Plin. Hist. Nat.* lib. x. 1.

 presents

presents something better than the disjointed ruins of a once beautiful fabric.

Confining myself now to the class of Birds, and deeming the structure of their beak, wings and feet, to be points of external anatomy, I conceive that part of their internal structure, which is next in importance to the naturalist after the vertebral axis, to be the digestive apparatus; since on this depends the nature of the food, and consequently the mode of living of the individual.

Hence the variation of structure in the crop, glandular crop, gizzard, intestines, and cæca of Birds, ought particularly to be studied; and, in fact, has always excited a considerable portion of ornithological attention. Yet unfortunately, from that natural tendency which we all more or less possess to generalize carelessly, there has been made a grand division of Birds into Carnivorous and Herbivorous, where the former was characterized by a membranaceous stomach, and the latter by a strong muscular gizzard*. Now this is all erroneous; the fact being that although the length of the intestine may have some relation to the animal or vegetable nature of the food, the muscular structure of the gizzard depends only on its degree of hardness. Thus Birds destined by nature to feed on soft vegetable matter, have a membranaceous stomach; and those intended to prey on hard animal matter, such as Coleopterous or Hymenopterous insects, have a muscular gizzard for trituration. The Humming Bird has a membranaceous stomach; while the *Pendulinus* has a muscular gizzard, although both these genera

* "It is well known," says Paley in his *Natural Theology*, p. 271, "that there are two intestinal systems found in birds:—one with a membranous stomach and a gastric juice capable of dissolving animal substances alone; and the other with a crop and gizzard calculated for the moistening, bruising, and afterwards digesting of vegetable aliment." It is much to be regretted that this work should be full of similar errors; which, being in the hands of almost every one, are perpetuated by those who are ignorant of Natural History.

suck

suck insects out of flowers with the nectar; but the reason of the difference between them is, that the Humming Bird contents itself with soft *Tipulidæ*, while the *Pendulinus* digests hard *Hymenoptera*. That the *Trochilidæ* should take animal food, we perceive from their analogy to the *Hirundinidæ* on the one side; and that they should also take vegetable aliment, we understand from their analogy to the *Psittacidæ* on the other. With both the *Hirundinidæ* and *Psittacidæ* it agrees in that peculiar anatomical characteristic, of wanting an emargination to the sternum.

While on the subject of analogies, I may be allowed to mention a series, which, although it is directly deducible from his diagrams, is not expressly mentioned at length by Mr. Vigors. It is valuable, inasmuch as it may serve to show that the perfection of ornithological structure and intelligence lies among the *Scansores*. Mr. Vigors has proved by a chain of examples, that the five groups of *Insessores* represent the five primary groups or orders of Birds; and so also it would appear that the five groups of *Scansores* represent the five groups of *Insessores*, and consequently the orders of Birds. For instance, Toucans belong to the group of *Insessores*, so that on this point nothing need be said; but every one must have also remarked the form of beak and prehensile foot of the Parrot to give it an analogy to the Birds of Prey*.

The backward position of the legs, with reference to the sternum, and the disappearance of the hind toe, with other points of structure in certain species of *Picidæ*, give a common character of analogy to them and the *Natatores*†. The length and curvature

* "Initium facere lubet à Psittaco quam curvirostrem avem et instructam cerâ quâ Striges Laniique carent, primo loco post Accipitres ipse quoque Linnæus posuit, quin olim cum iis quoque invitâ licet naturâ conjunxerat." *Herm. Tab. Aff. Anim.* p. 181.

† This analogy is the origin of such specific names as *Alca Psittacula* and *Alca Pica*. Hermann says, p. 156: "Pelecanus Carbo rigidâ caudâ quam solis cum Plotis communem

curvature of slender beak are common to the *Certhiadæ* and *Grallatores;* while the *Cuculidæ* approach to the *Rasores* in such genera as *Corythaix* and *Musophaga*. The following table, therefore, will express several analogical relations of the utmost value.

SCANSORES.	*INSESSORES.*	*AVES.*
PSITTACIDÆ representing the . .	DENTIROSTRES, and therefore the . .	RAPTORES.
RHAMPHASTIDÆ joining the . .	CONIROSTRES, and forming part of . .	INSESSORES.
CUCULIDÆ forming part of the .	SCANSORES, and joining the	RASORES.
CERTHIADÆ joining the	TENUIROSTRES, and representing the	GRALLATORES.
PICIDÆ representing the	FISSIROSTRES, and therefore the . .	NATATORES.

---

communem habet Picorum generi accedit." And again, (p. 31,) in speaking of the affinities of the Woodpeckers, he says: "Additæ sunt duæ species Pici, *tridactylus* et *semirostris,* quorum hic affinitatem longinquam quidem, sed tamen aliquam cum Rhynchope, item semirostri ave; ille autem cum Alcedine tridactylâ indicat." Neither of these relations, however, are truly those of affinity; that of *Picus semirostris* to *Rhynchops* being one of analogy; and that of *Picus tridactylus* to *Alcedo* being one of analogy, or if not, of the affinity of transultation.

II. *The*

II. *The Generic Characters of Formicaleo; with the Description of two new Species. By the Rev. Lansdown Guilding, B.A. F.L.S. F.G.S.*

Read *November* 20, 1827.

THE natural history of the cognate genus *Ascalaphus* was given at length in a former communication to the Linnean Society: the details of *Formicaleo* will be found equally complete, with the exception of the ova, which have not yet been noticed. It is remarkable that, after a long-continued search, not a single perfect insect has been found by me in a state of liberty, though the larvæ swarm under every rock or shed calculated to protect their pitfalls from the rain and wind; so successfully are they secreted from every enemy by their peculiar mode of resting, and the favourable colour of their bodies. No true *Myrmeleon* has yet occurred in St. Vincent. Mr. Donovan in his *Naturalist's Repository*, under the article *Myrmeleon libelluloides*, plate 139, has committed a great error in mistaking the larva of these insects, which has been so long known, for an apterous female.

The valuable characters of this family which the great French entomologist has given in his *Genera Crust. et Ins.* require some little correction. He should rather have said, *Antennæ* &c. apice *post mortem* compressæ;—these organs, as in the *Ascalaphi*, shrinking much when dry. *Palpi maxillares* externi articulis quinque &c. . . . ultimo ad apicem acutiusculo vel obscurè emarginato.

emarginato. *Palpi labiales* articulis tribus, ultimo cylindrico vel fusiformi. *Larva* araneidiformis, prædam puteolo vel fraude captans; *mandibulis* &c. . . . . tubulosis, perforatis ad succos hauriendos; *os* nullum; *abdomen* lateribus pectinatis, vel fasciculatis. *Nympha* dum nocte declaratur *acetabulum* elongatum emittens, &c.

In the larvæ of those genera of the family which dig pitfalls, we observe long and slender *antennulæ*, which are held erect, and are doubtless useful in indicating the approach of their prey by the falling of the sand: in the larvæ of *Ascalaphi* they are wanting or obscure.

INSECTA NEUROPTERA.

Fam. Myrmeleonidæ. *Guild.* Myrmeleonides. *Lat.*

Genus Formicaleo. *Geoff.*, *Leach.* Myrmeleon *Auctorum.*

Character Genericus.

Antennæ gradatim extrorsùm crassiores, subarcuatæ, thoracis longitudine, articulis minutis transversis: acumine terminali minimo.

Palpi sex: *labiales* multò longiores: articulo ultimo incrassato, fusiformi.

Oculi indivisi, prominuli.

Abdomen longum, lineare.

Corpus villosulum.

Alæ elongatæ, subæquales (quiescentis) deflexæ. *Stigma* indistinctum, vel evanidum. *Neura post-costalis* medio biradiata.

Tibiæ ciliatæ. *Calcaria* duo: *tarsi* pentameri: *unguiculi* simplices.

Ovum . . . .

Larva obesa, *capite* magno solido cordiformi: latera abdominalia

nalia fasciculata. *Pedes* 4 antici debiles, ciliati: postici breviores, unguiculis validissimis, ad motum retrogradum idonei.

Antennulæ filiformes, multiarticulatæ, erectæ, prædæ motus prædicandæ. *Oculi* suprà plurimi aggregati: subtùs unicus. *Palpuli* breves, capitati, ad radices mandibularum subtùs. *Fusulus* analis, tubulo retractili.

Motu retrogrado, nunc dextrorsùm nunc fessa sinistrorsùm sæpè circulos describendo, et arenam capite complanato mandibulisque clausis ejiciendo, pedibus anticis alternatim adjuvantibus, puteolum obconicum admirabilem citò fodit. In fundo corpus sepeliens, mandibulis liberis et expansis prædam viaticam inconsciam miseram expectat. Si verò insectum lapsurum fugam atterritum quærat, arenulis emissis iterum iterumque prosternit, mox captura quasi balistæ lapidibus. Succis haustis insectorum cadavera motu capitis subitò è speluncâ jactat Leo parvulus. Adulta folliculum arenulis fusulo connexis condit, cuteque lævi internâ tegit, exuvias intùs retinens.

Nympha arcuata mandibulis in hocce stadio internè serrulatis! an ad folliculum rumpendum? Exuviæ hyalinæ. Quies brevis. Metamorphosis nocturna.

* *Pedibus brevibus, tarsis simplicibus, unguiculis mediocribus.*

1. Formicaleo Leachii.

F. fuscescens, flavido maculatus; alis hyalinis subfalcatis immaculatis, neuris ciliatis, oculis cupreis, pedibus pallidis.

Habitat in arenosis aridis S^{ti} Vincentii. Quiescens antennas deprimit, ramulumque alis deflexis amplectitur, difficillimè distinguendus. Larva frequentissimè observanda, puteolo designata. Ovum et ovipositio latent.

Long.

Long. corp. 11 lin.—Expans. alar. 2 un. $\frac{2}{10}$.

In honorem amici Dom. W. E. Leach, M.D. Soc. Reg. et Linn. Socii; inter Zoologos Europæ meritò celeberrimi: qui genus hocce à tribulibus benè separavit propter trophorum differentiam.

DESCR. *Neuræ* majores interruptè diaphanæ. *Punctulum* albidum loco stigmatis. *Antennæ* sub lente villosulæ. *Thorax* flavido maculatus. *Segmenta abdominalia* posticè flavicantia. *Genitalia* hirsuta. *Palpi* maxillares externi apice emarginati, ad basin setiferi: *labiales* articulo incrassato atro.

Larva supernè nigro-fuscescens, corpore obscurè spinuloso, capite rufescente, mandibulis hirsutis, internè validè trispinosis, mandibularum apice unguiculisque posticis ferrugineis: capitis maculis, dorsique lineis macularibus nigris: subtùs maculis lineisque abdominis irregularibus nigris: anus spinosus, spinulis et sæpè curvaturâ motum adjuvans.

Pupa villosula, nigricante-rufescens, nigro varia: membris omnibus hyalino-pallidis, oculis mandibulisque ferrugineis, ano acuminato. Frons hirsuta antennis supra oculos deflexis. Acetabulum * ? cinereum, nitens. Folliculus orbicularis, operculo nullo.

** *Pedibus*

* Is not this extraordinary and regularly shaped body allied to the acetabula found in crustaceous animals before the change of the crust? and which are little stores of calcareous matter absorbed to give solidity to the integuments? In the *Myrmeleonidæ* the acetabula consist, probably, in some degree of chitine, the superabundant part of which is expelled by the pupa after its parts have acquired solidity: the centre is of a softer nature, and the crust hardened and brittle. It can hardly be a calculus produced by disease, as it is expelled by every individual of the family, as far as my observations go: perhaps it is more nearly related to the meconium of many animals. Submitted to the operation of acids,—in *muriatic*, these bodies undergo no change; in *nitric*, they are instantly dissolved with a great effervescence. In *sulphuric*, they are but slowly changed.

** *Pedibus longis, tarsis hirsutis, ungulâ subtùs spinulosâ, unguiculis elongatis.*

2. FORMICALEO TARSALIS.

F. nigro-fuscescens, flavido maculatus; alis hyalinis immaculatis subfalcatis, neuris interruptè nigris, stigmate nigro, pedibus flavescentibus atro variis.

Expans. alar. 1 un. 9 lin.—Long. corp. $\frac{8}{10}$ un.

Habitat in Americes Demerarâ? Vidi exemplum siccum.

DESCR. *Facies* pallida: *vertex* atro signatus: *antennæ* flavescentes, atro fasciatæ: *pedes* hirsuti, atro maculato-punctati.

changed. In the flame of a candle they burn to a coal, with very slight bubbling, giving out the peculiar smell of animal bodies exposed to fire. Alcohol slightly softens them.

The repagula of the *Ascalaphi* are only affected by *sulphuric* acid, which immediately dissolves them as well as the ova with considerable effervescence.

III. *The distinctive Characters of two British Species of Plecotus, supposed to have been confounded under the Name of Long-eared Bat. By the Rev. Leonard Jenyns, M.A. F.L.S. Communicated by the Zoological Club of the Linnean Society.*

Read March 4, 1828.

THE subgenus *Plecotus*, originally instituted by Geoffroy for the reception of the *Vespertilio auritus* and the *V. barbastellus* of Linnæus and Gmelin, has not, that I am aware, met with any Europæan additions from the discoveries of later times. I am on this account desirous of drawing the attention of naturalists to a third British species referable to this group, which may be considered either as entirely new, or at least one which has never been clearly distinguished from the former of the two above mentioned. I am the more anxious to do this, from a strong persuasion that the smaller species of the *Vespertilionidæ* still require much investigation, and that even in our own island many others, besides those recorded, remain to be ascertained.

This Bat, of which I have never met with more than one specimen, was discovered some years back, in the month of July, by Professor Henslow and myself, adhering to the bark of an old pollard willow, on the edge of Grunty Fen, in the Isle of Ely. It is a female; and, in a general point of view, so nearly resembles the *Common Long-eared Bat* of English authors, that the two might be easily confounded; nor, indeed, did I myself conceive it to be anything more than a young individual of that species

species during a long space of time that it remained by me preserved in spirits. It was not till very lately, when I was induced to give the matter a more close examination, that I discovered a well-marked difference between them, and such as, in my opinion, could hardly be looked upon as the result of immaturity alone. This difference, which resides for the most part in the colour and in the *relative* no less than in the *absolute* dimensions of the several parts, I shall now endeavour to point out; affixing, in the first instance, such characters to each species respectively, as may best serve to discriminate it from the other. Reserving the established name of *auritus* for the larger and more common sort, I propose to distinguish the new species by that of *brevimanus*, in respect of one of its leading peculiarities, to be hereafter noticed.

PLECOTUS. *Geoff.*, *Desm.*

1. *P. auritus.* Greater or Common Long-eared Bat.

P. vellere fusco-griseo, subtùs aliquantò pallidiori; auriculis oblongis, capite plus duplò longioribus; trago ovato-lanceolato; caudâ elongatâ, antibrachium longitudine superanti, apice obtusiusculo.

TAB. I. Fig. 1.

Vespertilio auritus. *Geoff. Ann. Mus. d'Hist. Nat. tom.* viii. *p.* 197. *sp.* 7. *Desm. Nouv. Diction. d'Hist. Nat. 2de edit. tom.* xxxv. *p.* 478. *Mammal. (Encycl. Method.) p.* 144. *sp.* 223.

Dimensions.

Dimensions *.

	Inches.	Lines.
Length of the head and body, from the nose to the root of the tail	1	10
——— of the head	0	8
——— of the tail	1	8
——— of the auricle	1	5
Breadth of the auricle	0	9
Length of the tragus	0	7
Breadth of the tragus	0	$2\frac{1}{2}$
Length of the arm	0	10
——— of the forearm	1	5
——— of the thumb	0	$2\frac{3}{4}$
——— of the phalanges of the middle finger, or the distance from the carpus to the apex of the wing	2	6
——— of the thigh	0	6
——— of the shank	0	8
Exsertion of the tail beyond the interfemoral membrane	0	$0\frac{3}{4}$
Expansion of the flying membrane	10	2

2. *P. brevimanus.* Lesser Long-eared Bat.

P. vellere suprà rufo-fusco, subtùs albescente; auriculis oblongis, capite haud duplò longioribus; trago ovato-lanceolato; caudâ antibrachium longitudine æquanti, apice acuto.

Tab. I. Fig. 2.

* These dimensions are taken from a *female* specimen, with the view of forming a more just comparison between this and the following species. The *males* are in general a trifle larger.

Dimensions.

Dimensions.

	Inches.	Lines.
Length of the head and body, from the nose to the root of the tail	1	6
——— of the head	0	7
——— of the tail	1	2
——— of the auricle	1	0
Breadth of the auricle	0	5
Length of the tragus	0	$5\frac{1}{2}$
Breadth of the tragus	0	2
Length of the arm	0	$7\frac{1}{2}$
——— of the forearm	1	2
——— of the thumb	0	3
——— of the phalanges of the middle finger, or the distance from the carpus to the apex of the wing	1	8
——— of the thigh	0	$5\frac{1}{2}$
——— of the shank	0	$5\frac{1}{2}$
Exsertion of the tail beyond the interfemoral membrane	0	1
Expansion of the flying membrane	6	6

I shall now detail more in particular some of the leading discrepancies between these two species, most of which are drawn from a comparative view of their respective dimensions as exhibited in the foregoing tables. It will be observed, in the first place, that in the *Plecotus auritus* the auricle is much larger in proportion to the body, and longer in proportion to the tragus, than in the *P. brevimanus*: and again, that in the former species the tail exceeds the forearm in length by three lines; whilst in the latter these parts are equal. There is nearly as great a difference with respect to the relative proportions of the femur and tibia, which are likewise of equal length in the *P. brevimanus.*

manus. On the other hand, in the *P. auritus* the thumb is somewhat shorter, and the tail not so much exserted from the interfemoral membrane; of which last part it may be also added, that in the *P. brevimanus* its extreme tip terminates in a fine point, whilst in the *P. auritus* it is somewhat obtuse and flattened. Another, and perhaps the most obvious distinction, resides in the expansion of the flying membrane, which, viewed *relatively* as well as *absolutely*, is by much the more considerable in the *P. auritus*. This circumstance arises from the greater development of the metacarpal bones and the phalanges of the fingers, as compared with the arm and forearm. In the *P. auritus*, the length of the middle finger, or the distance measured from the carpus to the apex of the wing, exceeds in length the arm and forearm together by three lines, and the forearm taken separately by more than an inch; whereas in the *P. brevimanus* the length of this part is *less* than that of the arm and forearm together, and only exceeds the forearm separately by six lines. It is with a view to this last peculiarity that I have selected the trivial name of this species. Lastly, I may remark, that in the *P. brevimanus* there is a shallow notch on each side of the interfemoral membrane, about half way between the heel and the extremity of the tail, which in the *P. auritus* is scarcely visible.

The above distinctions, many of which are founded upon a comparative view of the osteology of the two species, can scarcely be considered as the variations of a different age. Independently of them, however, these bats, when seen together, will not be easily confounded, from the great difference in their *absolute* size, and in the colour,—more especially of their *under* parts. In the *P. auritus*, the colour is brownish-grey mixed with dusky, and is nearly the same above and below, being in the last instance merely of a somewhat paler tint. In the *P. brevimanus*,

vimanus, not only have the upper parts a reddish tinge, which in a slight degree pervades the ears, wings, and interfemoral membrane; but what is more striking, they present a marked contrast with those underneath, which approach to yellowish-white. Moreover, it is worthy of note, that in this last species the hair is everywhere of the same colour throughout its whole length, whereas in the former it is of *two* colours, being always blackish at the roots.

I have contented myself on this occasion with mentioning those particularities which offer points of difference between the two species. Such as are the same in each, including the general appearance of the head and face, the singular formation of the nostrils, the peculiar shape of the auricle, tragus, &c., which are noticed with much accuracy in the *Mammalogie* of Desmarest and by other authors, I have not judged it necessary to speak of.

It is perhaps somewhat hazardous to form any conjectures on the habits of an animal from the case of a single individual, or we might have inferred, from the situation in which the above specimen of the *P. brevimanus* was found, that its natural place of abode was in the open country, remote from the habitations of men, and that during the hours of repose it retired to the hollows of trees. In this respect it would differ widely from the *P. auritus*, which resides altogether in buildings, more particularly within the roofs of dwelling-houses, where they may often be observed assembled in clusters of twenty or thirty together in the angles formed by the meeting of the rafters.

This bat must certainly be rare in Cambridgeshire, from the circumstance of my never having seen a second specimen*; but it may be common elsewhere, and, as I hinted at the beginning,

* Last summer (1827) I had an opportunity of again searching the neighbourhood of the spot where I first discovered this bat, but met with no success.

possibly

possibly may have been confounded with the other species. This circumstance is indeed rendered the more probable from the fact that different authors, describing the *Long-eared Bat*, have assigned to it different dimensions. On the continent, the larger species appears to have been the one observed, of which very correct descriptions and measurements are given by Geoffroy in the *Annales du Muséum*, and by Desmarest in the *Nouveau Dictionnaire d'Histoire Naturelle*, and *Encyclopédie Méthodique**, as referred to in the synonyms above quoted; but of our English authors, some appear to have seen *one* and some the *other* species. Thus we find Donovan (*Brit. Quad. vol.* i. *pl.* 44.) asserts the *Long-eared Bat* to be "one of the largest species of the genus that inhabits England;" whilst Shaw (*Gen. Zool. vol.* i. *p.* 123.) observes, that it is smaller than the *short-eared* or common sort. This last opinion seems indeed to be the more prevalent of the two. Daines Barrington, Berkenhout, Pennant, and Bewick, all fix the length of this species at no more than one inch and three-quarters; to which the two last add, "extent of wing seven inches†." I may also observe, that the figure given by Fleming (*Philos. of Zool. pl.* 1. *fig.* 1.), though still incorrect with respect to some of the relative dimensions, yet on the whole more nearly approaches to my *P. brevimanus*.

The concise descriptions of Linnæus, Brisson, and other of

* In this last work, Desmarest speaks of a small variety of the *Plecotus auritus*, found in Egypt, which would appear to border closely upon my new species, and may be the same with it; but from the very few particulars that are given respecting it, it is utterly impossible to decide with certainty upon this point.

† It is hardly possible that these measurements can be correct. If the *length* is meant to include that of the body and tail together, as would appear at least from Daines Barrington's account (*Miscellanies, p.* 165.), this bat must be very much smaller than even my *Plecotus brevimanus*, yet its extent of wing would be greater. If the length of the body *alone* is intended, it would nearly equal my *P. auritus*, while its extent of wing would be more than three inches less.

the older authors, to which no measurements are annexed, will apply equally to either species.

I cannot conclude this paper without expressing a hope, that it may at least induce others to make inquiry with respect to the bats found in their own neighbourhood. I strongly suspect, that even the two above described are not the only species of *Long-eared Bat* that are to be met with in this country. I well remember, that about five years since a bat of this kind was brought to me at Ely, which was taken in a bed-room, and which at the time I immediately referred to the *Vespertilio auritus* of Linnæus, not having then paid much attention to these animals: however, I am since convinced, from a memorandum I made respecting it, that it must have been a much larger species than either of the above two, and in point of size more nearly approaching to the *Vespertilio Noctula.* Possibly this may have been the *var.* β. of Desmarest, or the *Big-eared Bat* described by Rafinesque under the name of *Vespertilio megalotis**. This, however, cannot now be determined, as the specimen was not preserved. I only mention the circumstance to show that the history of these animals, so far at least as relates to our British species, is still imperfect, and to invite naturalists to a further investigation of the subject.

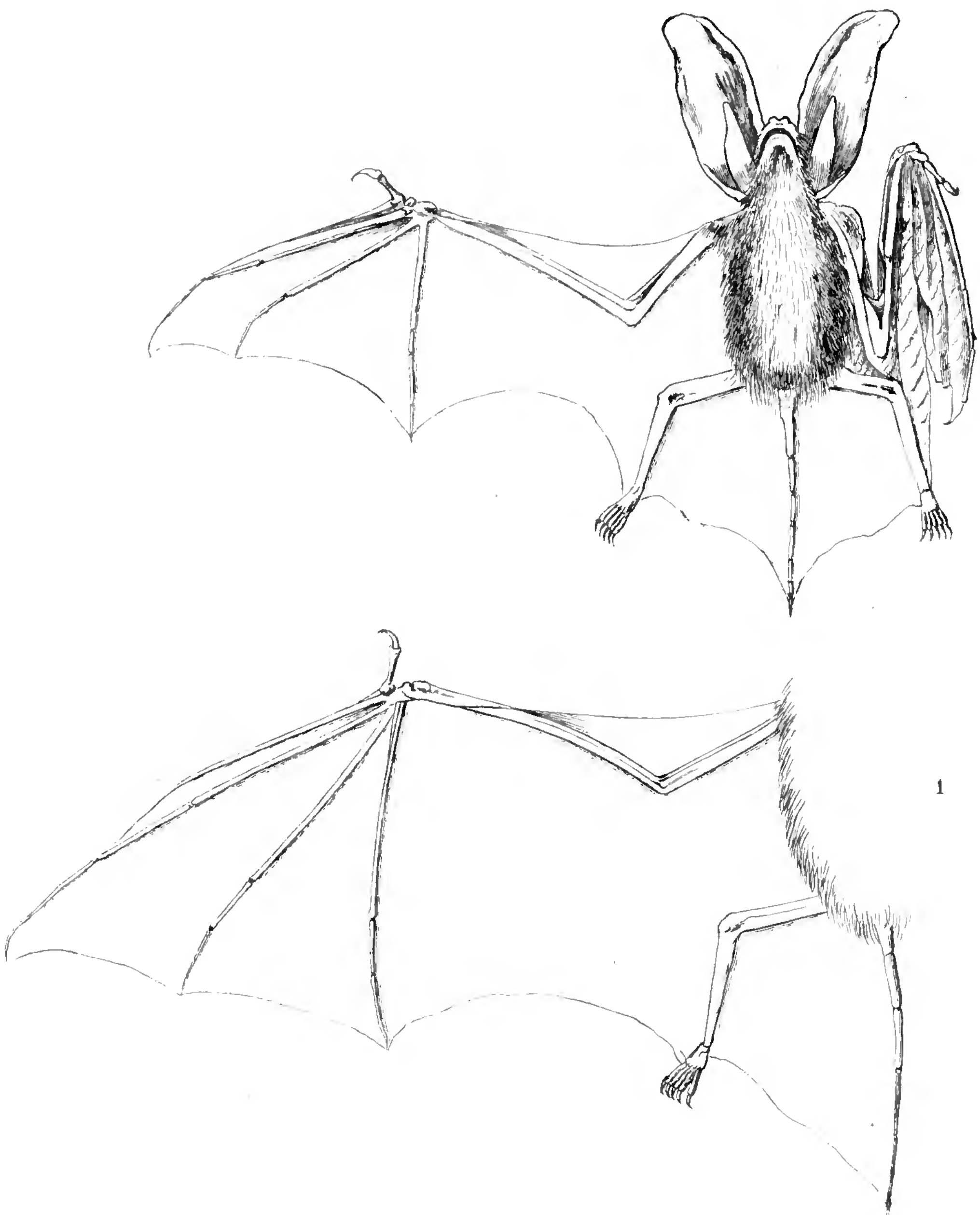
EXPLANATION OF TAB. I.

Fig. 1. A portion of the *Plecotus auritus*, exhibiting a comparative view of the anterior and posterior extremities, the tail, and interfemoral membrane.

2. *Plecotus brevimanus*, of the natural size.

* See Desmar. *Mammal.* p. 133 (*note*).

IV. *A De-*



J. S. Henslow del.

Engelmann, [illegible]

IV. *A Description of the Mammary Organs of the Kangaroo. By John Morgan, Esq., F.L.S.*

Read April 15, *and May* 6, 1828.

The development and growth of the fœtus in marsupial animals has long afforded an interesting subject of inquiry for the researches of the physiologist; yet, notwithstanding the numerous opportunities for observation supplied by the domestication of the most interesting of these animals, namely, the Kangaroo, it is to be regretted that hardly any information has of late years been obtained upon this important branch of natural science; for although we are acquainted with a few insulated facts relative to this subject, yet we are at present left in total ignorance respecting the principal object of our researches. We know little or nothing of the nature of those changes which must necessarily take place in the young while remaining in the uterus, or of the mode by which it is conveyed from that part to the teat: and dissection has hitherto afforded us no satisfactory information relative to the peculiarity of structure, which we may reasonably expect to find in those organs, by which the mother is enabled to impart nourishment to the fœtus, either while remaining in the womb, or afterwards, when attached to the nipple within the pouch. With the view, therefore, of affording assistance to those future inquirers, whose time may be devoted to the study of this particular subject, and whose opportunity for observation may be greater than my own, I am induced

induced to present to this Society a short account of an examination which I have recently made of the female Kangaroo, both in the virgin and in the impregnated state; with the hope that the result of my dissection, which has enabled me to establish a few hitherto unknown facts, may tend to throw some further light on the physiology of generation in marsupial animals.

In the beginning of October last I received for dissection the body of a young female Kangaroo in a virgin state. On opening the pouch of this animal, I found the whole of the interior lubricated by a secretion of a reddish-brown colour, somewhat viscid in its consistence, and of a faint and peculiar odour. This condition of parts I have always observed to exist in these animals during the periods at which the pouch remains unoccupied by the young; the secretion being very much diminished, or altogether suspended, at the time the young animal is lodged within the part.

On slitting open the fore-part of the pouch and exposing its interior, I was surprised to find that two nipples only were developed, one on each side (*tab.* 2. *f.* 1. *a.*), and that immediately beneath each of these a minute circular aperture, resembling in appearance the mouth of a follicle, marked the situation in which we usually find the two additional teats in the impregnated and adult animal (*tab.* 2. *f.* 1. *b.*). This circumstance led me to examine more particularly the structure of the mammary glands and parts immediately connected with them, which, having been carefully removed from the body, presented upon dissection the following appearances.

The substance which appeared to form the mammary gland was of a circular form, somewhat flattened, possessed of a considerable degree of vascularity, and lobulated upon its external surface,

surface, and closely confined by cellular connections to the skin of the pouch (*tab.* 2. *f.* 2. *a.*). To the upper and outward part of this structure a second glandular substance of smaller size was firmly attached by dense cellular membrane, appearing of a more loose and delicate texture, and possessing less vascularity than the former; of a yellowish-brown colour, and of an oblong and compressed shape (*tab.* 2. *f.* 2. *b.*). From the interior of this second gland a number of white membranous bands resembling ducts passed to the extremity of the teat; and I could discover no further connection, than that afforded by cellular membrane, between the larger glandular substance and the smaller; the teat and the lesser gland, which I have just mentioned, appearing to form a distinct and separate mammary organ. As far, therefore, as my dissections had yet gone, the larger gland appeared altogether unconnected with any structure by which its secretions might be rendered subservient to the purposes of furnishing nutrition to the young. Believing, however, that this structure must be in some way or other connected with the formation or functions of those teats which had not yet been developed, I proceeded to examine whether any and what connection might exist between these large and obviously important glands, and the follicular openings I have already described as occupying the situation of the future teats.

On passing a small probe through one of these openings, I found that the instrument entered a cavity about three-fourths of an inch in length; and on carefully dissecting away the surrounding portions of the gland, it appeared that this cavity was formed by a narrow, membranous, cylindrical canal, which was imbedded in the gland, and extended nearly throughout its whole diameter (*tab.* 2. *f.* 2. *c.*). The connections between this membranous tube and the gland were loose and easily broken down, except at the furthest extremity from the aperture,

ture, at which part the two structures were inseparably united. On making a section of the tube, I found that its cavity was nearly half filled with a secretion precisely resembling that already described as lubricating the interior of the pouch, and that its internal surface was formed by a reflection of cuticle continued from the surface of the pouch through the aperture by which it opened into that part.

At the furthest extremity of the canal, and at the part already described as connected firmly with the gland itself, its termination was formed by a rounded papilla, which projected into its interior, resembling in miniature the extremity of the future teat in the adult. On making a section of the papilla, this resemblance was still further increased by the exposure of numerous minute vessels, which presented very much the appearance of lactiferous tubes, and which passed directly from the expanded base of the papillary projection to its extremity (*tab.* 2. *f.* 2. *d.*). By an examination of the extremity of the papilla through a lens, the similarity between that part and the teat of the adult was strikingly shown. From these circumstances, I considered that the identity of this structure with the future teat was rendered more than probable; and it occurred to me, that the only mode by which a development of the organ could take place, must consist in the complete eversion of the canal, and the consequent protrusion of its previously imbedded and papillary extremity.

The canal on the opposite side had not yet been opened: with a view, therefore, of producing an artificial eversion by mechanical means, I made pressure upon that point of the gland, which I knew from previous dissection to be closely connected with the papillary extremity of the tube, and succeeded at length in completely everting (through the opening already mentioned) the whole of the canal, from one extremity

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to the other, producing a perfect teat in miniature, in the exact situation at which it is found in the adult impregnated animal (*tab.* 3. *f.* 1. *a.*).

I do not mean to infer from this, that pressure upon this part constitutes the means employed by nature for the development of the teat; but I mention this experiment to prove the possibility of eversion without necessary laceration of the part. The natural process by which this change is effected I have had no opportunity of ascertaining; yet in the absence of positive proof, the collateral evidence that such a change must take place seems to me too strong to admit of doubt. The complete absence of the third and fourth teats in the young female, and the exact correspondence between the situation of the openings of these canals, and the spot to which these supernumerary teats are always found attached, together with the exact miniature resemblance to those structures, which an artificial development produces; and, above all, the total want of any other structures connected with these parts, by which the production of the other teats can be in any way accounted for,—these combined circumstances afford evidence which, even unsupported by any other facts, must, I think, be allowed as confirming the correctness of my views upon this subject.

I have lately examined a young Kangaroo, preserved in the Museum of the Royal College of Surgeons, and which had but a few days only been received into the pouch (*tab.* 3. *f.* 2.). On comparing the extremely minute orifice which forms the mouth of the animal at this early period, with the teats of adult females during the time of suckling (*tab.* 3. *f.* 3.), it seems impossible, from the great size of these parts, that their comparatively enormous extremities should be received within so small an aperture as that afforded by the minute opening between the lips of the young at this early state of its existence;

ence; but this aperture, minute as it appeared, exactly corresponded with the extremity of the teat I have before referred to as having been artificially everted; and further examinations of various living Kangaroos, at different periods of gestation, furnished proof that it is to this lower elongated teat, and not to either of the upper nipples (which were found perfectly developed in the pouch of the unimpregnated Kangaroo), that the young are invariably attached; and from the period the young are first received into the pouch, to the time at which they become separated from the teat, the two superior nipples, and the smaller mammary glands attached to them, perform no functions which can apparently be connected with the process of preparing a nutritious fluid for their support. It is also found, that the size and condition of the true teat are constantly changing, in proportion to the growth of the young to which it gives attachment; that as the young animal increases in size, the teat enlarges; and this structure, —which in the unimpregnated state will measure barely half an inch, and which at the time the young is first attached to it does not exceed the size of that which I had artificially everted;—before the young has left the pouch, becomes enlarged and elongated to the extent of nearly six inches. The upper teats, however, remain in nearly the same condition as regards their relative size and form throughout every period of gestation.

Repeated recent examinations of the living animal have also proved, that the lower teats, which for distinction I may term marsupial, invariably diminish, when the young animal has ceased to suckle, to a smaller size than even that which I had artificially produced by eversion; but that, after being once developed by protrusion from their original situation in the substance of the gland, they never again recede to their former condition,

condition, but constitute permanent marsupial teats throughout the rest of life.

If a change in any way analogous to this extraordinary development of the teat in the Kangaroo should be found to occur in other animals possessing marsupial bones, it is possible that this circumstance may have given rise to the difficulty which Meckel and other comparative anatomists (unacquainted with this peculiarity) have met with in their endeavours to detect the perfect teat in the *Ornithorhynchus*, upon the supposition that young females only had been examined; since we are informed that the mammary gland only has been discovered, while the existence of a developed and perfect teat connected with that gland has escaped detection. Not having had an opportunity of examining that animal myself, I merely offer this as a matter of conjecture.

With these details of the result of my dissection of the mammary organs and pouch of the unimpregnated animal, I shall next point out the differences in the structure of those parts, which I afterwards met with in the dissection of an adult female Kangaroo, which was at the time of its death suckling a young one nearly sufficiently grown to leave the pouch. As I had in this case an opportunity of examining not only the organs to which I have referred, but also other structures connected with the functions of those parts, I shall describe their different appearances as they presented themselves on examination, including the anatomical peculiarities of the pouch, the marsupial bones, and the muscles connected with these and other important organs.

I must not, however, omit to express my gratitude to the Zoological Society, for the opportunity which was afforded me upon this occasion of continuing my investigation; having been most liberally furnished from this source with the subject for

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making those dissections of which I have now to detail the results.

Commencing the dissection upon the superficial covering of the abdomen, and having removed the common integuments of that part, it will be found, that a layer of panniculus carnosus of extraordinary strength and thickness is spread over the whole of the anterior and lateral parts of the abdominal parietes, connected closely by dense cellular membrane to the subjacent abdominal muscles, except at the part where the pouch is interposed between them; here it is in like manner connected to the anterior surface of the pouch itself. The fibres of this muscle are arranged in a double order, an indistinct layer passing transversely, the stronger and more numerous passing in a perpendicular direction from the thorax to the lower part of the abdomen, surrounding in their descent the mouth of the pouch, to which they form a sphincter, and terminating by sending off a narrow slip over the fore-part of the pubis, to be attached to the sphincter muscle of the vagina. The action of this part of the muscle, therefore, would operate in drawing the external opening of the vagina forwards and upwards over the symphisis pubis, and would thus approximate the external organs of generation to the mouth of the pouch (*tab.* 4. *f. a.*).

Whether this approximation takes place in the living animal at the time the young is removed from the cloaca to the nipple has not yet been clearly ascertained; but if such were proved to be the case, it is obvious that the action of these descending muscular fibres must be mainly instrumental in bringing these parts more nearly together.

The panniculus carnosus being entirely removed, the structure and connections of the pouch were clearly exhibited. The bag is simply formed of a fold or duplicature of the common integument, which, as already stated, is attached before to the panniculus

panniculus carnosus, posteriorly, and above to the tendon of the external oblique muscle of the abdomen, while the lower and lateral parts of the bag are attached to the mammary gland by the medium of its connection with the teat, and to a muscle of the gland by cellular tissue. This muscle of the mammary gland, which has not hitherto been clearly or correctly described, is situated immediately above the brim of the pelvis, lying upon the external oblique muscle of the abdomen. It is of a triangular shape, and is attached by a narrow origin to the back part of the pelvis, from which point it passes transversely round the lower part of the belly. In its course it expands, and afterwards divides into two layers, an anterior and a posterior; between these the mammary gland is inclosed; after which the fibres of the muscle are continued onwards, and passing forward, join with those of its fellow on the opposite side. The pair of muscles, therefore, completely encircle the lower part of the abdomen, inclosing and enveloping between their fibres the mammary gland on each side (*tab.* 5. *f. a.*). Neither these muscles nor the marsupial bones belong properly to the pouch; since the whole of the pouch may be removed from the abdominal muscles without disturbing in the slightest degree either the muscles I have just described, the glands themselves, or the marsupial bones and parts connected with them; the pouch being, as I have already stated, nothing more than a fold or duplicature of the skin, covered anteriorly by panniculus carnosus and common integument, and connected only by cellular tissue to the abdominal parietes.

The real use of the marsupial bones has not hitherto, I believe, been clearly explained; nor have I been able to meet with any accurate anatomical description of these parts and their surrounding connections: I consider it therefore necessary, before

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I state my own views respecting their physiology, to offer a short account of their anatomical structure.

The marsupial bones in the female Kangaroo are about three inches in length, long and narrow in shape, and incurvated in form, compressed laterally, presenting a rounded concave edge anteriorly, the posterior edge convex and sharp; the inferior extremity or base, by which it is attached to the side of the symphisis pubis, is enlarged to form an articular surface for its connection with that part. The superior extremity, which gives attachment merely to tendon and muscle, tapering to a flattened obtuse termination. The bones are placed with their rounded concave edges facing forwards, their bases being in contact, and their superior pointed extremities being separated to the extent of from three to four inches. They are confined in this situation partly by ligament and partly by their muscular attachments. By a capsular ligament they are bound to the symphisis pubis; and by triangular ligaments, the lower fourth of their posterior convex edges is connected with the body of that bone (*tab.* 7. *f. a.*).

The muscles attached to these bones are as follows: first, the tendon of the external oblique muscle of the abdomen closely covers, and is more or less connected with, these bones throughout their whole extent, and by the action of this muscle the bones are brought nearer together. The abdomen of the Kangaroo is supplied with four recti muscles, an anterior and a posterior on each side. The posterior and broader muscle is inserted into the base of the marsupial bone (*tab.* 7. *f. b.*); the anterior or smaller muscle is inserted by a round tendon into the superior extremity of the bone: this tendon extends through the centre of the muscle, the fibres of which are continued to the point of its insertion in a double penniform order (*tab.* 6. *f. a.*).

On the outer side of this tendon the muscular fibres terminate at at the point of its insertion; while those which are attached to the inner side of the tendon are continuous with another layer of muscular fibre, which arises from the whole extent of the concave anterior surface of the bone, from its superior extremity to its base, passing transversely inwards, to be inserted into the posterior surface of the tendon of the external oblique muscle, along the linea alba. This transverse muscle may be considered as part of the anterior rectus, with which it is continuous, and has no connection with its fellow on the opposite side, except by the intervention of the tendon of the two oblique abdominal muscles; since a tendinous septum, behind the linea alba, is interposed between the points of their insertion.

We are however informed, in an account of the anatomy of these parts published in the *Philosophical Transactions* by Sir Everard Home, in the year 1795, that a transverse and continuous layer of muscle is stretched between the two bones,—an arrangement of structure which I have not been fortunate enough to meet with in my dissections of these parts. And we are further assured, that this transverse muscle actually performs the office of a sling, by which the mamma is supported.

I confess that I am at a loss to account for the cause which has given rise to this mistake in the dissection of a recent subject; more particularly as that dissection was made by an individual whose character as a comparative anatomist has been held in high estimation. The author may possibly have met with a singular variety of formation in the animal which was submitted to his inspection, and which may account for the different results of our dissections; but I consider it almost impossible that he can have met with so great a deviation from the natural form and structure of this part, as to justify him in ascribing to these muscles the use he has assigned to them: for their use is obviously that of moving the superior extremities

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of the marsupial bones towards each other; and being situated immediately behind the mammæ, they are altogether prevented by that circumstance from affording the slightest support to the mamma itself.

The marsupial bones thus confined in their situation by ligaments, and by the surrounding muscles in which they lie imbedded, afford from their situation a firm inferior support to the abdominal viscera, and form an unyielding partition between those parts and the pouch. But another important purpose seems to be answered by these structures. I have already described two muscles, which are formed for the purpose of compressing the mammary gland; and I have mentioned also the continuity of these two muscles by the interlacement of their fibres over the linea alba (*tab.* 5. *f. a.*). These muscles form from their situation a sort of girdle around the belly immediately above the pelvis, and would necessarily, when put into action, press the mammary glands against the comparatively yielding sheet of abdominal muscles which lies behind them, were it not for the marsupial bones, which prevent any compression of the lower part of the abdomen from the action of the mammary muscle, and at the same time receive the glands themselves upon their concave anterior edges. These edges afford a hard and solid point of resistance, against which the glands are pressed; and their secretions are thus forced through their excretory ducts towards the teats.

It appears to me probable, that in the Kangaroo, the loose connection of the mammary gland to the subjacent textures may allow of its being drawn backwards and forwards across the edge of the marsupial bone, by the alternate contraction and relaxation of its proper muscle, and thus the process of emptying its ducts by pressure may be considerably facilitated.

That Nature in other cases avails herself of the agency of muscular

muscular contraction for the purpose of compressing a gland, and thereby emptying its ducts of their contents, we have already sufficient proof. The venom of the Rattle-snake is forced through its perforated fang by a muscular apparatus connected with the secreting organs; and the musk gland of the Crocodile has been shown by my friend Mr. Bell* to possess a muscular investment, obviously destined to perform the same functions as I have attributed to a similar peculiarity of structure in the Kangaroo.

The use of a forcible compression of the mammary gland of the Kangaroo, exerted at the will of the mother for the purpose of ejecting its secretion, will be rendered apparent by an examination of the young at the time it is first attached to the nipple; for the imperfect state of organization in which we find the young of marsupial animals at the time they first make their appearance in the pouch,—more particularly evinced by the state of the mouth and its appendages,—compared with the more mature development of the same parts in the young of other mammalia, renders some provision necessary, by which nutrition should be imparted solely by the agency of the mother; and this provision is clearly afforded by the injection of the milk into the mouth by the means I have already mentioned, instead of that fluid being extracted by the suction of the young, as in the case of other mammiferous animals. That the secretion of the marsupial mammary gland may be ejected by pressure made upon the part, is rendered probable not only by the existence of a compressing muscle, but also by the structure of the marsupial teat and its proper investments, which I shall next describe. I wish it, however, to be clearly understood, that in the description which I am now giving of the anatomy of these parts, I refer to the mammary organ in the full-grown Kangaroo,

* *Phil. Trans.* 1827, *p.* 132. *t.* 11.

garoo, when loaded with its secretions, and at a time when the young within the pouch was several months old; for, as I have before stated, the condition of these parts is constantly changing at different periods of gestation. At the particular period, however, which I have mentioned, as referring to the animal under consideration, the following appearances were presented.

On removing the muscle which enveloped the mamma, that part was found, as in the virgin animal, to be composed of two distinct glandular substances, bearing nearly the same relative proportions as in the former instance (*tab.* 8. *f.* 1.). In form, however, they were somewhat altered; for the larger gland had now changed from a circular to an oval shape, it was of a purplish colour, and possessed of a very high degree of vascularity. The marsupial teat was now found attached to its inner side. In the former instance, when mentioning the dissection of the virgin animal, it will be remembered, that this gland was described as closely confined to the skin of the pouch immediately behind the follicular openings, which led to a central canal in its interior; whereas, it was now found that its cellular connections were comparatively loose, and that its attachment to that part of the integuments, to which it formerly closely adhered, was now formed by the medium of its excretory ducts, which, inclosed within their proper sheath, were collected together and disposed in the form of a fasciculus or cord passing from the inner margin of the gland to the marsupial teat.

All remains of the follicular apertures in the pouch had disappeared, the gland was removed from its former situation, and its excretory ducts, formed into a plexus or fasciculated cord, were continued from the gland to the true marsupial teat, exactly through that part of the integuments of the pouch, which, in the virgin animal, was occupied by the aperture I have before alluded to.

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The smaller gland appeared somewhat more vascular than that which I had before examined in the younger animal, and was connected by a similar arrangement of ducts with the upper and smaller nipple (*tab.* 8. *f.* 1. *a.*). From the larger marsupial mammary gland about twenty excretory ducts are sent off, these being closely connected together by reticular membrane, and inclosed in a sheath, (forming, as I have stated, a sort of fasciculus or cord,) are continued to their termination at the extremity of the nipple in nearly a straight line. In its course from the gland, this plexus of ducts first passes between the skin of the pouch and the abdominal muscles as far as the base of the marsupial teat, at which part it enters the teat, and is continued to its extremity, where each duct terminates by a separate opening. A sheath of longitudinal muscular fibres closely envelops this fasciculus of ducts throughout its whole extent; and at the point of junction with the gland, these muscular fibres are expanded over the surface of that organ, to nearly the whole of which they are attached by cellular connections (*tab.* 8. *f.* 1. *b.*).

The use of this muscle is to draw up and shorten the teat, when its ducts are emptied, or to compress that part when this retraction is prevented by a distended state of its vessels: whenever, therefore, the lactiferous tubes are filled by injection from the mammary gland, and the part becomes distended, this muscle considerably facilitates the transmission of the secreted fluid through the teat by compressing the ducts, and thus squeezing their contents towards the extremity of the nipple. Thus the lactiferous tubes within the mammary gland, and the excretory vessels which are sent off from those tubes through the teat, are furnished by Nature with precisely the same muscular apparatus for the ejection of their contents.

The compressing muscle of the teat, however, is only capable of performing this office when assisted by that of the gland; for

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until by the contraction of the latter the ducts become distended, no resistance is offered in the direction of the longitudinal fibres of the muscle which incloses them; and we consequently find, that when the marsupial teat is empty and flaccid, its contraction (which can be easily felt in the living animal) diminishes the part to one-fourth of its size when in the distended state; for when empty the teat is drawn up, and the skin which covers it becomes loose and corrugated. When, however, the teat is distended, the contraction of the muscle would of course tend to produce a considerable degree of pressure upon the vessels which it incloses.

Having thus endeavoured to prove, that a forcible compression of the gland and teat is necessarily occasioned by the contraction of their surrounding muscular investments, and that by this compression the excretory vessels must be emptied of their contents; having also mentioned the probable necessity for this provision in the mother, as indicated by the condition of the young, I shall now conclude my account of the mammary organs by describing some other structures which enter into the composition of the teat and gland. It will be necessary, however, that I should first notice a peculiar and singular change in these structures, which I have observed to occur in the living animal, and which is, I conceive, in a great measure dependent upon the existence and functions of other parts which yet remain undescribed.

The change to which I allude consists in an extraordinary distention or enlargement of the marsupial mammary gland and teat, which is constantly found to take place during the time the young is engaged in the act of sucking. This distention is considerably greater than any which could possibly arise from the most forcible injection of the lactiferous tubes; and I have clearly ascertained, by repeated and careful examinations of the

the pouch in the living animal, that it is produced at will by the mother, apparently for the purpose of preparing the parts for the more ready transmission of milk to the young. On these occasions the gland and teat will be found of nearly double the size which a full injectment of the ducts is capable of producing. The cause of this additional enlargement however was, as I conceive, explained by an examination of the vascular system in the parts alluded to; for by continuing the dissection, and carefully removing the compressing muscles of the gland and teat, it was found that, from the number and size of the veins, any obstruction to the circulation of blood through these vessels would in itself be sufficient to occasion a degree of distention by which the extraordinary increase of size in these parts might be adequately accounted for. The distribution of the veins in the marsupial gland is not characterized by any remarkable appearance as regards their course; from their immense number, however, the whole surface of the gland presents when closely examined a reticulated congeries of vessels, which, with those of the interior, unite into larger trunks, the greater number of which terminate on the outer convex surface of the gland in a single vessel (*tab.* 8. *f.* 2. *a.*), which passes first between the two layers of the proper muscle of the mammæ, afterwards descends upon the tendon of the external oblique, and ultimately empties itself into the external iliac vein. This vessel, however, conveys only a part of the blood from the marsupial gland towards the heart, since another venous trunk, issuing from the inner margin of the gland, descends in a similar manner to the same termination, namely, to the iliac vessels. This vein conveys not only the remaining portion of blood from the gland, but also the whole of that which returns from the marsupial teat (*tab.* 8. *f.* 2. *b.*).

Venous circulation, carried on through vessels thus situated, must necessarily meet with obstruction from the action of the compressing

compressing muscles through which they pass; and it therefore appears more than probable, that whenever the gland is squeezed against the marsupial bone, a greater or less degree of venous congestion, and consequently distention of the part, must be occasioned by the pressure which is made upon the veins through which the blood is returned. That a loaded state of the veins, together with an injection of the lactiferous tubes, will occasion in the marsupial gland of the dead animal an increase of size corresponding to that which is found to exist in the parts during life, I have proved by the experiment of throwing an injection of quicksilver into the ducts, and one of water into the blood-vessels, by which process the exact natural form and capacity of the mamma, as it exists during the period of suckling, is artificially produced. Thus the extraordinary distention of the marsupial mammary gland to which I have alluded, is, I conceive, produced in a great measure by an enlargement of the vessels which naturally exist in the part; but the extraordinary distention of the nipple is partly occasioned by a change which takes place in a peculiar vascular structure which enters into the composition of the teat, and which is formed apparently for this particular purpose: for we find immediately beneath the compressing muscle of the teat, that a layer of loose reticular membrane, forming a bed for a congeries of tortuous veins, is interposed between that structure and the central fasciculus of excretory ducts. The vascular sheath by which this central fasciculus is thus inclosed, consists principally of a dense plexus of veins, which are extremely large and numerous in proportion to the size and number of the arteries which accompany them (*tab.* 8. *f.* 2. *c.*). So great is the vascularity of this sheath, that in many parts it nearly resembles in appearance the corpus spongiosum of the penis, and like that part is capable of considerable distention, either by an obstruction to its venous circulation in the

the living animal, or by artificial injection after death. The existence of this structure throughout the whole length of the marsupial teat, will at once account for the extraordinary enlargement of that part before alluded to; for since the veins of the plexus empty themselves into the mammary vessels, an obstruction to the circulation of blood through their main trunks must necessarily operate in producing a congestive swelling both of the marsupial gland and of the teat. I conceive, therefore, that the distention of the nipple at the period of suckling, is occasioned not only by the injection of its excretory ducts, but also by the state of venous congestion which must necessarily occur at that time in the vascular covering which surrounds those ducts, occasioned by the pressure of the muscles of the marsupial gland upon the trunks of the veins returning blood from the part. Thus it will be understood, that the teat is composed of four distinct structures; first, of the common integuments: secondly, of its compressing muscle; thirdly, of the vascular plexus, which I have just mentioned; and lastly, of its central fasciculus of lactiferous tubes.

I have injected the excretory ducts of the gland with quicksilver from the extremity of the nipple to their extreme branches, and have met with no unusual appearance either as regards their course or distribution. They are about twenty in number, and terminate by separate openings at the extremity of the nipple. The appearance which they present when injected is accurately shown (*tab.* 8. *f.* 2. *d.*). They are bound together by a delicate tissue of reticular membrane, and are continued a short way into the substance of the gland before they separate. Throughout their whole course they are possessed of a very considerable degree of elasticity.

Having thus detailed the anatomical peculiarities which I have met with in the marsupial gland and teat, and having endeavoured

deavoured to assign a cause for the changes which I have met with in these parts in the living animal, it now merely remains for me to describe the appearances which presented themselves in the dissection of the smaller gland and teat.

This gland, as I have before stated, is not possessed of any great degree of vascularity. Its coverings, as well as those of the smaller teat, are very similar to the investments of the larger organ, but considerably less distinct. From its close connection with the marsupial gland, it derives in common with that organ a strong covering from the compressing muscle of the mamma; but the compressing muscle of the teat consists of a few scattered fibres only, which cannot without difficulty be distinguished from the surrounding cellular membrane, beneath which a very small and delicate vascular plexus is situated, extending, as in the larger marsupial teat, from the extremity of the nipple to its base, forming a close investment around the excretory ducts of the gland (*tab.* 8. *f.* 1. *c.*). These ducts are extremely minute in size, from fifteen to twenty in number, and closely resemble in their course and distribution through the gland, the larger ducts of the marsupial teat (*tab.* 8. *f.* 1. *a.*). The veins and arteries of the smaller are closely connected with those of the larger gland; and the two organs so nearly resemble each other in their anatomical characters, that they can only be said to differ in size and in vascularity.

With regard, however, to the use of the smaller gland and teat, this is a point upon which I am unable to arrive at any satisfactory conclusion. I have never found the slightest alteration in the condition of these parts during any of the different periods of gestation. The young animal is never attached to the smaller nipple during the first period of its existence in the pouch; nor have I ever been able to ascertain (although I have taken much trouble to investigate this subject) that at any sub-

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sequent period the more perfectly developed young animal has ever been known to extract any nutritive fluid from the upper and smaller teat. Unless therefore I have recourse to analogy, and compare the smaller gland and teat with the supernumerary mammæ and nipples which we find in other animals, any theory which I could suggest relative to their use must be founded entirely upon conjecture.

I have now concluded my anatomical description of the mammary organs of the Kangaroo. At the time I was engaged in the dissection of these organs, I was not aware that a description had already been published of one of the structures described in this paper,—I allude to the compressing muscle of the teat,—the existence of which has been noticed by M. Geoffroy St. Hilaire, in the *Annales des Sciences* for 1826, who has correctly described its use; although, from the state in which he appears to have received a small portion only of this particular part, his dissection does not seem to have afforded him an opportunity of tracing the exact extent and attachment of the muscle.

With the exception, however, of the published account of M. Geoffroy St. Hilaire's dissection of these muscular fibres, I am not aware that any former anatomist has noticed the peculiarities of structure which I have described as existing in the mammary organs of the Kangaroo. Believing, therefore, that many of the facts which I have detailed are entirely new, I have been induced to present the foregoing account of my investigation to this Society, in the hope that by making them generally known, I may be fortunate enough to draw the attention of future physiologists more particularly to this interesting branch of natural science.

The facilities which in this country are afforded to those who may be inclined to undertake a course of experimental inquiries

 upon

upon the living marsupial animal will be found sufficiently ample, and our opportunities for making anatomical examinations upon the dead subject are by no means rare. With such advantages therefore, I trust that the time is not far distant when we shall be furnished with a full and distinct account of the object of our researches; and that by a detail of connected facts, the phænomena attending the changes which occur during the fœtal life of marsupial animals will be as clearly understood as those which take place during the progress of generation in other mammiferous quadrupeds.

EXPLANATION OF THE PLATES.

TAB. II.

Fig. 1. Represents the interior of the pouch of a virgin Kangaroo, the fore part of which has been cut away to show— *a.* The upper and smaller teat. *b.* The small circular aperture occupying the situation of the future marsupial teat. A bristle has been introduced.—Page 62.

Fig. 2. A view of the mammary glands of the same pouch, shown by removing the skin, &c. from the abdominal muscles, and reversing the preparation exhibited in Fig. 1. *a.* The larger gland or true mamma cut open to expose its membranous canal. *b.* The upper and smaller gland. *c.* The unopened membranous canal shown by dissecting away its connections with the gland. *d.* The canal slit open to show its termination in a projecting papilla. *e.* A bristle passed through the canal into the pouch.—Page 63, 64. *ff.* Glands apparently belonging to the absorbent system.

TAB.

TAB. III.

Fig. 1. Interior of the pouch of the virgin Kangaroo, in which the lower teat on the right side has been produced by artificially everting-- *a*. The membranous canal of the mammary gland, and projecting *b*. Its papillary termination. *c*. The follicular aperture formed by the opening of the canal, and through which the canal with its papilla is pushed and everted.—Page 65.

Fig. 2. Young Kangaroo supposed to be only a few days old, figured to show the contrast between the extremely minute aperture of the mouth at this early period, and the extremity of the marsupial teat as shown in Fig. 3. —Page 65.

Fig. 4. Represents the young animal in a more advanced state; the teat to which it was attached is shown in Fig. 5, which, it will be seen, bears a very close resemblance to that which is produced by the artificial eversion of the canal in the mamma, as shown in Fig. 1. *a*. *b*.

TAB. IV.

The panniculus carnosus of the Kangaroo, covering the fore part of the abdomen, as described in page 68. The muscular fibres will be seen encircling the mouth of the pouch, to which they form a sphincter, and some of the descending fibres are shown passing over the pubis to be inserted into the cloaca, *a*.

TAB. V.

This plate exhibits a view of the interior of the pouch of an adult Kangaroo at the period of suckling, together with the compressing muscle of the mamma. *a*. Compressing muscle. *b*. Marsupial teat. *c*. Upper and smaller teats.—Page 69 and 72.

Tab. VI.

a. The anterior Rectus abdominis muscle.—Page 70 and 71.

Tab. VII.

b. The posterior rectus muscle of the abdomen. *a.* The triangular ligament connecting the marsupial bone with the pelvis; the ligament has been removed on the opposite side, to show the exact form of the bone itself.—Page 70.

Tab. VIII.

Fig. 1. Represents the double mamma of the Kangaroo dissected.—Page 74. *a.* Excretory ducts of the smaller gland. *b.* Compressing muscle of the marsupial teat. —Page 75. *c.* Small plexus of vessels.

Fig. 2. A view of the blood-vessels and ducts of the true marsupial gland and teat.

a. Larger vein and artery. *b.* The smaller ditto.—Page 77 and 78.

c. Dense plexus of veins and arteries. *d.* Ducts of the gland traced to their termination.—Page 79.

V. *De-*

Fig 1.

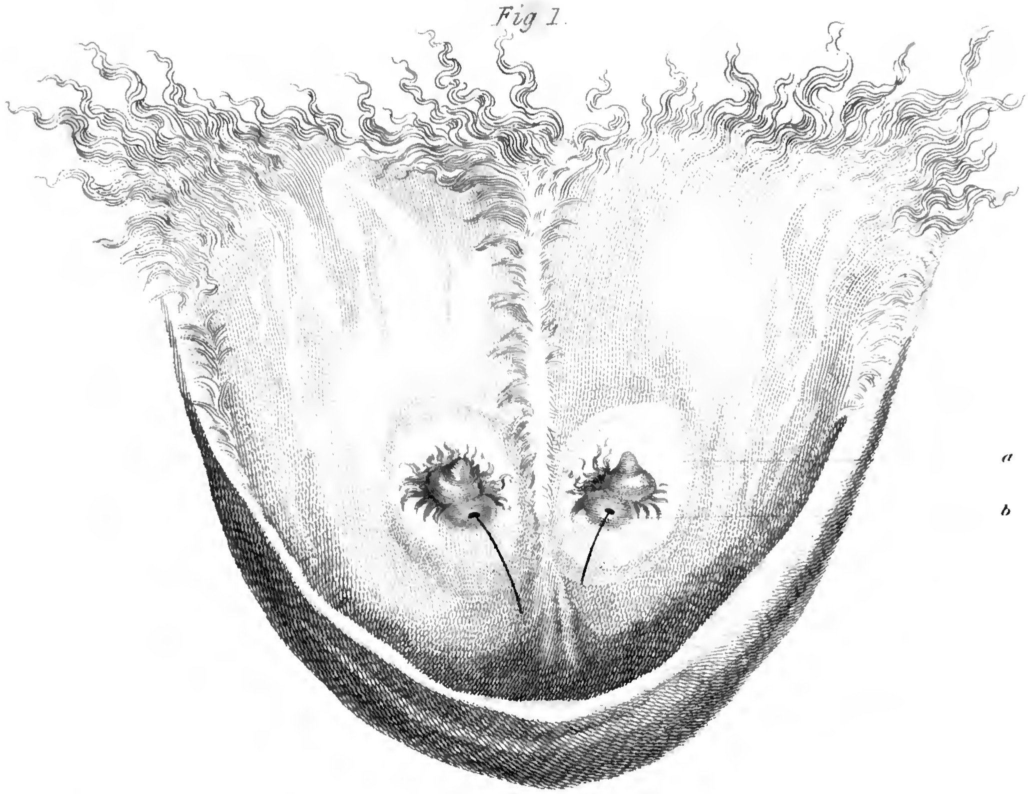


Fig 2.

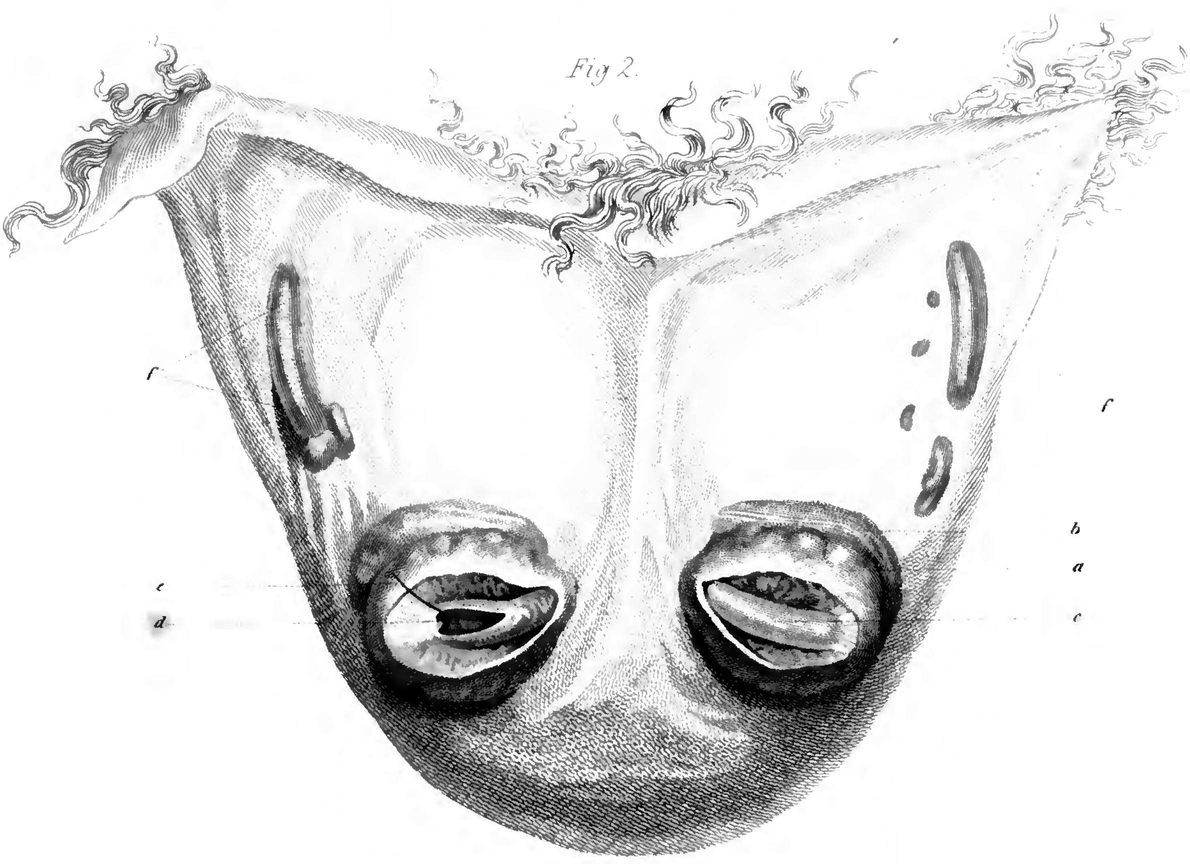


Fig. 1.

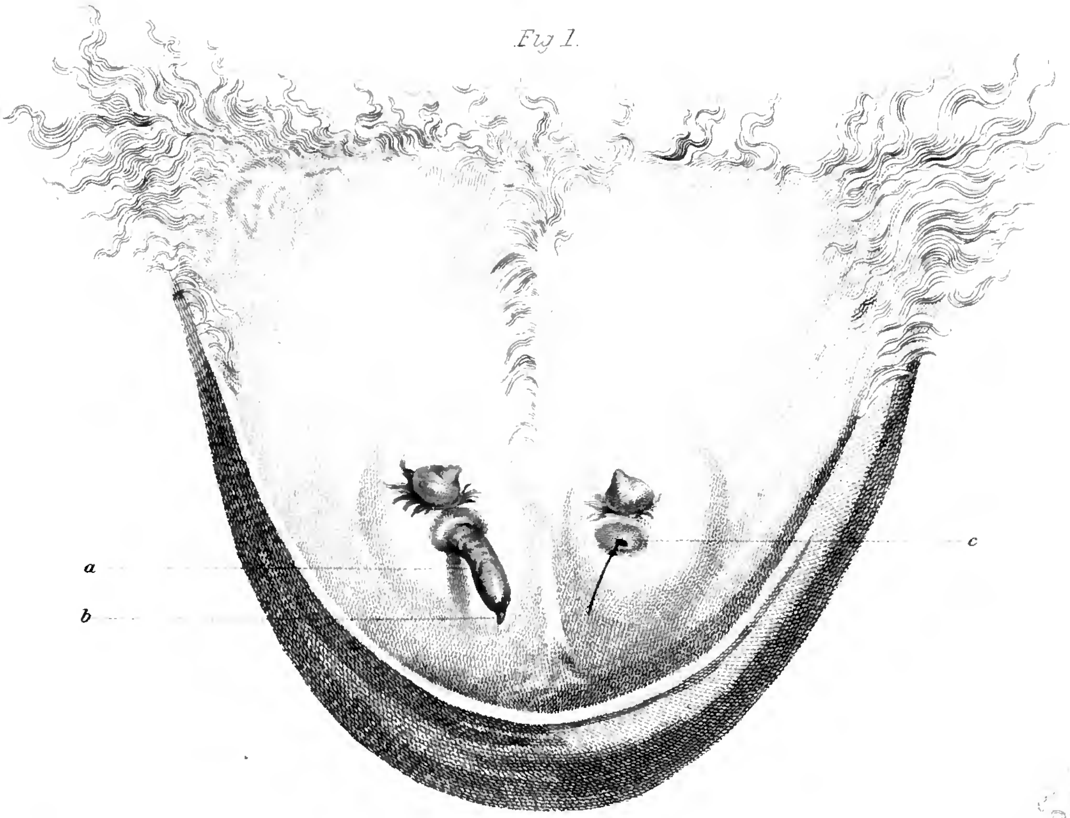


Fig. 5.

Fig. 3.

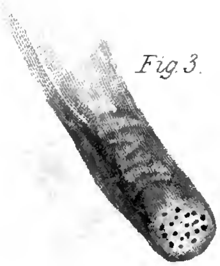
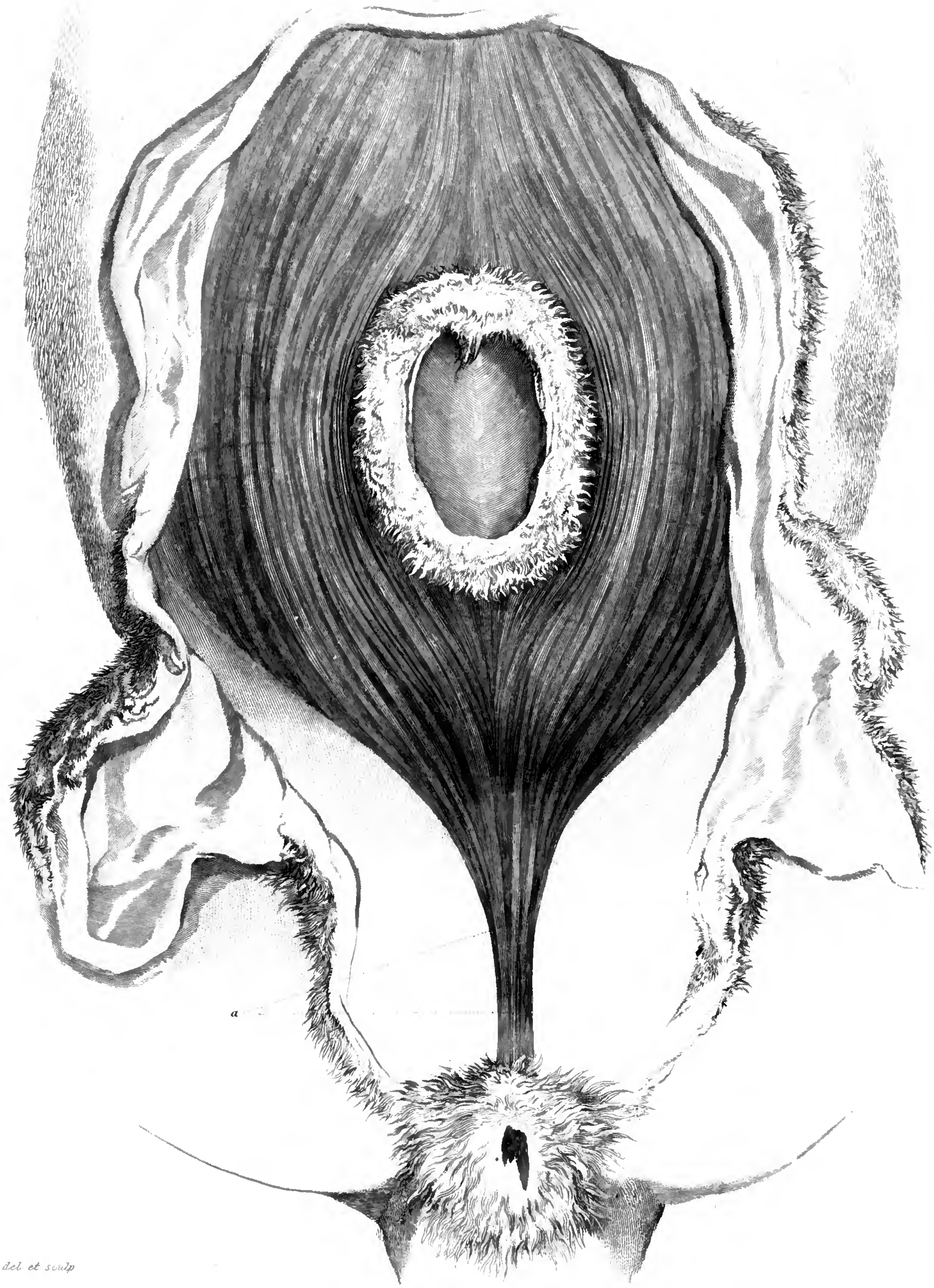
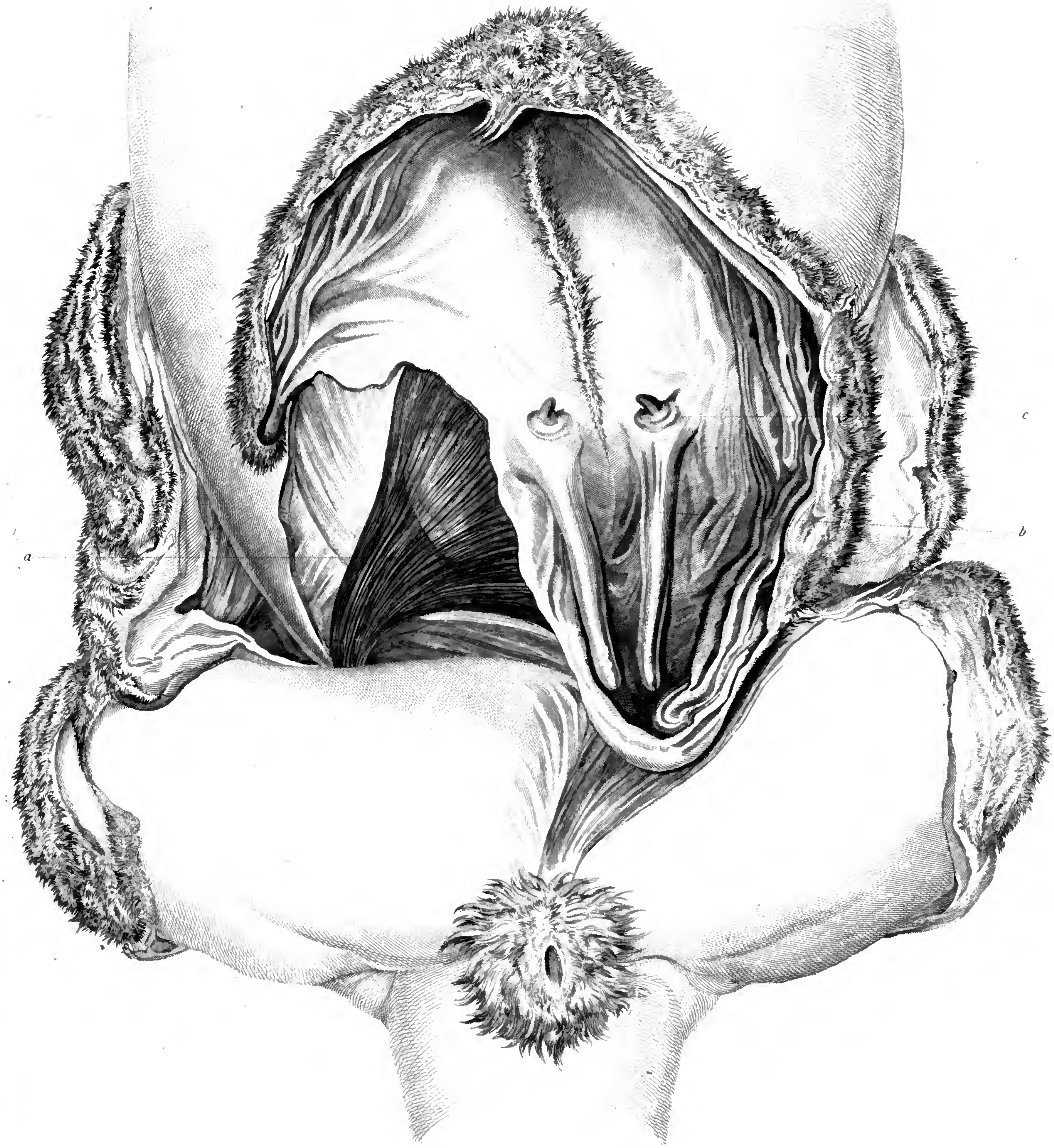


Fig. 2.

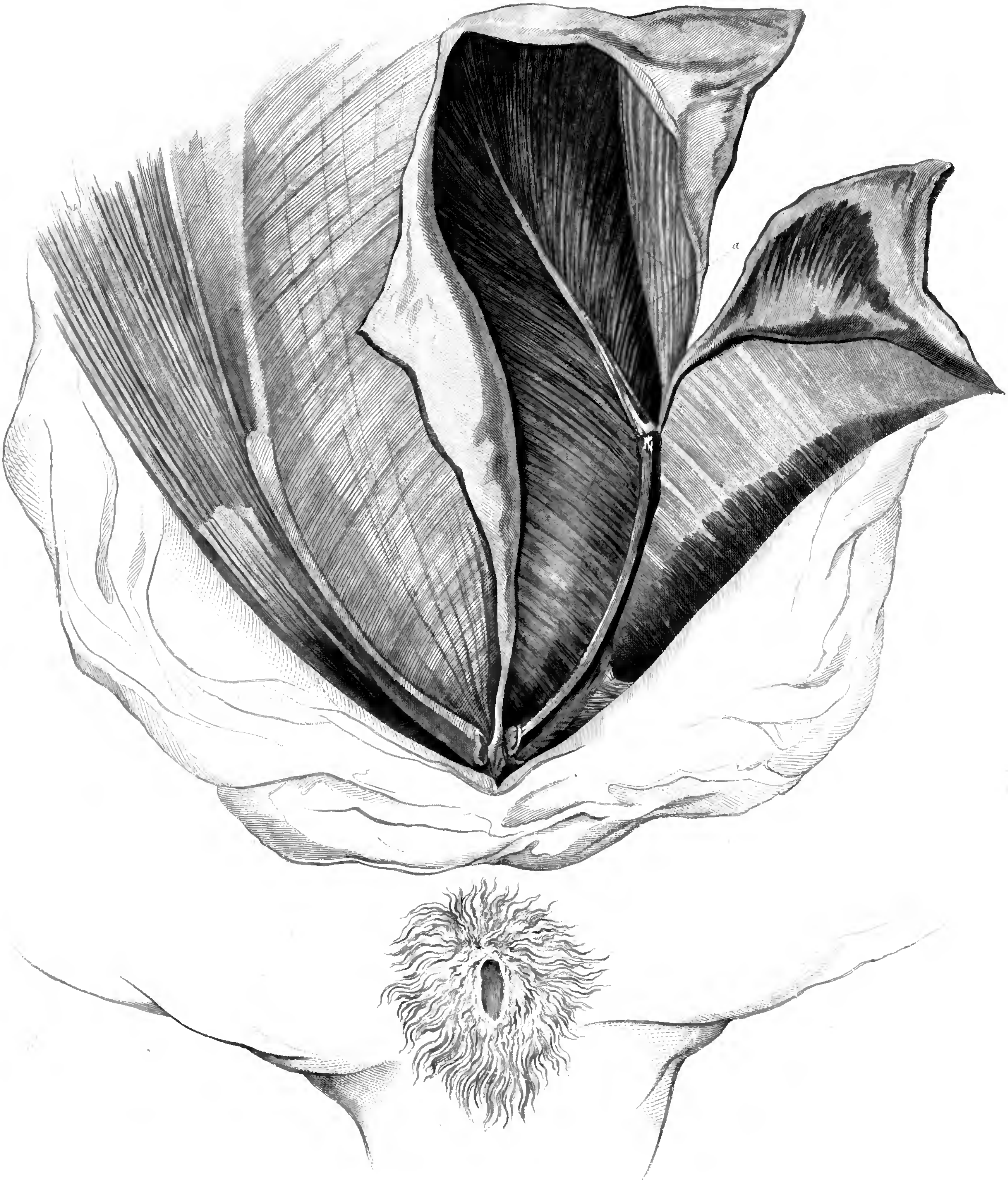
Fig. 4.



C. J. Canton. del et sculp



C. J. Canton. del et sculp



C. J. Canton. del. et sculp.

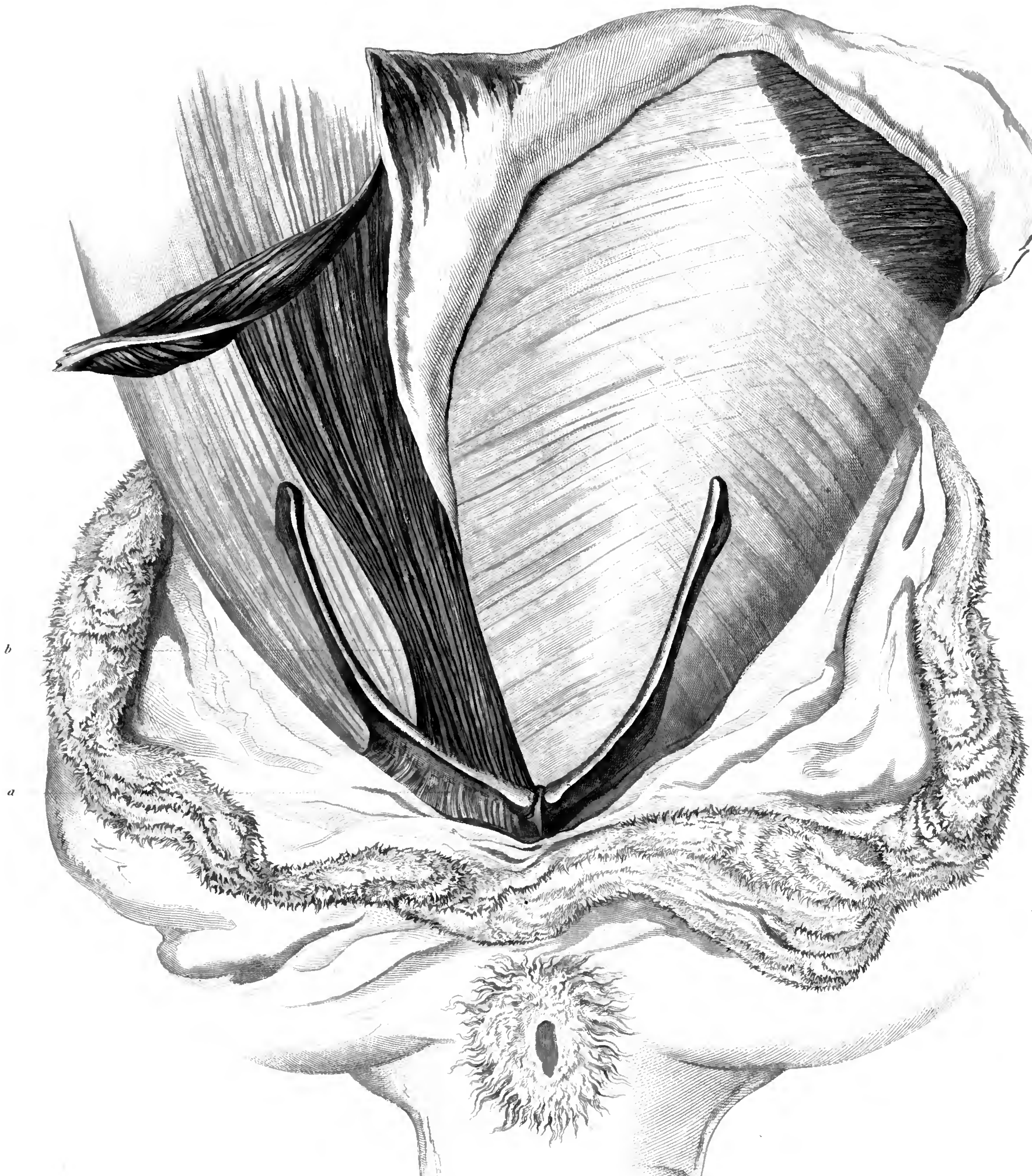

b
a

Fig 1.

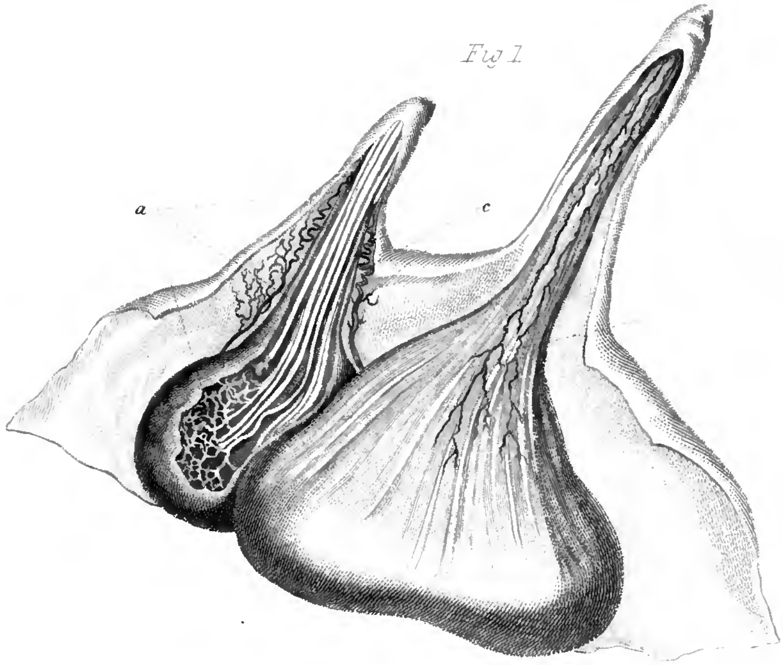
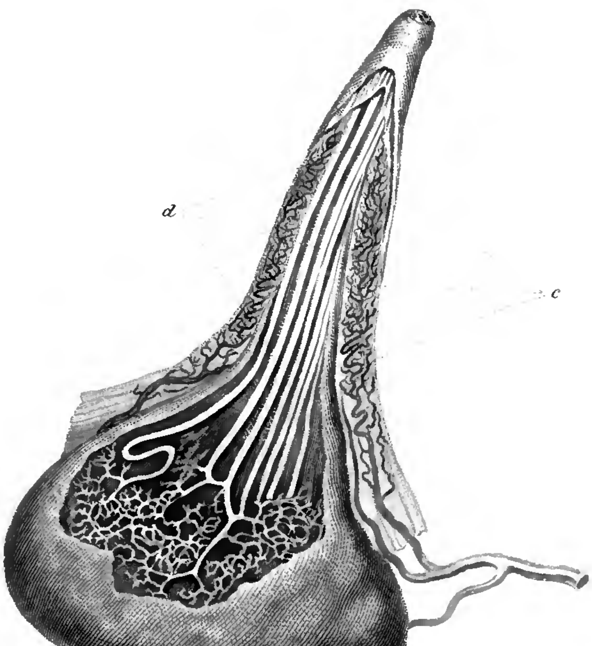


Fig 2.



V. *Descriptions of some new Species of Birds belonging chiefly to the rare Genera Phytotoma*, Gmel., *Indicator*, Vieill., *and Cursorius*, Latham. *By Mr. Benjamin Leadbeater, F.L.S. Communicated by the Zoological Club of the Linnean Society.*

Read December 20, 1825.

AMONG the numerous accessions which have taken place to our stock of Ornithology within the last few years, a few species belonging to some of the rarer genera have fallen into my hands, the descriptions of which may not prove unacceptable to this Society. Next to the interest which is excited by the discovery of species that exhibit any novel modification of form, may be considered that which arises from the accession of species to groups either little known, or which are of rare occurrence. The following birds are for the most part of this latter description. They belong to genera, of which the species have hitherto not only been much limited in number, but which are so rare as to have come but seldom under the inspection of ornithologists.

Ordo. INSESSORES. *Vigors.*
Tribus. CONIROSTRES. *Cuv.*
Fam. LOXIADÆ. *Vigors.*
Genus. PHYTOTOMA. *Gmel.*

FERREO-ROSTRE. *P. brunneum, capite, gulâ, caudâque suprà rufis; rostro nigro, crassissimo.*

Rostrum

Rostrum subbreve, crassissimum, basi latissimum, *rostri Loxiadarum* robur crassitudinemque in extremum ferens: irregulariter serratum; *mandibulâ* superiore dente conspicuâ prope basin armatâ; *tomiis* angulum prope basin formantibus. *Alæ* subbreves, rotundatæ, brunneæ; *remigibus* suprà fusco-brunneis, subtùs fuscis; *remige* secundâ primâ paulò longiori, tertiâ quartâ quintâ sextâque ferè æqualibus longissimis, septimâ octavâ nonâ decimâque gradatim brevescentibus. *Cauda* mediocris, rotundata; *rectricibus* duabus mediis suprà rufis, cæterûm pogoniis externis rufis, internis fuscis, omnibus subtùs fuscis. *Pedes* mediocres, fusco-brunnei, tetradactyli; *acrotarsiis* scutellatis, *paratarsiis* integris; *digitis* subgracilibus; exteriore usque ad articulum primum medio connexo; medio elongato, duobus externis subbrevibus, æqualibus; *hallıce* subforti, subelongato, *ungue* sublongo, subfalcato; *unguibus* omnibus compressis.

Longitudo *corporis*, $5\frac{7}{10}$; *alæ* a carpo ad remigem quartam, $2\frac{4}{5}$; *tarsi*, $\frac{4}{5}$; *rostri* ad frontem, $\frac{3}{5}$, ad rictum, $\frac{4}{5}$; altitudo *rostri* a basi gnathidiorum ad basin culminis $\frac{4}{5}$; latitudo inter gnathidia, $\frac{7}{10}$.

I have referred this bird to the genus *Phytotoma* of Gmelin, with the general characters of which it sufficiently accords. The bill, however, is of such extraordinary dimensions, and the bird exhibits in other respects such peculiar characters, that I make no doubt it will be found, when closely compared with the birds of that genus, to form a distinct group from them. Hitherto I have had no opportunity of making such a comparison, having never seen a specimen of the true *Phytotoma;* and I do not feel myself authorized to form my bird into a new genus without a more accurate knowledge of that group, with which

which it is certainly closely allied, than the superficial characters already given of it afford me. I have, however, subjoined a detailed account of the chief characters of the bird in the above description, in order that those ornithologists, who may have the good fortune of being able to compare the species of the true *Phytotoma* with it, may ascertain how far the birds agree. I have to add, when alluding to the extraordinary dimensions of the bill of the species, that the jaw-bones extend in width even further than the beak itself; the space between them being $\frac{9}{10}$ths of an inch, while that between the gnathidia of the lower mandible is but $\frac{7}{10}$ths.

The greatest breadth of the skull above is $\frac{3}{5}$ths of an inch.

Trib. DENTIROSTRES. *Cuv.*

Fam. MERULIDÆ. *Vigors.*

Gen. MYIOTHERA. *Ill.*

2. YARRELLII. *M. suprà brunnea; strigâ superciliari, thorace, crisso, guttisque alarum pallidè fulvis, abdomine albo; strigâ per oculos tectricibusque nigris.*

Caput saturatiùs brunneum; *cauda* rufescenti-brunnea. *Rostrum* suprà brunneum, subtùs fulvum; *pedes* fulvi.

Longitudo *corporis*, $5\frac{1}{2}$; *rostri*, $\frac{3}{5}$; *alæ* a carpo ad remigem tertiam, $2\frac{3}{5}$; *caudæ*, $2\frac{1}{2}$; *tarsi*, $1\frac{1}{10}$.

I have dedicated this beautiful species to my friend Wm. Yarrell, Esq., whose services as an ornithologist entitle him to this public mark of approbation, and whose long continued friendship demands from me this private tribute of esteem.

Fam.

Fam. SYLVIADÆ. *Vigors.*

Gen. TYRANNULUS. *Vieill.*

3. VIEILLOTI. *T. suprà viridi-olivaceus, corpore subtùs strigâque superciliari utrinque flavis; capite cristato, alis, caudâ, maculâque utrinque abdominali atris; regione auriculari atro-cæruleâ; capite summo crissoque roseis; mento strigâque alarum albis.*

Pteromata fulva. *Tectrices* inferiores albæ, nigro notatæ. *Rectrices* externæ apice albo. *Rostrum pedes*que nigri.

Longitudo *corporis*, 4; *rostri*, $\frac{1}{2}$; *alæ* a carpo ad remigem tertiam, $1\frac{3}{4}$; *caudæ*, $1\frac{9}{16}$; *tarsi*, $\frac{3}{4}$.

I have named this little Wren, which comes from Chili, after M. Vieillot, who first characterized the American species, without the feathers which cover the nostrils, as distinct from the European *Regulus*.

Fam. PIPRIDÆ. *Vigors.*

Gen. PARDALOTUS. *Vieill.*

4. AFRICANUS. *P. suprà virescenti-olivaceus, subtùs flavescenti-albidus; alis caudâque nigris, illis albo guttatis, hâc albo terminatâ.*

*Capitis nuchæ*que plumæ fusco ad apicem marginatæ, *gulæ pectoris*que leviter undulatæ. *Ptila* guttis rotundis albis frequentibus notata, *pteromata* guttis similibus terminata. *Genæ crissum*que flavæ. *Tectrices* inferiores albidæ. *Rostrum* nigro-brunneum; *pedes* pallidi.

Longitudo *corporis*, $4\frac{1}{4}$; *rostri*, $\frac{1}{4}$; *alæ* a carpo ad remigem secundam, $2\frac{3}{8}$; *caudæ*, $1\frac{5}{8}$; *tarsi* $\frac{9}{16}$.

This little bird, which has all the general characters of the Australian genus *Pardalotus*, as well as the usual colouring and markings, was found far in the interior of Africa. It is the only

only species of the genus yet discovered, that does not belong to New Holland.

Trib. SCANSORES. *Auct.*

Fam. CUCULIDÆ. *Leach.*

Gen. INDICATOR. *Vieillot.*

The group of *Honeyguides*, the first account of the interesting manners of which was given by Dr. Sparmann, was separated from the Linnæan genus *Cuculus*, where it was originally placed by systematic writers, by M. Le Vaillant* under the name of *Indicateurs;* and was afterwards formed into a genus by M. Vieillot, under the scientific name of *Indicator*. Some confusion exists respecting the species already described of this genus. M. Le Vaillant has described and figured two species, which he calls "*le Grand Indicateur*" and "*le Petit Indicateur.*" Dr. Shaw refers to three species, which he denominates *I. Sparmanni* (*Cuculus Indicator* Mill.), the bird originally discovered by Dr. Sparmann; *I. major;* and *I. minor;* the two last being the species figured by M. Le Vaillant. M. Temminck, however, includes but two species in the genus†, the original *Cuculus Indicator* Mill. (*I. Sparmanni* Shaw), and the *Petit Indicateur* of M. Le Vaillant (*I. minor* Shaw); apparently concluding that the former bird and the *Grand Indicateur* of M. Le Vaillant (*I. major* Shaw) are the same species.

These birds are of rare occurrence, and I have had no opportunity of ascertaining this point; but I have the good fortune to be able to add the descriptions of two new species, which have been sent to me from the interior of Africa, and which differ totally from all the descriptions and figures of those species already published. To these I shall add the detailed de-

* *Ois. d'Afrique.*

† *Analyse du Syst. gen. d'Ornith.* p. 73.—1825.—He has subsequently added a third species in his *Planches Coloriées*, No. 367.—Nov. 29, 1828.

 scription

scription of a species I have received from the Cape of Good Hope. This bird, although it does not exactly accord with the description of the bird originally brought from the same place by Dr. Sparmann, may yet be the female, or a variety of that species; the descriptions of it being very vague and confused, and the identity of the species being much in doubt.

5. LE VAILLANTII. *I. olivaceo-brunneus, subtùs albidus, gulâ pectoreque flavo-variegatis; rectricibus duabus mediis fusco-brunneis, cæteris albis fusco-brunneo notatis.*

Tectrices superiores flavo leviter marginatæ, inferiores albidæ. *Remiges* olivaceo-brunneæ margine interno pallidiore, subtùs fuscæ internè albido marginatæ. *Rectrices* prima et secunda albæ apice brunneo, tertia alba apice basique brunneis, quarta et quinta brunneæ margine interno albo, duæ mediæ brunneæ. *Rostrum* obscurè brunneum, subbreve, gonyde subfortiter angulatâ. *Pedes* nigri, *unguibus* pallidioribus.

Longitudo *corporis*, $7\frac{1}{4}$; *alæ* a carpo ad remigem tertiam, $4\frac{1}{10}$; *caudæ* $3\frac{1}{10}$; *rostri* ad rictum $\frac{13}{20}$, ad frontem $\frac{1}{2}$; *tarsi* $\frac{13}{20}$.

This bird has at first sight some appearance of the *I. albicollis** of M. Temminck; and on a superficial examination might be pronounced either the female or the young male of that species. But the bill will be found to be decidedly distinct; being shorter and stronger, and having a much more acutely angulated *gonys* than the bill of that bird.

I. Le Vaillantii also is of less dimensions than the former bird; and the disposition of the colours, as may be seen by the above descriptions, is different in both. I have named the species

* The male and female of this species had been originally described and named in this paper; but as the species has been figured by M. Temminck subsequently to the reading of the paper, I adopt his name.—Nov. 29, 1828.

cies in honour of M. Le Vaillant, who first pointed out the characteristic peculiarities of this group, and whose services in general to science have been of the highest importance.

6. Buphagoides. *I. olivaceo-fuscus, abdomine albido; alis dorsoque infimo flavo variegatis; rectricibus quatuor mediis olivaceo-brunneis; rostro brevi, crasso.*

Tectrices superiores, primariæ externè flavæ, internè albido marginatæ, secundariæ utrinque flavo marginatæ; inferiores albidæ. *Remiges* suprà, externâ exceptâ, externè flavo internè albido marginatæ; subtùs fuscæ, internè albido marginatæ. *Rectrices* tres externæ albæ, apice brunneo, quarta alba apice basique brunneis, quatuor mediæ brunneæ. *Rostrum* nigrum, mandibulâ inferiori basi albidâ, gonyde grandi.

Longitudo *corporis*, 6; *alæ* a carpo ad remigem tertiam $3\frac{7}{10}$; *caudæ* $2\frac{1}{2}$; *rostri* ad frontem $\frac{2}{6}$, ad rictum $\frac{11}{20}$; *tarsi* $\frac{3}{6}$.

The bill of this species, although agreeing in general characters with those of the rest of the group, exhibits a decided difference from all, in its shortness and thickness. In this respect it has nearly the appearance of the *Beefeater's* bill, partially agreeing in the strong and angulated form so conspicuous in that genus.

This analogical resemblance has induced me to confer on the species the name of *Buphagoides*.

7. Sparmanni? *I. olivaceo-brunneus, gulâ pectoreque albido maculatis; abdomine crissoque albidis, brunneo lineatis, rectricibus externis albis, apice brunneis.*

Caput parcè albido striatum. *Alarum* plumæ flavescenti marginatæ; *femorales crissique* in medio brunneo striatæ. *Remiges* inferiores fuscæ. *Pteromata* alba: *ptila* alba brunneo-variegata.

N 2

variegata. *Rectrices* quatuor mediæ brunneæ, cæteræ albæ apice brunneo. *Rostrum* nigrum, *mandibulâ* inferiore albescente. *Pedes* nigri.

Longitudo *corporis*, $7\frac{3}{10}$; *alæ* a' carpo ad remigem tertiam $4\frac{1}{5}$; *caudæ* $2\frac{9}{10}$; *rostri* ad pontem $\frac{1}{2}$, ad rictum $7\frac{1}{10}$; *tarsi* $\frac{13}{20}$.

Fam. Ramphastidæ. *Vigors.*

Gen. Momotus. *Lath.*

8. Platyrhynchus. *M. flavescenti-viridis, capite collo pectoreque rufo-castaneis; strigâ per oculos, notisque thoracicis nigris; rostro latissimo.*

*Rostrum pedes*que nigri. *Remiges* pogonio externo viridi, interno rhachibusque fuscis. *Tectrices* inferiores virides. *Rectrices* suprà virides, rhachibus apiceque atris; subtùs fuscæ.

Longitudo *corporis* ab apice rostri ad apicem caudæ, $14\frac{5}{8}$ unc.; *rostri* ad frontem $1\frac{5}{8}$, ad rictum 2; *alæ* a carpo ad apicem remigis quartæ $5\frac{1}{8}$; *caudæ* $8\frac{1}{4}$; *tarsi* $\frac{3}{4}$.

The distinguishing character of this bird is its bill, which is flat and broad, unlike the compressed bill of the other three species. The black *stria* on the side of the head extends from the *rictus* of the bill through the eyes, and covers the ears; those on the throat are formed by detached black feathers, not exceeding in this specimen seven in number. The webs of the central tail-feathers are bare for about an inch near the *apex*, as is usual in this genus.

This bird was found in Brazil.

Ord. Grallatores. *Illiger.*

Fam. Charadriadæ. *Leach.*

Gen. Cursorius. *Latham.*

9. Grallator. *C. ochraceus, capite dorsoque nigro brunneo-*

que

que variegatis; subtùs parcè nigro lineatus; fasciis duabus parallelis pectoralibus nigris.

Rostrum nigrescens. *Pedes* pallidi.

Longitudo *corporis*, $7\frac{3}{5}$; *rostri* $\frac{3}{5}$; *tarsi* 2.

The extraordinary length of the *tarsi* of this bird brings the group to which it belongs into near contact with the long-legged genera of *Himantopus* Cuv. and *Ædicnemus* Cuv., and adds to the number of those groups of the family of *Charadriadæ* which are immediately allied to the *Gruidæ* of the same order. The stilt-like appearance of the bird has suggested the specific name which I have given it.

VI. *On a new Genus of the Order Rodentia. By Joshua Brookes, Esq., F.R.S. and L.S. Communicated by the Zoological Club of the Linnean Society.*

Read June 3rd and 17th, 1828.

THE science of Natural History is of so unbounded an extent, that perhaps I may be allowed, comparatively speaking, to say, that scarcely a day passes without an opportunity being afforded to zoologists of bringing to light unknown instances of its latent treasures.

The animal which I am at present about to describe has been in my possession for several years; and although there is strong evidence of its being new to science, as far as relates to a knowledge of its real structure, yet, from a variety of circumstances, I have neglected to avail myself of the means so long afforded me; and possibly now it may only be in consequence of the approaching dispersion of my collection that a stimulus is given to exertions, which otherwise might have remained dormant.

The individual in question, which appears to be unique, was obtained, when recently dead, from Mr. Cross, in whose Vivarium at Exeter Change it had been seen while living, and especially noticed, both by M. de Blainville and by M. F. Cuvier. Each of these distinguished naturalists has described its general characters and habits; but, unacquainted with its real structure, they have failed in referring it to its correct situation in Nature. By each of them it has been erroneously placed among the Jerboas, under the name of *Dipus maximus*. The latter author,

author, indeed, appears to have doubted the propriety of this location, and mentions with evident regret, that the loss of the remains of the animal had prevented our becoming acquainted with its organization, and ascertaining precisely its characters. Fortunately, however, the animal, although obscured from notice during so long a period, is yet in a condition for accurate and minute examination.

The description of its preserved skin and skeleton I have now the honour of presenting to the notice of the Society; and from the structure of the latter especially, it will be evident that it must be referred to a new genus, to which I propose to give the name of *Lagostomus.* The form of the teeth, on which so much stress is justly laid in characterizing genera, differs essentially from that exhibited by all the other *Rodentia;* from which it is also distinguished not only by the number of its toes, but by various other particulars of its osteology, which I shall now proceed rapidly to describe, assuming occasionally as a point of comparison the skeleton of the *Dipus Sagitta*, with which it has been generically confounded.

The upper surface of the cranium in *Lagostomus* exhibits the usual form of that of the *Rodentia*, its sides being nearly parallel, and its occipital breadth scarcely exceeding its breadth immediately anterior to the orbits. In *Dipus*, on the contrary, the outline is decidedly triangular, arising from the very considerable dilatation of its hinder part, occasioned by the extraordinary development of the mastoid processes of the temporal bones, which are extremely delicate, and possess, as in man, a cellular structure*. The

* The Egyptian Jerboas being known to domiciliate themselves under bushes frequented by the *Cerastes*, so that it frequently, or perhaps generally occurs, that where the one, there the other is also found; this particular osseous extension may be destined by Nature, to give increased sensitiveness to the auditory organ, for the greater security of the animal. In the *Chlamyphorus truncatus* there are two somewhat similar osseous tumours

The occipital spine in the Jerboa is very trifling: a singular circumstance, when considered in connection with the upright position continually assumed by that animal; while in *Lagostomus* it is most strongly and decidedly pronounced. In both, the orbit is separated from the temporal fossa by a broad and strong bony process;—a structure which occurs also in *Echinothrix dorsata*, and in *Cœlogenus Agouti;* but not in *Lepus*, *Arctomys*, *Castor*, and many others of the *Rodentia*. The zygomatic arch is weak posteriorly.

The incisor teeth, as in most of the genera of this order, are two in number in each jaw; they are long, and protrude considerably, almost equalling in this respect those of *Orycterus maritimus*, and exceeding those of any other species, with that exception: those of the lower jaw are rather the longest, and are grooved along the middle line of their outer surface. The molar teeth are four in number on each side of each of the jaws: those of the lower jaw are placed in a very oblique direction forwards and outwards; each of them is composed of two equal portions, distinctly surrounded by a margin of enamel, and closely united, so as to give the appearance of two single flat teeth intimately ossified together laterally. The three anterior molar teeth of the upper jaw very much resemble those of the lower, but are placed somewhat less obliquely: the fourth, or hinder one, differs in having added to it a third portion, which is rather smaller than the others, and is rounded in its posterior outline. In the Jerboa the molar teeth, it is almost unnecessary to remark, are only three in number on each side of the lower jaw: the structure of their crowns, in which the circumvolutions of the enamel are so complicated

tumours situated just above the orbits, the use and connections of which are unknown, but which may be probably intended for an extension of the olfactory organ, or possibly for a more elaborate diffusion of sound in its subterranean pursuits.

 as

as scarcely to be capable of scientific description, is strongly opposed to the very simple form of those of *Lagostomus*, which present only three parallel lines of enamel, separated by two intervening portions of the osseous part of the tooth.

The rami of the lower jaw are arched, broad, and strong, and exhibit very distinctly on their under surface the roots of the molar teeth, and also the course of the incisors within the bone: the angle is very much produced posteriorly: the plate is broad, and is deeply grooved above, behind the molar teeth: the coronoid process is very acute; the condyle elongated from before backwards, and the glenoid cavity large, and extended considerably in the direction of the condyle.

As all the *Mammalia* have seven cervical vertebræ, with the exception of the Sloth, which has nine, there cannot be any necessity for referring to those bones for numerical comparison with those of other animals. The number of ribs, and consequently that of the dorsal vertebræ, is twelve on each side; that of the lumbar, seven: in both these particulars *Lagostomus* agrees with the Jerboa. The sacral vertebræ of *Lagostomus* are three, and the caudal twenty.

The anterior extremity is comparatively shorter than in the greater number of the *Rodentia*, but is longer and stronger than in the Jerboa. The clavicle is complete. The scapula is rather delicate; its spine is but slightly elevated; and the acromion is slender, flattened, and considerably elongated, equalling in length the remaining portion of the spine. The os brachii is strong, has a considerable tubercle at its outer surface somewhat below the head of the bone, and exhibits a tendency to expand into a ridge (the processus deltoides). The condyles are lengthened transversely, and are widely separated. The radius is about one-fourth longer than the os brachii, and it inclines towards the ulna, which is anchylosed anteriorly with it through about two-

two-thirds of its length, by the ossification of the interosseous ligament. The toes are four in number, terminated by small claws, and the skeleton exhibits not the slightest rudiment of a thumb. In the Jerboa the scapula is still more delicate; the acromion, though slender, does not exceed one-third of the length of the spine; the os brachii is weak, and its deltoid process a simple but strong tubercle; the radius is twice as long as the arm-bone, and there is a marked rudiment of a thumb, which is visible even in the living animal.

The general appearance of the pelvis in *Lagostomus* is delicate; it is comparatively narrow, and is wider in its transverse than in its sacro-pubal diameter: its position is extremely vertical, whence it appears incapable of affording much support to the abdominal viscera when the animal assumes the upright position. The ossa pubis are but little produced; their symphysis is slender and much elongated, and the obturator foramen is consequently enormously large.

The ilia are long and narrow, and their crista, which is blunt, is little expanded. The ossa femoris are straight, strong, and without ridges; they are furnished, like those of the rabbit, squirrel, and some other animals, with three trochanters, the ordinary trochanter major and trochanter minor, with a trochanter externus, situated a little below the larger process. The tibia and fibula are nearly half as long again as the femur; the fibula is complete, extending downwards, and forming the malleolus externus. The os calcis is strong, and elongated backwards: the metatarsal bones are three; they are strong; the middle one is not quite one-half of the length of the tibia: at the tarsal extremity of the outer one there is a small somewhat curved and obtusely-pointed tubercular elongation directed backwards, as though it were intended as a fulcrum to give additional security to the foot in leaping. A similar formation

 may

may be noticed in the squirrel and *Pteromys*. The toes are three, the middle one being the longest and the inner one the shortest.

From this the hinder extremity of *Dipus* differs most essentially. Its femur is arched, with the convexity forwards, and is only half the length of the tibia. The fibula is short, and extends to just below the middle of the tibia, where these bones are firmly ossified together: the metatarsal bone, which is about two-thirds of the length of the tibia, is single, and is terminated by three nearly equal toes, the lower part of the limb bearing in the skeleton a striking resemblance to that of a small tridactylous wader.

To this outline of the more remarkable particulars exhibited by the skeleton of *Lagostomus*, and of the numerous and important differences which exist between it and that of the Jerboa, a few observations may be added respecting its relation with those of other rodent quadrupeds nearly approaching to it in size.

The *Lagostomus* has	12	ribs, and consequently twelve dorsal [vertebræ.
Jerboa . .	12	——
Squirrel . .	12	——
Rabbit . .	12	——
Marmot . .	13	——
Coypus . .	13	——
Agouti . .	13	——
Urson . . .	14	——
Capromys . .	16	——

The *Lagostomus* .	7	lumbar vertebræ.
Jerboa . .	7	———
Squirrel . .	7	———

The

The Rabbit . . .	7	lumbar vertebræ.
Marmot . . .	7	———
Urson . . .	6	———
Agouti . . .	6	———
Coypus . . .	6	———
Capromys . .	6	———

Hence it appears, that in the number of the ribs, and of the lumbar vertebræ, the *Lagostomus* agrees with the Jerboa, the Squirrel, and the Rabbit. From the former of these its distinctions have been already pointed out. From the Squirrel it differs amply in the want of the rotatory motion of the bones of the fore-arm, and in the number of the toes, which in that animal are five upon each foot. In the Rabbit the fibula is anchylosed with the tibia a little below its middle, as in the Jerboa,—a circumstance which takes place also in the Rat. From the *Agouti*, with which it corresponds in its tridactyle hinder extremities, it is distinguished by the number of the ribs and of the lumbar vertebræ, as well as by various other particulars of the osteology. In the *Helamys* there are five toes to the fore-feet, and four to the hinder. With the exception of this animal, of the Rabbit, and of the Jerboa, the tibia of *Lagostomus* exceeds in comparative length, that of any of the other *Mammalia* enumerated above.

One circumstance which has been noticed in the anatomical description is worthy of particular remark ;—the bony union of the radius and ulna in an animal, which, from the testimony of accurate observers, who saw it during its life, employed its anterior extremities in conveying its food to its mouth. This structure, so far as I am acquainted with the osteology of the *Mammalia*, is perfectly unique. It has been hitherto regarded as quite at variance with the existence of claviculæ, most of the quadrupeds

quadrupeds which use their paws for the purpose of hands depending in a great measure for the extent to which they can be so employed, on the perfection or deficiency of these bones, and on the rotatory motion of the radius on the ulna.

With the generic character, and with a few observations on the single species on which it is founded, I shall now conclude this paper.

LAGOSTOMUS.

Dentes incisores in utrâque maxillâ duo elongati, prominentes; maxillæ inferioris canaliculati, paulò longiores.

——— *molares* in utrâque maxillâ utrinque quatuor, obliqui, antrorsùm extrorsùmque spectantes, coronâ simplici laminatâ; maxillæ inferioris obliquiores bilaminati; maxillæ superioris tres anteriores bilaminati, posticus trilaminatus.

Pedes antici breviores, digitis quatuor.

——— *postici* elongati, validi, digitis tribus: *ossa metatarsi* digitis numero æqualia.

Cauda mediocris, pilis longioribus pectinatis vestita.

Species unica.

Lagostomus trichodactylus.

Tab. IX.

Dipus maximus. *De Blainville.* *F. Cuvier, Dict. des Scien. Nat.* xviii. *p.* 471.

To the original descriptions given from the living animal by M. de Blainville and by M. F. Cuvier it is necessary for me to add but little, their general correctness being shown by a reference to the stuffed skin. I have ventured to change the trivial name, as we are at present unacquainted with any congener with which a comparison could be made, and it would be improper to retain the epithet *maximus* for a single species. That which I have

have proposed, *trichodactylus*, is derived from a curious and hitherto unnoticed character, the animal being remarkable for a tuft of bristly hairs on the back of each of the hinder toes.

In one important particular the descriptions of the zoologists to whom I have referred differ materially. M. F. Cuvier states, that "la queue étoit de moyenne longueur, touffue et tout à fait relevée contre le dos:" while M. de Blainville remarks (*Desm.*, *Enc. Méth. Mammalogie*, ii. 314.) "La queue du seul individu observé étoit tronquée et mutilée, et il en restoit environ deux pouces." For this discrepancy I can only account by supposing that the animal seen by the former naturalist was not the same as that described by the latter. Mr. Cross, I believe, received a pair of these animals at the same time, one of which escaped from his cage and was lost. The individual in question was skinned and stuffed by Mr. Leadbeater, who delivered the recent body to me; and it is obvious that the tails of the skin and that of the skeleton correspond with regard to length, *i.e.* five or six inches. In the stuffed specimen the tail is bushy, of a darker colour than that which prevails over the body, and having the hairs spread laterally, pectinated similarly to those of a *Myoxus*, or of a common Squirrel.

The size of the *Lagostomus trichodactylus*, as described by M. de Blainville and M. F. Cuvier, is that of a full-grown Rabbit of moderate dimensions. This, although sufficiently accurate, and as correct as the dimensions of any active and savage animal can be estimated while it is living, is by no means sufficiently precise. I therefore subjoin some of the more important measurements of the skeleton, which I give in preference to those of the skin.

From

	Feet.	Inches.
From the atlas to the tuber ischii	1	$0\frac{1}{2}$
——— crista ilii to the tuber ischii	0	4
Length of the fore extremity from the head of the os brachii to the end of the longest nail	0	6
——— from the head of the os brachii to the external condyle	0	$2\frac{1}{4}$
——— from the end of the olecranon to that of the longest nail	0	$4\frac{1}{2}$
——— of the hinder extremity	1	$0\frac{1}{2}$
——— from the trochanter major to the lower portion of the external condyle of the femur	0	$3\frac{1}{2}$
——— from the upper surface of the tibia along the fibula to the malleolus externus	0	$4\frac{1}{2}$
——— from the end of the os calcis to the extreme end of the middle toe	0	$4\frac{1}{8}$

The occipital diameter of the cranium of the *Lagostomus* is 1 inch and $\frac{6}{8}$ths, and its diameter between the ascending portions of the zygoma 1 inch and $\frac{5}{8}$ths. The corresponding measurements in the *Dipus* are respectively $\frac{7}{8}$ths and $\frac{4}{8}$ths of an inch.

EXPLANATION OF TAB. IX.

Fig. *a.* *Lagostomus trichodactylus*,
b. Skeleton of the same,
c. Upper jaw,
d. Under jaw,
} Half the Natural size.

e. Crown of the second molar tooth of the left side of the lower jaw,
f. Ditto of the last molar tooth of the right side of the upper jaw,
} Natural size.

VII. *De-*

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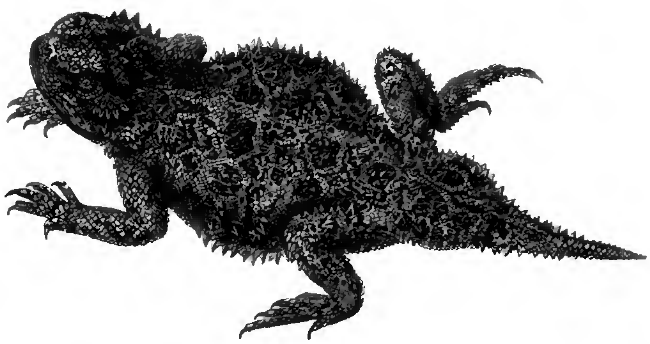
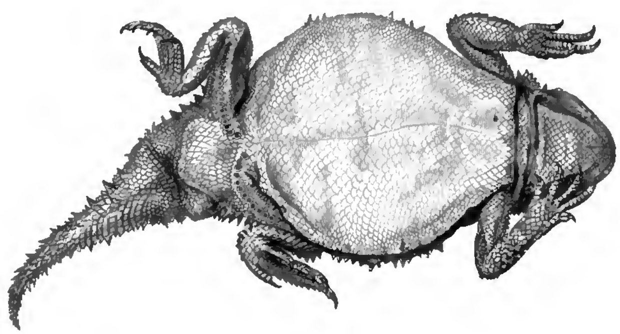




Agama Douglasii.

VII. *Description of a new Species of Agama, brought from the Columbia River by Mr. Douglass. By Thomas Bell, Esq., F.R.S. & L.S.*

Read June 17, 1828.

Genus. AGAMA. *Daudin.*

Agama Douglassii.

Tab. X.

A. Poris femoralibus utrinque xx.

Habitat in orâ occidentali Americæ Borealis ad ripas fluminis Columbiæ.

In its general form, colours, and marking, this species very much resembles *A. superciliosa*, *A. orbicularis*, and others of the same section of the genus. The head is obtusely triangular, with a distinct ridge overhanging the orbits: the body suborbicular and depressed; the tail tumid at its origin, from whence it becomes rather suddenly contracted, and tapers to its extremity. The head, body, limbs and tail, are covered on the upper side with small raised scales, interspersed with larger ones which are aculeated, and most of them quadrangular. These form distinct ridges over the eyes, above the ears, across the occiput, and along the sides of the body and tail. The under side is wholly covered with small uniform smooth scales. The gular fold is of considerable size. The colour of the upper part is a mixture of yellowish-white and

piceous

piceous disposed in dots, exactly resembling mosaic work, and with distinct, large, irregular ocelli of the latter colour, margined with white, disposed in transverse series across the back. There is also a white longitudinal central line from the occiput to the end of the tail. The under side is of an uniform faint white colour, and the femoral pores of a sulphur-yellow.

This beautiful and highly interesting species was found by Mr. David Douglass in the course of his late indefatigable and productive researches in the western parts of North America, to whom I am also indebted for the following account of its habits.

It is seen in great numbers in all woodless sandy arid deserts in the interior of the country, on the southern parts of Columbia river. On the banks of streams, in thickets composed of *Purshia tridentata*, *Artemisia* and *Salvia*, it was observed by Mr. Douglass to take up its abode, in the holes made by species of *Lepus*, *Arctomys*, &c., which are alternately occupied by them and several species of Coluber, which resort there for the purpose of preying on these *Agamæ* and on the Marmots. It feeds on both animal and vegetable substances. In the stomach were found coleopterous insects, and the leaves of *Purshia*, *Artemisia*, and *Salvia*. Like most others of the tribe it is very nimble during the summer months, and it is then difficult to capture it; but in April, when it first makes its appearance, or in October, before it retires to its winter habitation, being at both seasons weakly, it may be readily taken. At such seasons the traveller is constantly annoyed by them during the night, seeking shelter from the cold under his blanket, and is frequently under the necessity of removing these little intruders on his rest. "In April," continues Mr. Douglass, "I have observed the young, not exceeding half an inch in length, perfectly formed, of the same colour and equally nimble with the older ones. The co-

lour

lour in all seasons appears to be the same both in male and female. Like the species of the genus Coluber, this lizard is never seen more than a mile or a mile and half from the water; but, on the contrary, is invariably found in the greatest numbers in its immediate vicinity."

The existence of femoral pores in this species is particularly important, as it totally invalidates the generic character of *Agama* as hitherto given by authors, who have considered the absence of these organs as essentially distinguishing the genus. Whether the presence or the absence of femoral pores is to be considered as a character of sufficient importance, standing alone, to separate species otherwise perfectly similar in every circumstance both of form and structure, can hardly be determined until the use of these singular bodies is ascertained: but in our present state of ignorance on this point, it is hardly safe perhaps to view it in so important a light; and as in every other respect this may be considered as even a typical representative of the genus, I should propose rather to alter the generic character for its reception, to the formation of a new genus by which it would be separated from its immediate congeners.

VIII. *Description of a Species of Tringa, killed in Cambridgeshire, new to England and Europe. By William Yarrell, Esq., F.L.S. Communicated by the Zoological Club of the Linnean Society.*

Read June 17, 1828.

Tringa rufescens.

Supra' fuscescente-rufescens, nigro maculata; alis caudâque versus apicem nigris albisque; tectricibus alarum inferioribus versus apicem albis, nigro variis; remigibus subtùs albis nigro guttatis punctatisque; gulâ juguloque rufescentibus; abdomine rufescente-albo. *Vieill. Gal. Ois. p.* 105. *pl.* 238.

Le Tringa roussâtre. *Nouv. Dict. d'Hist. Nat. 2de edit. tom.* xxxiv. *p.* 470. *Encycl. Meth. p.* 1090.

Such are the characters and references which M. Vieillot points out as distinguishing the bird he has chosen for his type of the genus *Tringa*, a species found in Louisiana, and a specimen of which I have now the pleasure to record as a British bird.

This interesting and prettily marked *Tringa* was shot early in the month of September 1826, in the parish of Melbourne in Cambridgeshire, in company with some Dotterell (*Charadrius morinellus*); and passed immediately afterwards into the possession of Mr. Baker of Melbourne, by whom the skin was preserved, and of whom it was purchased for me. An additional

tional interest attaches to this specimen, since knowing it to be new to this country; I am besides authorised to add the testimony of Mons. Temminck,—to whom, during his recent visit to London, I exhibited the example now figured,—that this bird is also entirely new to Europe. I have therefore ventured to place a notice of it before the Linnean Society, and add the following description.

Ordo. Grallatores *Vigors.*

Fam. Scolopacidæ. *Ejusd.*

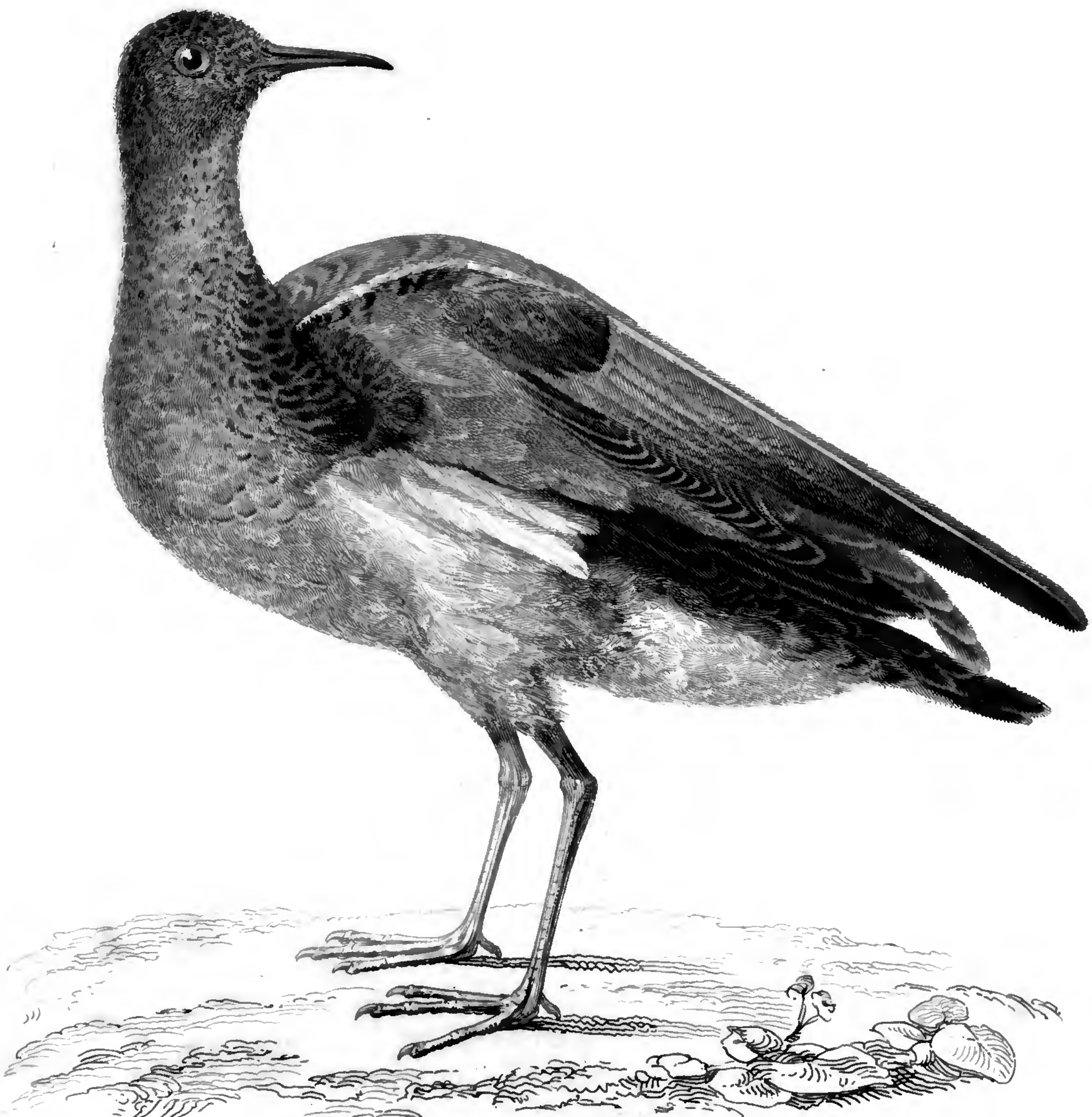
Tringa rufescens. *Vieill.*

Buff-breasted Sandpiper.

Tab. XI.

The beak is slender and very slightly curved, three-fourths of an inch in length, and black; from the point to the gape it measures one inch, and from the gape to the occiput is also one inch: the feathers on the top of the head are dark brown, approaching to black, each feather edged with very light brown, giving a mottled appearance; the back of the neck light brown, the dark spots formed by the centre of each feather minute; the back very dark brown, the extreme edges only of the feathers light brown: the wing-coverts brown, and intermediate in appearance between the light brown feathers of the neck and those of the back; the primaries nearly black, tipped with white; the shafts white; the tertials brown, edged with light brown; tail-coverts brown, with lighter-coloured borders: the tail cuneiform, the centre feathers black, the shafts and edges lighter; the feathers on each side light brown, inclosed by a zone of black, and edged with white.

The chin, sides of the neck, throat and breast, light brown tinged with



Tringa Rufescens.

with buff; abdomen, flanks and under tail-coverts white, but pervaded also with the buff colour of the higher parts; the sides of the neck spotted, from the dark centres of the feathers occupying a larger surface than upon the front; the anterior portion of the under surface of the wing rufous brown; the outer portion spotted, the under wing-coverts pure white. The shafts of the primaries on their under surface pearl white, the outer web dusky, the inner web also dusky, and plain on the part nearest the shaft, the other inner half of the web beautifully mottled with dark specks; the secondary wing-feathers also mottled at their bases, and ending in sabre-shaped points, presenting a regular series of lines formed by alternating shades of white, black, and dusky bands, which in the adult bird are well defined, and present a beautifully variegated appearance, peculiar to this species. The legs are bare for half an inch above the joint; the tarsus one inch and one quarter in length; the middle toe $\frac{7}{8}$ths of an inch; the whole of these parts brown; the nails black: the whole length of the bird eight inches.

A single specimen of this Sandpiper deposited in the Paris Museum appears to have served for the descriptions contained in the works already referred to; and this example is probably an adult bird in summer plumage.

Wilson's excellent work on the Birds of America does not contain this *Tringa*, nor is it included in the Continuation, on the same judicious and valuable plan, by the Prince of Musignano; neither have I been able to find a notice of this species in any other ornithological work, except those before quoted. It is readily distinguished from all the other birds of this genus by the peculiar markings of the under surface of the wings. The value of this acquisition to our Fauna is still further en-

hanced

hanced by the twofold circumstance, of its extreme rarity, as well as being in a different state of plumage from the only other specimen known.

The plumage and the state of ossification of the tarsi prove this specimen to be a young bird of the year; but whether bred in the marshes of the county in which it was killed, or, having wandered from America to the northern part of our island, had accompanied the Dotterell in their southern autumnal visit to the chalk district of Cambridgeshire, can only be conjectured.

The extensive range of hills around Melbourne are frequented by Dotterell in considerable numbers for a short period during every spring and autumn, in their way to and from their breeding-ground; and the only locality from which I could ever obtain their eggs was the Grampian Hills.

But three of the many additions to British ornithology that have lately occurred having been recorded in the *Transactions of the Linnean Society*, I take the opportunity this communication affords me, of adding a list of thirteen others, with a reference to the authorities from whom the first notices of these addenda have emanated. The names of the three above mentioned are also included to complete the list.

Loxia pytiopsittacus. Parrot Crossbill. See *Selby's Illustrations of British Ornithology, p.* 254.

Plectrophanes Lapponica. Lark-spurred Bunting. *Linn. Trans. vol.* xv. *part* 1. *p.* 156.

Emberiza hortulana. Ortolan Bunting. *Zool. Journ. vol.* iii. *p.* 498.

Anthus Richardi. Richard's Lark. *Zool. Journ. vol.* i. *p.* 280 *&* 411.

Sylvia Suecica. Blue-breasted Warbler. *Synopsis of the Contents of the Newcastle Museum, by G. T. Fox, Esq., F.L.S. p.* 298.

Accentor

Accentor alpinus. Alpine Warbler. *Zool. Journ. vol.* ii. *p.* 281.
Scolopax Sabini. Sabine's Snipe. *Linn. Trans. vol.* xiv. *part* 3. *p.* 556.
Tringa rufescens. Buff-breasted Sandpiper. (The subject of the present communication.)
Tringa Temminckii. Temminck's Sandpiper. *Zool. Journ. vol.* iii. *pp.* 88 *&* 302.
Gallinula Baillonii. Baillon's Gallinule. *Zool. Journ. vol.* ii. *p.* 279.
Sterna arctica. Arctic Tern. *Zool. Journ. vol.* ii. *p.* 461.
Larus eburneus. Ivory Gull. *Bewick's British Birds, edit.* 1826, *vol.* ii. *p.* 214.
Anas Gambensis. Spur-winged Goose. *Bewick's British Birds, edit.* 1826, *vol.* ii. *p.* 296.
Anas Casarka. Ruddy Goose. *Bewick's British Birds, edit.* 1826, *vol.* ii. *p.* 313.
Anas glocitans. Bimaculated Duck. *Linn. Trans. vol.* xiv. *part* 3, *p.* 559.
Anas rufina. Red-crested Duck. *Zool. Journ. vol.* ii. *pp.* 492 *&* 552; and *vol.* iii. *p.* 604.

 IX. *An*

IX. *An Account of Margarodes, a new Genus of Insects found in the Neighbourhood of Ants' Nests. By the Rev. Lansdown Guilding, B.A. F.L.S.*

Read December 4, 1827.

I USED to imagine that nothing would give me so much pleasure (excepting the discovery of a recent Belemnite), as an opportunity of investigating those curious and minute bodies which have been so often sent to Europe in collections of shells, under the name of ground pearl; and by accident I have at last been gratified in this respect.

The only person who has lately noticed them is Dr. Nugent, a learned geologist resident in Antigua. In the second part of the fifth volume of the *Transactions of the Geological Society of London*, page 463, he informs us, that the ground pearl (erroneously supposed to be fossil) occurs in the marl of that island, and "is found in prodigious quantity in the furrows of the land when newly turned up." Dr. Nugent appears, however, to have suspected its real nature, for he says, (page 473,) "that though it be derived exclusively from the marl, it may possibly be in some unaccountable manner the production of some recent insect on the surface. The ground pearl generally has an opening as if the larva had escaped; but in a few cases I have found them without opening, containing a minute portion of mucous matter: the negroes then call them live ground pearl. It is singular that turkeys and other poultry devour these ground pearls; and their

 death

death ensues in consequence, unless immediate relief be afforded. Vinegar is poured down the throat, which probably dissolves these substances in the crop, and thus removes the distention they had occasioned. The astonishing quantity in the land puzzles me. I know of no insect sufficiently abundant to produce them in such vast quantity. The ant and the musquito are the only insects whose number bears any proportion to these little substances."

With the musquito they are of course in no way connected; but I have every reason to believe that the animal is placed by a merciful Providence in the dry colonies, as a parasite to keep down the numbers of those little invincible and voracious creatures the ants, which would otherwise swarm in countless myriads uninjured by the rains which thin their ranks in the mountainous and more rainy islands. They occur plentifully in the Bahamas; and, under the name of ant-eggs, are strung into necklaces and ornamental purses by the ladies. In the rainy climate of St. Vincent they have not been found; but in the smaller islands of the Government, which, from the absence of gigantic mountain ranges, are subject to continued drought, these bodies are met with in abundance. On a late visit to the Union Island I collected a boxfull; and suspecting that others had failed in tracing the animals to maturity from improperly placing them in too dry a situation, I brought them home in moist marl, and had soon the satisfaction to observe the insects which are here figured issuing from the pearls. I lament to say, that from the distance of this island, it may be a long time before I am able to obtain an animal so delicate and small in its state of ovum and larva; or have an opportunity of observing them *in coitu*, to ascertain whether there be any apparent difference in the structure of the sexes.

I met with them most plentifully in marly soil about stones, under

under which some families of ants had established receptacles for their broods. Many lay near the surface, while others, buried at the depth of many inches, would require (even aided by their strong fossorious legs) the favourable opportunity of a shower to enable them to penetrate to the surface, and attack the congregated larvæ of the ant. Though armed with a noble microscope, I cannot satisfy myself as to the form of the foramen in the anterior claws, through which the liquid food is pumped, as in the mandibles of the larvæ of the *Myrmeleonidæ*. I do not remember any other *perfect* insect in which the mouth is altogether wanting, and the food is absorbed by tubes ending in a foramen; and it will probably be found necessary to constitute a new order for its reception. It is curious, too, that the tubes for feeding should be seated in the anterior *legs*. It is well known that the raptorious legs of the *Scolopendridæ* are tubular, but this structure is only applied to the injection of the deadening poison by which they kill or stupefy their prey.

I once thought that the ground pearls were the ova of some insect; but from the great diversity in their size and shape it was impossible to maintain this opinion: the ova of the same insect rarely differing in any very sensible degree. It was moreover easy to trace on the greater number of specimens, when cleaned, a rostriform projection (*tab.* 12. *f.* 5. *a.*), with several minute and obliterated spots, which seem to mark the position of the legs, or rather, perhaps, the spiracula of the larvæ: the anal portion of the pearl is also remarkable for five minute and regular spots, two placed in a line, and three (*tab.* 12. *f.* 6.) smaller ones in a triangle between them. The pearl is irregular in its outline, the smaller specimens are roundish, while the larger ones are swollen on the sides, with the anal termination often bent upwards (*tab.* 12. *f.* 5.). The whole puparium is covered with large caducous scales, which strongly *effervesce* and disappear in nitric and muriatic acids,

acids, while sulphuric turns them black. Vinegar slowly decomposes them. Exposed to flame they bubble and burn like horn.

A most remarkable circumstance in the history of these animals is, the power which the puparia possess, when placed in too dry a spot, to throw out gradually certain filiform and very long organs, for the purpose of preventing the drying and destruction of the animal within by obtaining moisture by capillary attraction. These organs I have named *Siphones* (*fila absorbentia*), a term, I believe, not already selected by Mr. Kirby. They appear tubular, and are composed of parallel friable fibres. At first I readily accounted for their appearance, by supposing that they were delicate filiform fungi which had sprung up on the pearls; but on further investigation it proved that, contrary to the law observed by Fungi, they were thrown out when placed in a very dry camphorated box, or on dry soil; and that they only sprung from the half-obliterated spots which seem to mark the position of the spiracula of the larva. There can, therefore, be little doubt as to the use of these singular threads, which seem to have no analogues in the animal kingdom, and which imitate in so curious a manner the operation of some vegetable organs.

St. Vincent, July 24, 1827.

INSECTA.

ORDO??*

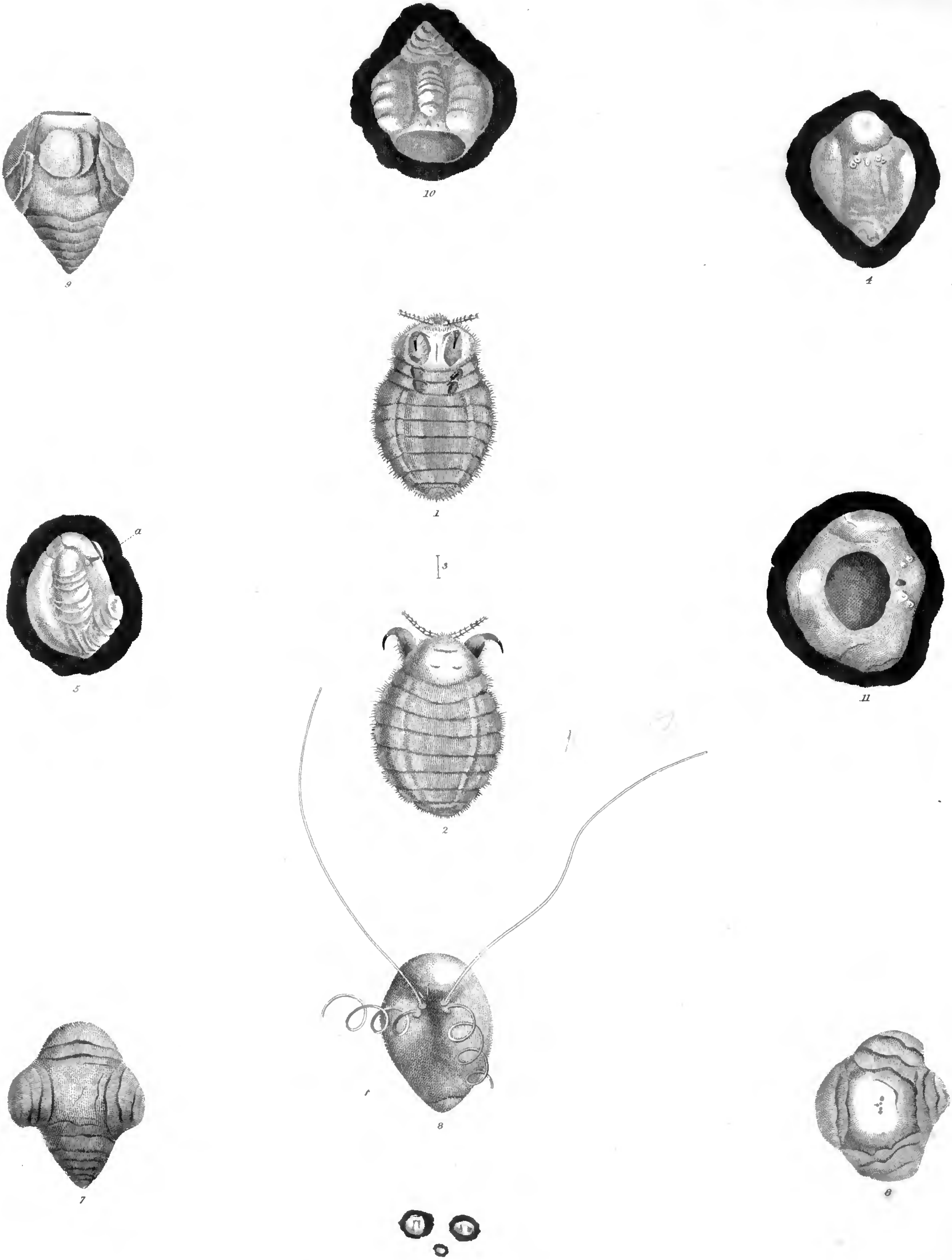
Genus. MARGARODES. *Guild.*

Character Genericus.

Corpus obesum, molle.
Caput evanidum.
Thorax abdomine annuloso vix distinctus.

* Ordo, statio, et affinitas omnino incerti. Locum monstret doctissimus amicus Dominus Kirby.

Os



Margarodes formicarum.

Lansdown Guilding del.

Swaine Sculp.

Os nullum.
Oculi nulli, aut omnino obscuri.
Antennæ mediocres, filiformes, 7-articulatæ, sub fronte approximatæ.
Manus validissimæ, fossoriæ, raptoriæ, unguiculis foraminatis?
Pedes minuti, breves, gressorii, unguiculis simplicibus.
Anus terminalis.
Corpus adminiculis scabrum. *Motus* valde segnis.
Ovum?
Larva?
Pupa. —— Metamorphosis subcoarctata.
Puparium margaritiforme, suboperculatum, squamis calcareis tectum.
Siphones (fila absorbentia pupæ), longissimi, mox spirales.

Margarodes formicarum.

Tab. XII.

M. totus flavescens, hirsutulus; unguiculis brunneis, recurvis.
Habitat mirè frequens in Coloniis aridis Indiæ Occidentalis; an formicarum destructor?

EXPLICATIO TABULÆ XII.

Figuræ 1. & 2. Margarodes formicarum auctus. Fig. 3. Long. nat. Fig. 4. Puparium squamâ operculiformi infractâ. Fig. 5. Idem ad latus visum, rostro projecto (*a.*). Fig. 6. Puparii anus signatus. Fig. 7. Varietas ferruginea. Fig. 8. Puparium siphonibus exsertis. Fig. 9. Idem operculo rejecto, ad dorsum visum. Fig. 10. Idem ad ventrem visum. Fig. 11. Antrum puparii. Fig. 12. Mag. naturalis.

X. *De-*

X. *Description of a new Species of Phalangista.* By *Thomas Bell, Esq., F.R.S. & L.S.*

Read November 4, 1828.

Ordo. MARSUPIATA.

Genus. PHALANGISTA. *Geoffroy.*

PHALANGISTA GLIRIFORMIS.

TAB. XIII. XIV.

P. DORSO rufo-cinereo, gulâ fulvâ, maculâ post aurem utrinque albâ: auribus nudis.

Habitat in Australiâ.

Description. The general form of this animal resembles that of the common dormouse; but it is larger, broader, and more depressed. The head is broad across the ears, from whence it tapers to the nose, which is somewhat pointed. The nostrils are narrow, and of a semicircular form: the upper jaw, which is elongated, overhangs the under, and almost entirely conceals it. The lips are scantily covered with soft short hair, of a whitish colour, and are furnished with four rows of long black vibrissæ, the posterior ones tipped with light brown. The eyes are very large, remarkably prominent, and of a jet-black colour: the ears of considerable size, erect, totally destitute of hair, and of an uniform mouse-colour. The teeth are not very easily examined in the living subject; the incisores, however, are seen to resemble those of the other species of the genus; but from the difficulty of examining the back part of the mouth, the molares have not been very accurately observed: they are moreover extremely small, and almost concealed by the gum. The body is particularly flat and broad, and is covered with a very soft and thick fur; the hairs which compose it being of a gray colour tipped with reddish-brown, give the general hue of rufous-gray. The under parts are more sparingly covered with fur of a pale yellowish-gray colour, the yellow predominating at the sides, and especially at the throat. The general colour of the face is also yellowish, the upper and back part of the head assuming the rufous-gray colour of the back: there is a blackish ring round the eyes, which passes upwards on each side to the forehead, where it mingles with the general colour of that part. The sides of the neck as well as the throat are buff. There is a darkish ring partially surrounding the ears, at the anterior part, interrupted by a distinct white spot behind each.

The feet are almost entirely concealed by the fur when the animal is at rest; and even when in an active state, the breadth of the body, combined with the length of the fur, and the extent to which the skin of the sides is attached to the legs, namely, as far as the carpi and tarsi, gives it very much the aspect of a *Petaurista*, to which genus the present species may, I think, be considered as exhibiting a remarkable approximation. The tail is nearly as long as the body and head together; it is remarkably broad and thick at the base, to more than half an inch from the origin, at which part it becomes contracted, and then gradually tapers to the extremity. It is hairy, being more thickly covered on the upper part, and especially at the base, where it partakes of the

the general colour of the upper parts of the body, becoming more scantily furnished towards the point; and there is, at the extremity of the under part, a narrow space, about half an inch in length, which is entirely naked. The tail is more or less prehensile throughout its whole length, but especially towards the extremity, as is indicated by the bare patch or line just mentioned: there are slight circular depressions at intervals, apparently marking the divisions of the vertebræ, which are more distinctly observable underneath.

The feet are perfectly prehensile. The thumb, as in the other species of the genus, is destitute of a nail both on the fore and hinder feet, and the nails of the other toes are very narrow and slightly hooked. The toes on the fore-feet are nearly of an equal length, and generally stand out in a radiated direction when the animal is standing on a flat surface. The hinder-feet are longer than the fore; the thumb is thick and short, and placed at a greater distance from the other toes in the latter than in the former. The two outer toes are nearly of the same length,—the two next shorter, and, like the other *Phalangistæ*, united together, except at the last phalanx, which gives the appearance of one broad toe with two nails, and these are sharper and narrower than those of the other toes. The under part of the feet is bare,—the upper part sparingly covered with extremely fine short silky hair.

The two specimens from which this description is given being females, the account of the generative organs must be restricted to that sex. One of them had brought forth young ones, which were said to have been in the pouch when she was taken, but died before her arrival in England. The other appears not to have been impregnated. When they were first brought to this country there was a very obvious difference in the state of the pouches. The teats, which are four in number, were much larger in the elder specimen, particularly the two anterior ones; which is directly opposite to the state of these organs in the Kangaroo, as described in the valuable and elaborate paper of my friend Mr. Morgan, lately read before the Linnean Society. At the present time, however, the teats in the two specimens are nearly, if not exactly, of the same size,—an interesting circumstance, as indicating an analogy to these organs in the Kangaroo; in which animal, as shown in the paper just referred to, a similar diminution of the teats takes place after the young have finally left the pouch. The cloaca is placed about one-third of the distance from the root of the tail to the pouch.

On examining the characters of this interesting and elegant little animal, it is impossible not to be struck with its general approach to the *Petauristæ*,—a resemblance to which I have already alluded. The identity of many of its more obvious characters with those of *Phalangista nana* is too marked not to demand a particular investigation. The history of the latter species is but very imperfectly known; indeed, the short and necessarily unsatisfactory account given by the celebrated Temminck in his Monograph of this genus, serves only to raise our curiosity, without affording an opportunity of satisfying it. The small size of that species, being not larger than a mouse, together with some general similarity in the colour and marking, would almost lead us to identify them as one and the same species, were it not for one striking character, which cannot be mistaken, namely, the surface of the ears. The description of *Phalangista nana*, as given by the above-mentioned distinguished zoologist,

zoologist, has this very obvious character: "les oreilles sont arrondies et *couvertes de poils.*" Now in the specimen from which the present description is given, the ears are so absolutely naked that not even with a lens can the slightest hairiness be discovered on them. This very marked distinction renders it the less necessary for me to dwell upon the minor differences of colour; the under part of *Ph. nana,* for instance, being white, that of our species a yellowish-gray*.

Two specimens of this beautiful animal are now living in the possession of my friend Mr. Morgan, to whose kindness I am indebted for permission to lay the present account before this Society. He received them from New Holland, according to the declaration of the person who brought them to England, but from what part was not stated.

In their habits they are extremely like the dormouse, feeding on nuts and other similar food, which they hold in their fore paws, using them as hands. They are nocturnal, remaining asleep during the whole of the day, or, if disturbed, not easily roused to a state of activity; and coming forth late in the evening, and then assuming their natural rapid and vivacious habits. They run about a small tree which is placed in their cage, using their paws to hold by the branches, and assisting themselves by their prehensile tail, which is always held in readiness to support them, especially when in a descending attitude. Sometimes the tail is thrown in a reversed direction, turned over the back; and at other times, when the weather is cold, it is rolled closely up towards the under part, and coiled almost between the thighs. When eating they sit up on their hind quarters, holding the

* See Desmarest, *Nouv. Dict. d'Hist. Nat.* xxv. 477.—Desmar. *Mamm.* p. 268.—F. Cuvier, *Dict. des Sc. Nat.* xxxix. 415.—Temminck, *Monog. Mamm.* 9. The first reference appears to be the original one, and the others either taken from that or from the specimen which formed the subject of it.

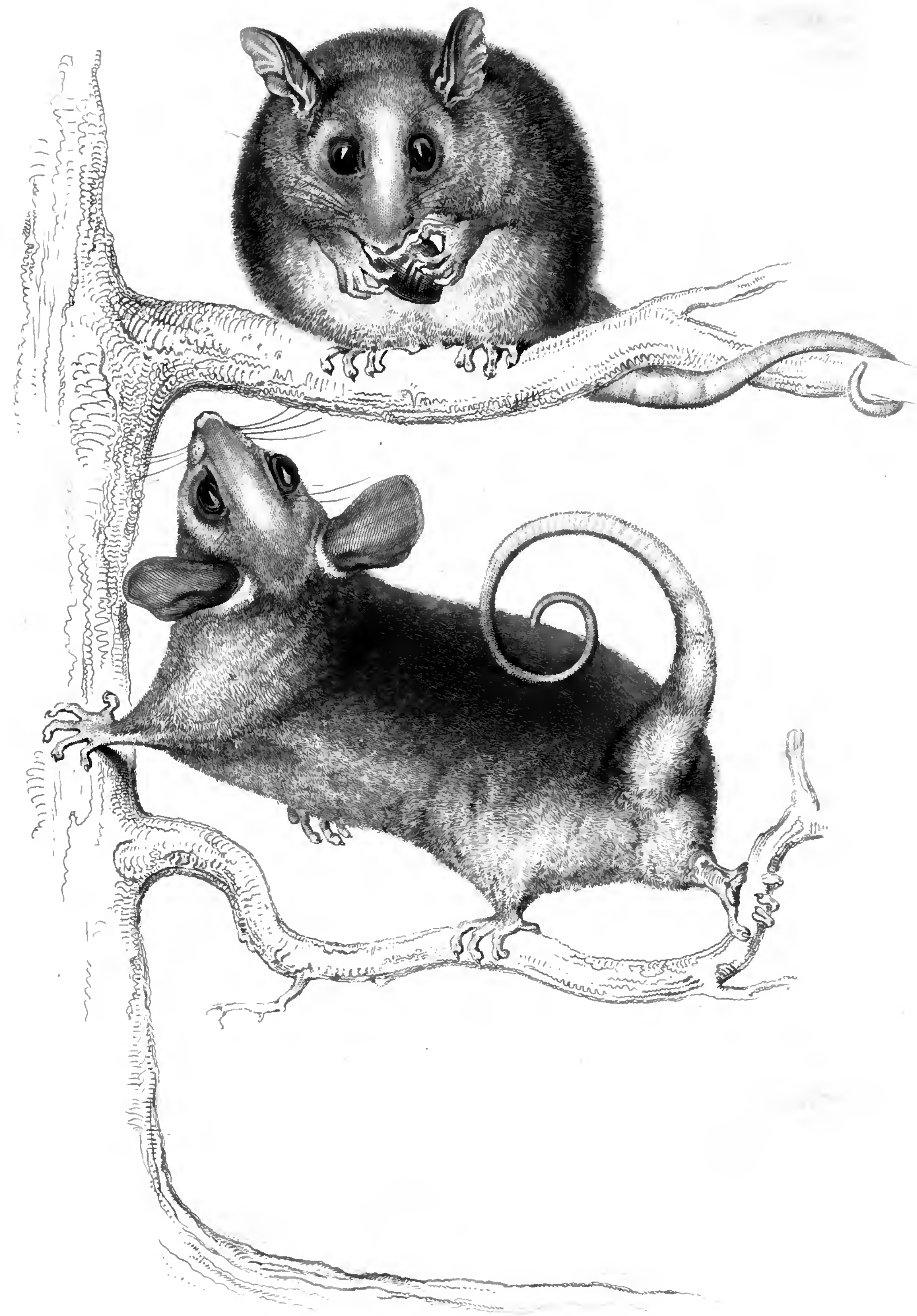
food

food in their fore paws, which, with the face, are the only parts apparently standing out from the ball of fur, of which the body seems at that time to be composed. They are perfectly harmless and tame, permitting any one to hold and caress them without ever attempting to bite, but do not evince the least attachment either to persons about them or even to each other.

The analogy of these animals to the *Rodentia*, and especially to the genus *Myoxus*, is so obvious as to require merely a casual notice of their habits, to strike any one who observes them. It is shown in their nocturnal activity, the nature of their food, their manner of taking it, their attitudes and motions, no less than in many circumstances connected with their external form and characters; as, the general form of the body, the nature of the fur, the character of the feet, the prominence and remarkable size of the eyes, &c. There is, however, one very important peculiarity of the dormouse, which has not as yet been observed to appertain to our animal, and that is its hybernation.

The habits of the dormouse and squirrel in this respect are universally known. Every one has seen the eagerness with which these animals will seize, pick to pieces, and carry to their places of repose, such substances as are placed within their reach for the purpose of forming their winter bed. But although similar substances have been given to the little animals now described, no attempt has up to the present period (November 4th) been made by them to construct their winter habitation; and wherever the wool and other matters are placed, there they take their day's rest, without disturbing or altering the arrangement or situation.

As both the specimens from which this account is taken are still in health, it may be some time before an opportunity is afforded of ascertaining their anatomical structure; but whenever such



Phalangista gliriformis.

[illegible] del. D. Allen sculp.

such an opportunity does occur, it shall not be suffered to pass by unimproved.

Measurement.

	Inches.	Lines.
Total length	7	6
Length of the head	1	2
———— body	2	8
———— tail	3	6
Breadth of the head between the ears . .	0	9
Length of the ears	0	5
Breadth of the ears when expanded . . .	0	5
Breadth of the body when at rest	2	1
Height of ditto	1	6
Breadth of the tail at its origin	0	6
———— at one inch from base .	0	3
Depth of the tail at its origin	0	3
Span of the fore-foot	0	6
———— hind ditto	0	7
Length of fore-toes	0	$2\frac{1}{2}$
———— two outer hind-toes	0	3
———— the double hind-toe	0	2
———— the thumbs before and behind .	0	2
Distance from the edge of pouch to the cloaca	0	6

EXPLANATION OF THE PLATES.

Tab. XIII.

Phalangista gliriformis, of the natural size.

Tab.

Tab. XIV.

Pouch and extremities of the same.

Fig. *a.* Pouch and teats, shortly after the period of suckling.
b. Pouch and teats of the unimpregnated animal.
c. Prehensile extremity of the tail.
d. Fore-foot, upper part.
e. Fore-foot, under part.
f. Hind-foot, upper part.
g. Hind-foot, under part.
h. Curl of the tail, observed during sleep.

XI. *On*


a
b
d
c
e
f
h
g

XI. *On an undescribed Species of the Genus Phasianus.* By *Mr. Benjamin Leadbeater, F.L.S.*

Read December 2, 1828.

THE return of His Excellency the Right Honourable Earl Amherst from India, has made us acquainted with one of the most splendid examples of the genus *Phasianus* that has been submitted to the notice of ornithologists for many years past.

Two males of this new and beautiful species came originally from the mountains of Cochin China, and were presented by the King of Ava to Sir Archibald Campbell, who gave them to the Countess Amherst. Her ladyship retained them in her possession about two years, and ultimately succeeded in bringing them both to England alive, but they only survived the voyage a few weeks.

I propose the name of *Phasianus Amherstiæ* (*tab.* 15.) for this valuable addition to our catalogue, as a tribute due to the distinguished lady to whom ornithologists are indebted for the knowledge of this new species; and I have great pleasure in publicly recording my thanks to her ladyship for the kindness and condescension with which my request to be allowed to make this bird known to the world through the medium of the Linnean Society, was immediately granted.

The lovers of science will be further gratified by the knowledge, that her ladyship's zeal in this single branch of natural history, enabled her to select and bring over nearly 500 species,

 many

many of which, I have reason to believe, are as yet unknown to European naturalists.

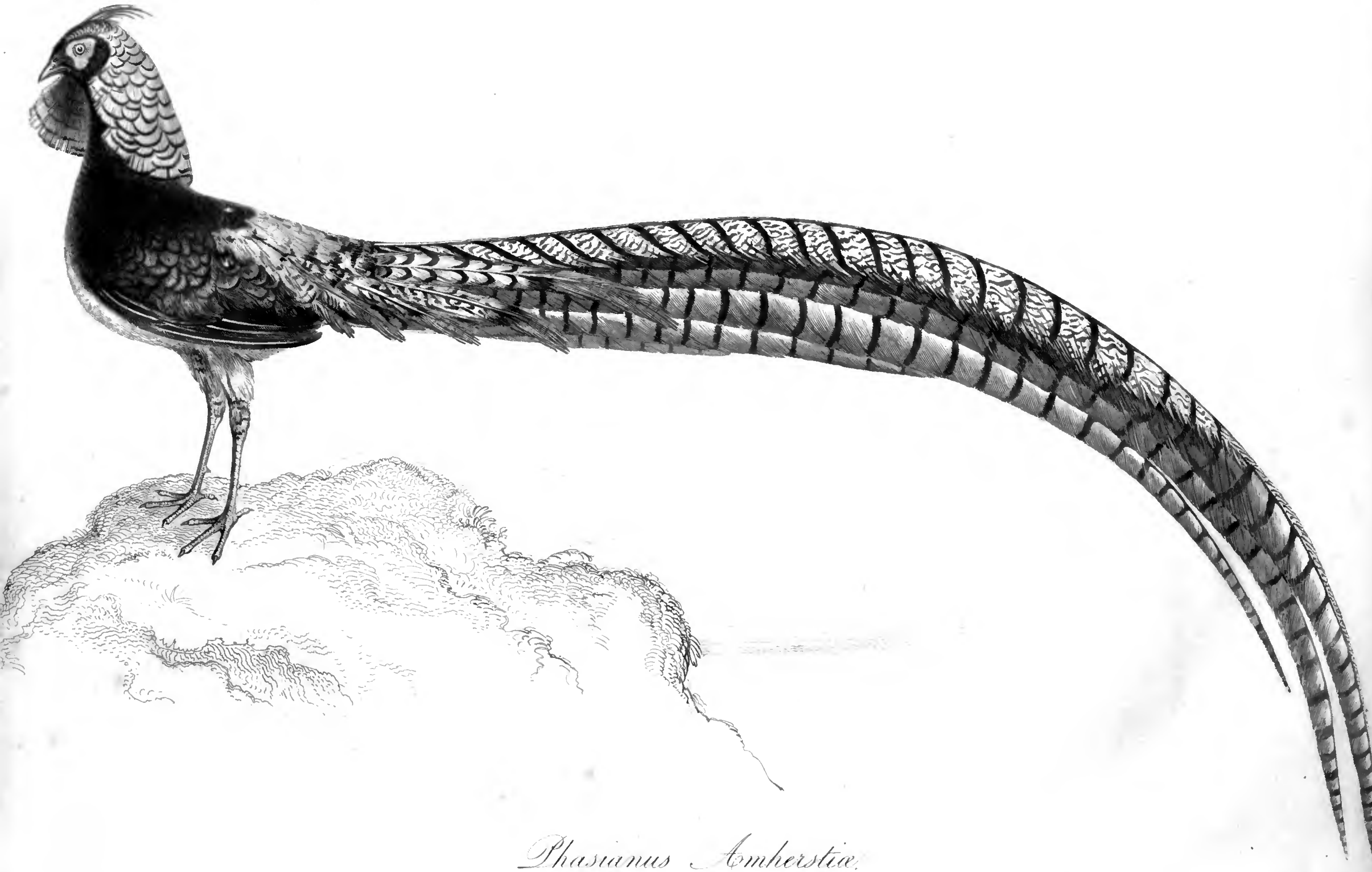
The dimensions of various parts of this Pheasant are as follows:

	Inches.
Length from point of the beak to the gape . .	$1\frac{1}{2}$
——— from the beak to the rump	13
Longest tail-feather	38
Point of the beak to the end of the tail . . .	51
Height of the bird when standing	$8\frac{3}{4}$
Length of the tarsus	$3\frac{1}{4}$
Length of middle toe and nail	$2\frac{1}{2}$
Length of the back toe	$0\frac{3}{4}$
Length of the other toes, each	$1\frac{3}{4}$
Spurs small and short.	

The general character of this bird and the arrangement of its plumage is similar to that of our well-known Golden Pheasant.

The irides are white, and the naked part surrounding the eyes of a light verditer blue.

The feathers on the top of the head are green; the crest-feathers crimson, and $2\frac{1}{4}$ inches in length; the pendant tippet is of a beautiful white, each feather tipped with a dark-green circular band, with a straight band of the same colour across each feather about $\frac{3}{8}$ths of an inch above the end; the whole depth of this tippet is $5\frac{1}{4}$ inches, the longest feathers $4\frac{1}{4}$ inches; the neck, back, shoulders, chest and wing-coverts, are of a beautiful metallic green, each feather ending in a broad zone of velvet black; the wing primaries dusky, with lighter-coloured shafts, and white outer edges; the greater wing-coverts and secondaries bluish-black; the breast and belly white; thighs and



Phasianus Amherstiæ.

D. Allen sculp.

and under tail-coverts mottled dark brown and white; the legs light blue. The feathers on the rump are brown at the base, green in the middle, the remaining most exposed portion of a bright saffron-yellow; the tail-coverts are also brown at the base, the centre portion barred green and white, ending in scarlet, these feathers elongating to the extent of 10 inches, as their place of insertion approaches that of the true tail primaries: the first tail primary measures only 29 inches, the plume $1\frac{1}{4}$ inch in depth, of a beautiful white ground, with broad bars of green about $\frac{3}{4}$ths of an inch apart, extending in the direction of the web, and mottled across from bar to bar; the third and fourth primaries are the longest, and measure, as before stated, 38 inches each; the inner web narrow, and mottled black and white; the outer web $1\frac{3}{8}$ inch wide, with transverse circular dark-green bars about $\frac{3}{4}$ths of an inch apart, on a ground the inner portion of which is grayish-white, the outer part light chesnut-brown.

It may be proper to state, that the splendid appearance these specimens now exhibit in this country, is entirely owing to the very judicious plan of taking off their extraordinary tail-feathers, about two inches from the body of the birds, before consigning them to the coops in which they were conveyed from India.

One of these beautiful Pheasants forms part of my own private collection.

EXPLANATION OF TAB. XV.

Phasianus Amherstiæ, one-fourth of the natural size.

XII. *Observations on some Species of the Genera Tetrao and Ortyx, natives of North America; with Descriptions of Four new Species of the former, and Two of the latter Genus.* By *Mr. David Douglas, F.L.S.*

Read December 16, 1828. [1829]

In the course of a journey across the continent of North America, performed in the years 1825, 1826, and 1827, having discovered several species of these genera, not before observed or described, I submit the following notice of them to the Society.

TETRAO.

1. *T. Urophasianus.* Mas. Brunnescenti-griseus, ferrugineo nigroque undulatus, collo anteriore abdomineque imo nigris, pectore albo plumis superioribus rhachibus rigidis, inferioribus in medio nigro-lineatis, plumis colli lateralibus elongatis, linearibus: caudâ cuneatâ, rectricibus subrigidis, acutis.

Fœm. Brunnescenti-grisea, albo nigroque parcè undulata; abdomine imo nigro, pectore albo nigro-fasciato, caudâ subcuneatâ, rectricibus subacutis.

T. Urophasianus. *C. L. Bonaparte in Zoological Journal, vol.* iii. *p.* 212.

Cock of the Plains. *Lewis and Clark's Travels, p.* 473.

Male. Bill black, one inch and three-fourths long: upper mandible

dible very strong; nostrils cushioned with fine short silky feathers. Head, neck, back and wings, of a uniform light brownish-gray, waved with black and reddish bars transversely. Plumage of the head and neck short and fine, with a series on the sides of the neck of long white hair-like feathers, terminating on the hind part of the neck with decomposed white feathers, which have linear black points, exceeding the length of the plumage by two inches. Throat marked with minute white spots, having a faint irregular white bar running from each eye. Upper part of the breast, immediately below the œsophagus, white, rigid, angular at the points, as if cut with an instrument. Œsophagus orbicular, naked, yellow. Lower part of the breast bluish-gray, the points of the feathers black in the middle, linear, more slender than those on the neck. Belly black, with a few scattered white feathers. Vent and legs light ash-gray. Tarsi one inch and three-fourths long. Toes strongly pectinated, the middle one feathered to the first joint. Quills 16, with dusky webs and white shafts. Scapulars and outer coverts same colour as the back; under coverts white. Tail 20 feathers, wedge-shaped, 10 inches long, somewhat rigid, of the same colour as the back: under coverts black tipped with white. Length 32 inches. Girth 22. Weight 6 to 8 pounds.

Female smaller, of the same colour as the male, with scattered white small feathers. Destitute of the series of long hair-like feathers on the neck, and white rigid scale-like ones which are found on the breast of the male bird. Tail partly wedge-shaped, somewhat acute. Flesh dark-coloured, and but tolerable in point of flavour. Food, buds, leaves and fruit of *Purshia tridentata, Artemisia*, seeds of *Cactus*, brown and black ants, and sand bugs.

Trachea

Trachea unusually large, and very strong. Gizzard disproportionately large, having but little muscular substance; and the horny consistence of the inner coat, so conspicuous in most species of this genus, is in the present remarkably thin, in many so thin, that it can only be observed but by careful examination. The pebbles in it seldom exceed 30 or 40, generally white quartz. Two cæcal appendages, moderately long, beautifully grooved or longitudinally fluted.

The flight of these birds is slow, unsteady, and affords but little amusement to the sportsman. From the disproportionately small, convex, thin-quilled wing,—so thin, that a vacant space half as broad as a quill appears between each,—the flight may be said to be a sort of fluttering more than any thing else: the bird giving two or three claps of the wings in quick succession, at the same time hurriedly rising; then shooting or floating, swinging from side to side, gradually falling, and thus producing a clapping whirring sound. When started, the voice is *Cuck, cuck, cuck,* like the Common Pheasant. They pair in March and April. Small eminences on the banks of streams are the places usually selected for celebrating the weddings, the time generally about sun-rise. The wings of the male bird are lowered, buzzing on the ground, the tail spread like a fan, somewhat erect; the bare yellow œsophagus inflated to a prodigious size, fully half as large as his body, and from its soft membranous substance being well contrasted with the scale-like feathers below it on the breast, and the flexile silky feathers on the neck, which on these occasions stand erect. In this grotesque form he displays in the presence of his intended mate a variety of pleasing attitudes. His love-song is a confused, grating, but not offensively disagreeable tone,—something that we can imitate, but have a difficulty of expressing,—*Hurr-hurr-hurr-r-r-r-hoo,* ending in a deep hollow tone,

tone, not unlike the sound produced by blowing into a large reed. Nest on the ground, under the shade of *Purshia* and *Artemisia*, or near streams among *Phalaris arundinacea*, carelessly constructed of dry grass and slender twigs. Eggs 13 to 17, about the size of those of a common fowl, of a wood-brown colour, with irregular chocolate blotches on the thick end. Period of incubation twenty-one to twenty-two days. The young leave the nest a few hours after they are hatched.

In the summer and autumn months these birds are seen in small troops, and in winter and spring in flocks of several hundreds. Plentiful throughout the barren arid plains of the river Columbia; also in the interior of North California. They do not exist on the banks of the river Missouri; nor have they been seen in any place east of the Rocky Mountains.

The short notice of this species, by the above-quoted distinguished ornithologist, appears to have been taken from a young male in indifferent plumage; it is correctly observed by him to represent *T. Urogallus* in the New Continent. Its vernacular name among the Kyùse Indians who reside on the Columbia, is *Pỳamis.*

2. *T. Urophasianellus.* Mas. Griseo-brunnescens, albo ferrugineo nigroque undulatus, nuchâ alisque albo maculatis, abdomine albo lateribus brunneo-fasciatis, rectricibus mediis 4 elongatis.

Fœm. Mari tertio minor, subpallidior, nuchâ nigro fasciatâ, rectricibus subelongatis.

Male. Bill brown. Head, neck and back, brownish-gray, waved with bars of a reddish and darker tinge. Plumage of the head and neck short and fine; breast and belly dusky-white edged with brownish-gray, and mixed with darker gray or brown spots. Quills 22; webs dusky, with darker shafts; the

the outer webs white, spotted; under-coverts bluish-white. Tarsi one inch long, thinly clothed with feathers of the same colour as the belly and vent. Toes scarcely pectinated, having instead small close hard scales. Tail consisting of 18 feathers, pointed, the four centre ones the longest. Length 19 inches. Breadth 12 inches. Weight one and a half to two pounds.

Female smaller, darker on the hind part of the neck; colour less distinctly marked, and the tail scarcely half so long as the male bird. The trachea and gizzard of the present species, as regards muscular consistence and size, differs but little from the preceding.

Their flight is swift and steady, with little noise. Their habits approach so closely to those of the former, that to describe them would be only repeating what has been stated of that species. Suffice it to say, they inhabit the same range of country, form their nests after the same fashion and in similar places, subsist on the same sort of food, having young at the same season. Eggs 11—15, light ash-colour, about the size of a pigeon's. The voice is *Chick, chick, chick*, the sounds running into each other. They are more numerous than the former, with whom they associate, and seem to live in harmony; they are shy, and difficult to be approached. The flesh is similar to that of the former.

3. *T. Sabini.* Rufus, nigro notatus: dorso maculis cordiformibus, nuchâ alisque lineis ferrugineo-flavis; abdomine albo brunneo fasciato; rectricibus fasciatis, fasciâ subapicali latâ nigrâ.

Male. Bill blackish-gray, lower mandible yellow, tipped with black. Head, neck and body, red, elegantly marked with black spots; those on the rump heart-shaped, saffron-coloured.

loured. Breast and belly yellowish-white with brown bars. Tarsi one inch long, rusty colour. Quills 20, dusky; outer webs irregularly and faintly brown, spotted; under-coverts white. Ruffle of 20 short black feathers, without any azure glossiness. Tail 18 feathers, square at the ends, waved or barred with lighter tints, terminating with a black band one inch broad. The three middle feathers speckled, and wanting the black band, the tips red: under-coverts foxy-red.

Female smaller; colours less bright; ruffle shorter, and the bars on the tail less distinct. Length 18 inches. Breadth 13 inches. Weight two pounds.

Flight rapid, consisting of a quick clapping of the wing, and then a sudden darting or shooting, with scarcely any apparent motion. Food, buds of *Pinus*, *Fragaria*, *Rubus*, *Corylus* and *Alnus*, and berries of *Vaccinium*. Nest built on the ground in coppices of *Corylus*, *Amelanchier*, and *Pteris*, on the outskirts of pine-forests, composed of the slender fronds of *Pteris*, dry leaves, and grass. They pair in March. Eggs 9 to 11, dingy-white with red spots.

These birds are not so common as many others; they associate in flocks never exceeding eight or twelve, except for a short time in the early months of spring; at other seasons it rarely happens that more than three or four are seen together. In manner this bird is near akin to the well-known Wood Partridge of the United States (*T. umbellus*) and the Canadas, particularly in the strong attachment which it has for its young. The over-abundant care which it manifests for the brood seldom fails of directing the steps of the hunter to the nest or young; and should he come within a few yards, out sallies the mother in furious rage, with the tail spread, the wings buzzing on the ground, and the frill raised, to meet the intruder, continuing to run

run backwards and forwards; and so great is her anxiety, that she will venture within two or three yards of him.

In another respect the present species agrees with *T. umbellus*, in perching on stumps of decayed trees in the darkest part of the forests, *drumming*, which is effected in the same way, namely, by giving two or three loud distinct claps with the wings, then others gradually quicker and quicker, until the sound dies in the distance,—not unlike the sound of very distant thunder. The voice is a continuation of measured sounds, not unlike the ticking of a large clock, *Tuck, tuck, tuck*, slowly pronounced, and, when the bird is on the wing, is a sort of chuckling noise. This very fine bird is an inhabitant of the woody parts of the coast of North-west America, between the parallels of 40° and 49° from Cape Mendocina on the south, to the Straits of Juan de Fuca, Quadra, and Vancouver's Island on the north.

The name is a tribute to the merits of my friend Joseph Sabine, Esq., whose intimate acquaintance with this widely-dispersed and highly interesting genus, and whose distinguished services in natural history in general, are universally known and justly appreciated.

4. *T. Franklinii.* Mas. Saturatè plumbeo-griseus nigro fasciatus; gulâ pectore nuchâque nigris, tectricibus suprà et infrà nigris, apice albo.

Fœm. Pallidior, gulâ pectore nuchâque plumbeo-griseis.

Beak black; irides hazel, with a large, bare, lunulated, fringed scarlet spot above the eye. Head, neck and back dark leaden-gray waved with narrow black bars; throat, breast, and hinder part of the neck black. Belly ash-gray. Tarsi one inch long, light gray. Toes pectinated. Quills 24, the third the longest; shafts white; under coverts bluish-

gray.

gray. Tail square, of 16 feathers, black, white at the points; upper and under coverts black tipped with white. Length 20 inches. Breadth 14 inches. Weight two pounds.

Female a little smaller and of a lighter colour. Head, neck and body, leaden-gray, sparingly white, spotted on the belly. Flesh white, well-flavoured.

In manner there is nothing striking in this bird. Its flight is similar to the last-mentioned: the present, however, runs over the shattered rocks and among the brushwood with amazing speed, and only uses its wings as the last effort of escape. Nest on the ground, composed of dead leaves and grass, not unfrequently at the foot of decayed stumps, or by the side of fallen timber in the mountain woods. Eggs 5 to 7, dingy-white, somewhat smaller than that of *Columba Palumbus*.

I have never heard the voice of this bird, except its alarm note, which is two or three hollow sounds, ending in a yearning disagreeable grating noise, like the latter part of the call of the well-known *Numida Meleagris*. It is one of the most common birds in the valleys of the Rocky Mountains, from latitude 50° to 54°, near the sources of the Columbia river. It may perhaps be found to inhabit higher latitudes. Sparingly seen in small troops on the high mountains which form the base or platform of the snowy peaks "Mount Hood," "Mount St. Helens," and "Mount Baker," situated on the western parts of the continent.

In habit the present species assimilates more with *T. Canadensis* than any other. The unusually long square tail, constantly tipped with white, as is also the case with the upper and under coverts of the tail, are characters too prominent to be overlooked.

Named

Named in honour of Captain John Franklin, R.N., the amiable and distinguished Commander of the Land Arctic Expedition, to whom the lovers of American research owe so much.

5. *T. Richardsonii.* Mas. Pallidè plumbeo-griseus fusco sparsim undulatus: gulæ plumis in medio albis: abdomine saturatiore albo parcè maculato: maculâ laterali sub nuchâ albâ: rectricibus nigris, apice albicante.

Fœm. Minor, brunnescenti-grisea, dorso brunneo fasciato; subtùs albo frequenter notata, rectricibus duabus mediis ferrugineo fasciatis.

T. Richardsonii. *Sabine Mss.*

Beak: upper mandible black; lower pale brown or horn-colour. Irides dark hazel, with a lunulate yellow granulate bare spot above the eye. Head, neck and breast, glossy lead-colour, with a tinge of light gray: and with black, dark, dusky or brown scattered minute spots. Chin finely spotted with white. Ear-coverts fuscous: the hind part of the neck partly white. Scapulars dark, red speckled. Belly light bluish-gray, white spotted, the centre of the feather partly white. Tarsi one inch and a half long. Toes pectinated. Quills 24; shafts white; inner web dusky, outer mottled; outer coverts brown, speckled; under coverts white. Tail square at the end, of 20 feathers, black, tipped with white; upper coverts black, speckled at the points; under coverts black, tipped with white.

Female smaller, brownish, gray-and-white mottled; the feathers of the neck with two narrow reddish bars; those of the back with only one, which is broader. The three centre feathers of the tail waved with red bands; colour of the others lighter than in the male bird. Length 20 inches. Breadth 15 inches. Weight two and a half to three pounds.

Flesh

Flesh white, excellent. Pair in April: nest formed of small twigs, leaves, and grass, on the declivities of the sub-alpine hills, in coppices of *Corylus* and *Betula*, very generally selecting the vicinity of mountain rills or springs. Eggs 13 to 19, nearly the size of a common fowl's, with large and small red specks.

Period of incubation three weeks. Food, buds of *Pinus*, catkins of *Betula*, *Alnus*, and *Corylus*, berries of *Fragaria* and *Vaccinium*. The voice is a continuation of distinct hollow sounds, *Hoo—hoo hoo*, like the cooing of a dove. Flight swift, steady, and particularly graceful, making but little buzzing or clapping noise. On being started from the dark shadowy pine-trees, their usual roosting-place, they descend, or, more properly, allow themselves to fall within a few feet of the ground before they commence flying,—a circumstance which often leads the sportsman to think he has secured his bird, until the object of his attention leaves him, darting and floating through the forest. This trait appears to be peculiar to this species. No bird is more readily destroyed; they will sit with apparent tranquillity on the rocks or pine branches after several shots have been fired.

In spring they are seen in great numbers basking in the sun on the southern declivities of the low hills, and in winter in the neighbourhood of springs, lakes, or large streams, in flocks of sixty or eighty. They are easily captured by small snares formed of sinews of the deer tribe. Very abundant on the sub-alpine regions of the Rocky Mountains in latitude 52° N. longitude 115° W. Still more numerous in the mountainous districts of the river Columbia in latitude 48° N., longitude 118° W.

Rare on the mountains of the north-west coast. I captured several in April 1825, and in the winters of 1826-7 several more; the

the birds from this last locality appear larger, the colours more distinct, and the white on the extremity of the tail much broader. I cannot for the present attempt to separate them from the species found on the Rocky Mountains, as my specimens from the coast are all destroyed; but probably they will be found on comparison distinct.

Three or four years ago, Mr. Sabine received specimens of this through the Hudson's Bay Company, probably taken in the mountains near the sources of the river Athabasca. The name was given by Mr. Sabine, in honour of Dr. Richardson, whose varied scientific acquirements have eminently contributed to the advancement of natural history.

The present species is nearly allied to *T. obscura* of Say, one of the birds observed during Long's Expedition to the Rocky Mountains.

ORTYX.

1. *O. picta.* Mas. Fusca subtùs ferrugineo flava nigro-fasciata: gulâ rubrâ purpureâ albo graciliter cinctâ: pectore vertice caudâque plumbeis: cristâ nigrâ longissimâ lineari; lineis superciliaribus albis, caudâ tectricibus inferioribus ferrugineis.

Fœm. Subcristata, gulâ pectoreque fusco-ferrugineis, fusco fasciatis.

Male. Bill small, black. Crown of the head and breast lead-colour. Crest three linear black feathers, two inches long. Irides bright hazel-red; throat purple-red, bounded by a narrow white line forming a gorget above the breast, and extending round the eye and root of the beak. Back, scapulars, and outer coverts of the wings, fuscous-brown. Belly bright tawny or rusty-colour, waved with black, the points of the feathers white. Quills 18 feathers, the fourth

the

the longest. Under coverts light brown mixed with a rusty colour. Tail 12 feathers, of unequal length, rounded, lead-colour, but less bright than the breast or crown of the head. Tarsi one inch and a quarter long, reddish. Toes webbed nearly to the first joint.

Female. Head and breast light fuscous-brown, the middle of the feathers black. Crest half an inch long. Throat whitish or light gray. Belly light gray waved with black, less bright than the male. Under coverts of the tail foxy-red. Length 10 inches. Girth 16 inches. Weight about twelve ounces. Flesh brown, well-flavoured.

From October until March these birds congregate in vast flocks, and seem to live in a state of almost perpetual warfare; dreadful conflicts ensue between the males, which not unfrequently end in the destruction of one or both combatants, if we may judge from the number of dead birds daily seen plucked, mutilated, and covered with blood. When feeding, they move in compact bodies, each individual endeavouring to outdo his neighbour in obtaining the prize. The voice is, *Quick—quick—quick*, pronounced slowly, with a gentle suspension of the voice between each syllable. At such times, or when surprised, the crest is usually thrown forward over the beak, and the reverse when retreating, being brought backwards and laid quite close on the back. Their favourite haunts are dry upland or undulating gravelly or sandy soils in open woods, or coppice thickets of the interior; but during the severity of winter, when the ground is covered with snow, they migrate in large flocks to the more temperate places in the immediate vicinity of the ocean. Seeds of *Bromus altissimus*, *Madia sativa*, and a tribe of plants allied to *Wedelia*, catkins of *Corylus*, leaves of *Fragaria*, and various insects, are their common food. Nest on the

the ground, in thickets of *Pteris*, *Aspidium*, *Rubus*, *Rhamnus*, and *Ceanothus*, neatly built with grass and dry leaves, secreted with so much caution, that without the help of a dog they can hardly be found. Eggs 11 to 15, yellowish-white, with minute brown spots; large in proportion to the bird. Pair in March. Common in the interior of California, and during the summer months extending as far northward as 45° north latitude, that is, within a few miles of the Columbian valley. No specimen of this exceedingly interesting bird exists in any collection. Several pairs, male and female, as well as several of the following species, which I prepared with great care in the interior of California, in November 1826, I had the misfortune (too painful to dwell upon) to lose, with a multitude of treasures botanical and zoological, crossing one of the rapid tributary streams of the river *Multnomah*, near its source in the mountains, on my return northwards. On this occasion I lost the labour of fifty-four days of fatigue and anxiety, the too frequent attendants of such undertakings.

2. *O. Douglasii.* Plumbeo-brunnea: cristâ erectâ alisque superioribus saturatè brunneis: his flavo-ferrugineo striatis: capite genis nuchâque brunneo- et flavo-ferrugineo striatis: gulâ albâ brunneo notatâ: abdomine albo guttato.

O. Douglasii. *Vigors Mss.*

Bill brown: crest linear, black, one inch long. Irides hazel-red. Body fuscous-brown, with a mixture of lead-colour and rusty or yellow streaks. Throat whitish, with brown spots. Belly foxy-red or tawny-white spotted. Quill-feathers 18. Scapulars and outer coverts bright brown. Under coverts light reddish-brown. Tail 12 unequal, rounded feathers. Legs reddish. Length 9 inches. Girth 12 inches. Weight ten ounces. Flesh pleasant; dark-coloured.

Female. Crest scarcely perceptible, darker.

 This

This species appears to be an inhabitant of a more temperate climate than the preceding one, as it is never seen higher than 42° north latitude, and even that very sparingly in comparison to *O. picta* or *O. Californica.* The species do not associate together. In manner they are similar, at least as far as the opportunity I had of observing them went. I have never seen them but in winter dress, and know nothing of their nesting.

Mr. Vigors, the zealous and enlightened Secretary of the Zoological Society, in his partial kindness has done me the honour of placing my name to this species. To that gentleman I communicated an account of this bird shortly after my return to England; and subsequently he has had an opportunity of seeing a solitary specimen in a collection brought home by Captain Beechey.

In addition to *Tetrao*, I subjoin a few notes relative to some already described species. But, in the first place, I may be permitted to mention a new species, nearly allied to *T. Lagopus*, but much smaller, with a white tail, and when in winter-dress, snow-white, without the least particle of black. This is an inhabitant of the Rocky Mountains and the snowy peaks of North-west America. During my journey across the dividing ridge in April 1827, I killed several, which, from the extreme difficulties to be surmounted at that early season of the year, I was reluctantly obliged to leave behind me. This loss I do not now regret, as Dr. Richardson was fortunate enough to secure the species, an accurate description of which will be shortly given by him in his forthcoming Fauna of British North America.

T. Lagopus of Gmelin is not an uncommon bird on the Rocky Mountains; near the verge of perpetual snow, in latitude 54°; to to the north, it is more plentiful; and it is occasionally seen on similar altitudes contiguous to the lakes of the Columbia. On the north-west coast it exists as low as 45° 7′, the position of Mount Hood. This is the same bird as the Scotch Ptarmigan, and has been distinguished by Captain Sabine, in the Supplement to Captain Parry's First Voyage, as distinct from the next species.

T. rupestris of Gmelin. I did not meet with this bird on the Rocky Mountains, and therefore suppose it is confined to the northern parts of the continent and the adjacent islands, from which it was brought in abundance by the officers of the different Arctic Voyages.—For the differences between this and the preceding species, I refer to the accurate examination of Captain Sabine in the work above referred to, as well as to Mr. Sabine's Appendix to Captain Franklin's First Narrative. I am informed by Mr. Sabine, that this is the bird commonly met with in the northern parts of Europe, where it is erroneously considered as *T. Lagopus*, which species he believes to be exclusively confined to the mountains of Scotland and to the northern parts of America.

T. Saliceti. This bird, so common in Hudson's Bay, appears rare in the Rocky Mountains. I saw only one pair there; it did not come under my notice on the north-west coast.

T. Canadensis. As far as I know, this bird has not yet been found to the west of the central ridge of the continent. A solitary individual is occasionally seen contiguous to the eastern base of that ridge, near the sources of Athabasca river, in 55° north latitude; but the species does not become in anywise numerous until we reach the low woody countries in a similar parallel. About Lesser Slave Lake they abound, and on the woody places of

 Sascatch-

Sascatchawan river, and the streams that flow into Hudson's Bay.

T. Phasianellus. Like the last mentioned, is not seen west of the Rocky Mountains. It abounds on the dry undulating coppices or prairies of Sascatchawan river, throughout the whole chain of that stream. On the shores of Oxford lake this is the most common bird of the tribe.

T. Cupido. In August 1827 I killed several birds of this species between Red river and Pembina in 49° north latitude. This may, perhaps, be found to be its most northern range. It did not come under my observation on the western parts of the continent.

T. Umbellus. Perhaps no one of the genus extends over such a tract of country, and no one is more varied in plumage than the present bird. In the valleys of the Rocky Mountains, 54° north latitude, and a few miles northwards near the sources of Peace river, a supposed variety of this species is found,—different from *T. Umbellus* of Wilson. On comparing my specimens from that country with some which I prepared in the States of New York and Pennsylvania, and on the shores on the chain of lakes in Upper Canada, I find the following differences. First, the northern bird is constantly one-third smaller, of a very light speckled mixed gray, having little of that rusty colour so conspicuous in the southern bird:—secondly, the ruffle consists invariably of only 20 feathers, these short, black, and with but little azure glossiness; the crest-feathers are few and short. Should these characters hereafter be considered of sufficient importance for constituting a distinct species, it might perhaps be well to call it *T. Umbelloïdes.*

I am

I am partially acquainted with two other species of *Tetrao*, of the greatest interest, but for the present I forbear to describe them; the more especially, as I look forward at no distant period to again resuming my labours on the western parts of the same continent, the result of which, in due season, it will afford me the greatest pleasure to submit to the Society.

XIII. *Account of a new Plant of the Gastromycous Order of Fungi. By J. E. Bowman, Esq., F.L.S.*

Read February 19, 1828.

I BEG leave to offer to the Linnean Society the following account of a minute but very interesting individual of the Gastromycous tribe of Fungi, recently detected by me in this neighbourhood. Though it does not appear to have been hitherto noticed by botanists, it is not improbable that it may sometimes occur in similar favourable situations. Its extreme minuteness and general resemblance to others of the same natural family, easily accounts for its having been overlooked altogether, or confounded with them. The peculiar elegance of its mature form, were it of sufficient size to meet the common eye, could not fail to arrest the attention of the most indifferent. As it is, specimens can be discovered only by the patient explorers of their shaded and secluded haunts: for so ephemeral is their duration, and their texture so perishable, that but few of them can be preserved for future examination. On this account, I regret that I am unable to present any specimens to the Society of the individual in question; but the accompanying plate exhibiting its different stages may be relied on as correct.

Its height scarcely exceeds half a line, and its colour differs little from the decaying wood on which it grows. *Tab.* 16. *f. a.* represents its natural size both in its early and mature states, but the rest of the figures are all highly magnified. It requires a good a good lens to distinguish its general structure; and the insertion of the filaments into the under surface of the pileus, on which I have founded its generic name (ενερθε *ab infra*, and νημα *filamentum*,) can only be discovered by the compound microscope.

Class and Order. Cryptogamia Fungi.

Natural Order. Gastromyci. *Link*, *Greville*. Gasteromycetes. *Fries*.

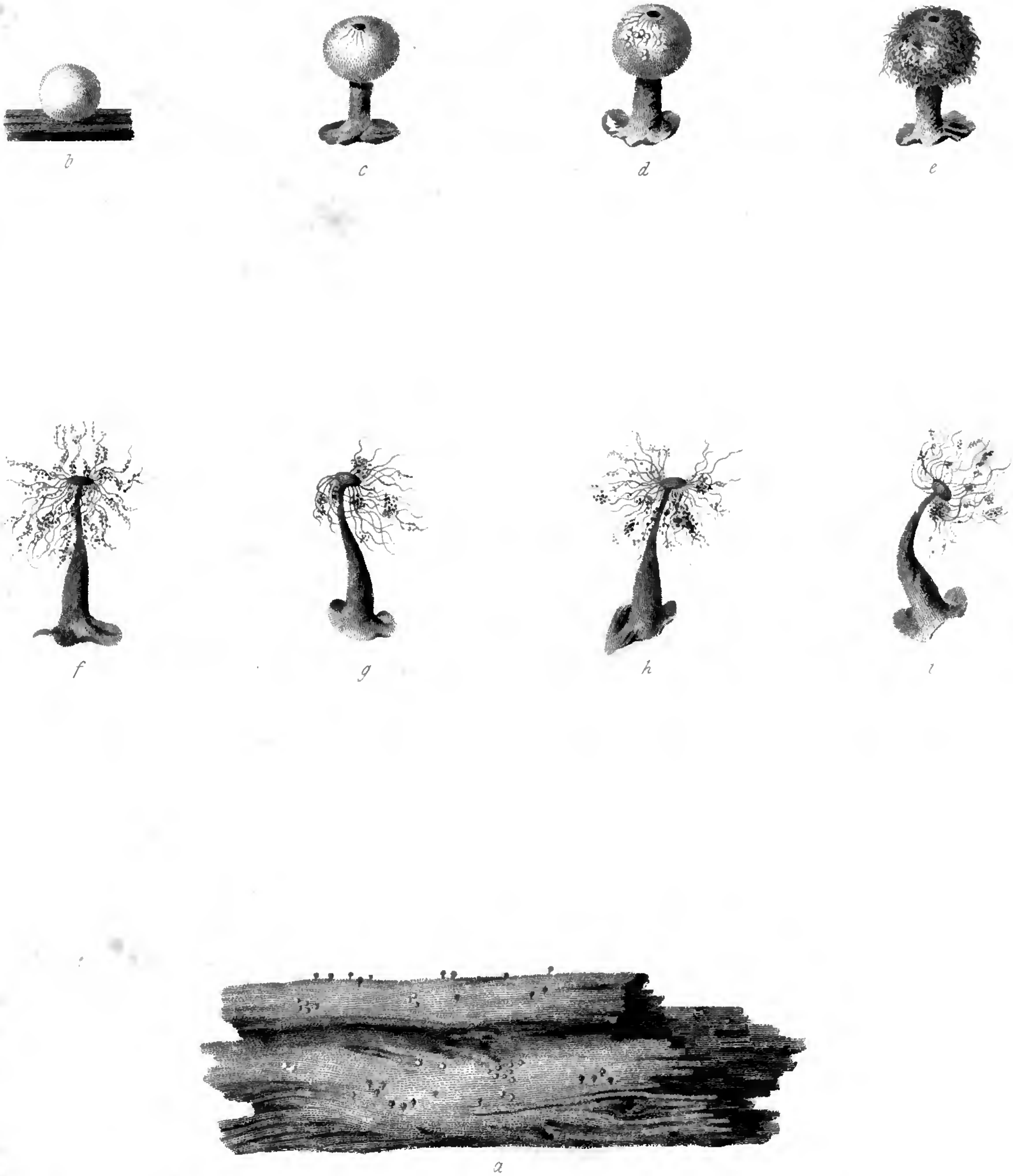
Enerthenema elegans.

Tab. XVI.

Gen. Char. *Peridium* subglobatum, pellucidum, lacteo-albidum, stipite perforante, pileo terminali, filamentis ab infra sursùm cirratis.

Spec. Char. *Sporangium* imprimis sessile, globosum, deinde stipitatum; stipite infrà cylindraceo, supernè conico, postremò peridio rimoso, evanescente. Crescit gregatim in sylvis opacis apud quercûs ramos decorticatos.

In its earliest stage the capsule or sporangium is globular and stemless, gelatinous, white, and semitransparent (*Tab.* 16. *f. b.*) like its kindred genera *Trichia*, *Stemonytis*, *Arscyria*, &c. It soon acquires a stem, and the head becomes sphæroidal, the stipes passing through its shorter axis, and having a small circular and rather depressed spot on its apex, which may be termed a pileus or cap (*fig. c, d, &c.*). This pileus hardens, and changes its colour to a dark brown, while the sporangium is still soft and diaphanous; and if the latter be examined in this stage of its growth by a good microscope in a strong light, very slender brown and waved filaments may be seen imbedded within its substance, radiating round the pileus (*fig. c.*). The sporangium afterwards appears coagulated and opaque, though still white; the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the change commencing with the parts surrounding the pileus, and the sporules may now be first distinguished in white detached masses. The peridium next assumes a light brown colour; and being still partially pellucid, the internal filaments of a darker brown, and the interspersed groups of sporules, are distinctly visible through its shining surface (*fig. d.*). As the sporules attain maturity, the peridium becomes opaque, and of a full though lively brown; but soon cracking irregularly, and peeling off from the expansion of the filaments, the sporules are exposed; and the sporangium, from their dispersion, loses its regular shape and becomes ragged and broken (*fig. e.*).

The curious and peculiar structure of this interesting plant now *first* becomes apparent, and causes it to assume a new and altered character. As the seeds disperse, the filaments, hitherto concealed, are exposed to view; and by the assistance of a high magnifying power, are found to issue from the *inferior* surface of the pileus, as in the genus *Hydnum;* but infinitely longer in proportion, and occasionally branched. The pileus is also found to be fixed centrally by its under surface on the top of the pedicel or stipes, which rises independently through the axis of the sporangium. When therefore, from the ripening of the seeds, the peridium bursts, and the filaments are set at liberty, their elasticity or hygrometrical sensibility soon enables them to expand, and to acquire first a horizontal, and afterwards a more perpendicular or erect position. Many of them rise, like a curled lock of hair, above the pileus, giving to the plant a real increase of altitude; while the stipes appears to be elongated, by its upper portion (originally concealed within the sporangium) being exposed to view. The course of the filaments during their erection may be compared to that of the whalebone stretchers of an umbrella in the act of its being unfurled. A few of them may be seen in *fig. e.* just disengaged

 from

from the sporangium; while *fig. f, g, h,* and *i,* exhibit different individuals in their expanded state. The filaments are more or less erected or horizontal; but some seem always to retain their original downward direction, like the lower branches of the larch or some of the palm tribe.

That portion of the stipes which had been surrounded by the sporangium is very slender, and tapers towards the pileus; while its lower half is suddenly swelled out to a very disproportionate thickness, and dilated into a thin membranous and glutinous base, by which it is attached to the wood whereon it grows. This kind of base, common to many of these minute parasites, being destitute of fibres or vascular structure, seems to indicate that they require no further nourishment after the sporules are once expanded into the gelatinous mass which is their earliest visible form, or that they derive any further supply from the disengaged gases which float in the dank atmosphere in which they live. I first found the *Enerthenema* in October, and again in December last, on decaying branches of oak deprived of their bark, and lying on the ground in the damp and shady parts of Erddig wood, near Wrexham, Denbighshire; a spot not less attractive to the botanist than to the lover of picturesque woodland scenery, and always accessible to the public through the liberality of its worthy proprietor, S. Yorke, Esq.

XIV. *On*

XIV. *On the Origin and Nature of the Ligulate Rays in Zinnia; and on a remarkable Multiplication observed in the Parts of Fructification of that Genus.* By *Mr. David Don, Libr. L.S.*

Read November 18, 1828.

The ligulate rays of *Zinnia* consist of a foliaceous, persistent, coloured, and highly vascular membrane, with rough, spinously-denticulated edges. They are traversed by two principal trunks of vessels almost parallel to their margin, which branch out into innumerable ramifications through the disk. These trunks, which are composed of proper and spiral vessels, may be very distinctly traced from the limb of the ray downwards along the two prominent edges of the ovarium. The vessels become more apparent on the withering of the rays, and the beautiful arrangement of their ramifications constitute then an interesting object. The principal trunks of vessels, thus occupying both sides of the lamina, tend to extend them so considerably beyond the centre, as to constitute frequently two distinct lobes. The want of articulation in the tube, visible in the florets of the disk, their consistence, and the disposition of the vessels, and their ramification,—a disposition which is found precisely the same in the central ovaria,—would seem to prove that the rays of *Zinnia* are an elongation of the exterior cortical layers of the ovarium, which in the centre florets are developed into a species of paleaceous pappus, which is not present in the ray florets. The peripherical ovaria are frequently triquetrous, and each of the edges

edges is occupied by a fascicle of vessels: the two parallel ones, which are also generally the most prominent, develop themselves into the ligulate appendage; and the third, which occupies the facial edge, terminates abruptly in the sinus. There are other vessels which occupy the space between the three principal trunks. These circumstances taken together, have induced me to regard the corolla as wanting in the rays of *Zinnia*.

My own observations tend fully to confirm the interesting hypothesis advanced by Mr. Brown respecting the compound nature of the pistillum in *Compositæ*. In *Zinnia verticillata* and *multiflora* the branches of the style, especially of such flowers as have an increased number, only partially cohere together, are readily separable, and may be traced from the apex of the stigmata to their connexion with the two filiform cords to which the embryo is attached, and which Mr. Brown* regards as a species of placenta. These cords, which are particularly distinct in *Zinnia*, are slightly thickened at their extremity, and bear a striking analogy to the slender bases of the filaments, which are generally found adherent to the tube of the corolla, as the former are to the sides of the ovarium. The embryo is attached to the inner edge of the extremities of these cords, one of which I have frequently found not adhering to the parietes of the ovarium, but passing down its centre quite free. In some cases the branches of the style are found wholly free, so that they resemble so many distinct styles; and they may not unaptly be compared to those of *Umbelliferæ* and *Araliaceæ*. The embryo of *Zinnia* is easily extracted from the ovarium entire suspended between the two placental cords, and surmounted by the style and stigmata; and as there appears to be no interruption between the branches of the style and these cords, it occurred to me as probable that they would prove only a continuation of that organ.

* *Linn. Trans.* vol. xii. p. 89.

The

The parts of fructification of *Zinnia* vary exceedingly in number, and on this account there is not perhaps a more interesting genus in the whole class to which it belongs. While engaged examining a capitulum of *Zinnia verticillata* in the garden at Boyton in September last, my attention was arrested by a floret of unusual size occupying the centre of the disk; and on removing and placing it under a common lens, I discovered that the limb was divided into 10 lobes; that it had 10 stamina, and 10 stigmata, all perfect. On laying open the ovarium longitudinally, I found 5 embryos occupying the interior of its cavity, and connected together in a cluster: they were of unequal size, and their cotyledons were deformed and unequal, and in some instances solitary. I extended my researches to other capitula of the same species, and likewise to those of *Z. revoluta*, *multiflora*, and *pauciflora*, and found the deviations from the typical form of corolla frequent in all of them; and that the limb varied with 3, 4, 5, 6, 7, 8, and 10 lobes; that the stamina were 4, 5, 6, 7, 8, or 10; and the stigmata, 2, 3, 4, 5, 6, 8, or 10. In such florets as had their limb divided into 3 or 4 lobes only, the stamina were sometimes of the usual number, 5; but in the others, the stamina were always found corresponding in number with the divisions of the corolla. The stigmata were found to be indefinite, and generally not influenced by the number of the other parts of the flower: for in the usual form of corolla,—namely, with 5 lobes,—3 were as frequently observed as 2, and sometimes, although more rarely, 4, 5, and 6; and in the 6-cleft corolla they frequently did not exceed the ordinary number. In those flowers where the segments of the corolla amounted to 8 or 10, the stigmata sometimes equalled that number; but in the 10-cleft corolla the stigmata were often found not to exceed 5. With an increased number of stigmata there is always a plurality of embryos: for example, with

with 4 or 5 stigmata, the number was two or three; with 6, three; with 8, four; and with 10, five; but when they exceeded two, they were found generally to be imperfectly formed and united together, having but seldom more than one cotyledon; and where no increase takes place, as very often happens, the embryo is always found to be distorted, and the cotyledons unequal. It is not unusual to find, even in a floret of the ordinary structure, but with an increased number of stigmata, a monstrous embryo having several unilateral, dolabriform cotyledons, and a long, filiform radicle. In the perfect embryo of *Zinnia* the cotyledons are linear-oblong, obtuse, with a straight, subulate radicle scarcely half their length.

In conclusion it may be observed, that deviations from the typical form are of rare occurrence in the flowers of *Zinnia elegans*, as in all the capitula of that species, which were examined by me, I did not meet with a solitary instance. The species in which I have found them most frequently to occur is *Zinnia verticillata;* for almost every capitulum of this species will be found to furnish many examples: and the circumstance of the leaves being frequently verticillate in this species would appear to exert an influence over the parts of fructification, affording a striking proof, as it appears to me, of the correctness of the theory advanced by Mr. Brown respecting the origin of those parts, and also of his hypothesis regarding the plan on which the female organ in phænogamous plants* is formed. In *Zinnia verticillata* I have occasionally met with hermaphrodite florets, having 5 stamina and 5 perfect stigmata.

* *Linn. Trans.* loc. cit.

XV. *Some*

XV. *Some Observations on the Common Bat of Pennant: with an Attempt to prove its Identity with the Pipistrelle of French Authors. By the Rev. Leonard Jenyns, M.A. F.L.S. Communicated by the Zoological Club of the Linnean Society.*

Read February 3, 1829.

It has been usual with every systematic writer upon British zoology from the time of Pennant to the present day, to refer the Common Bat of this country to the *Vespertilio murinus* of Linnæus. Upon the correctness or incorrectness of this conclusion it were not, perhaps, at this period very easy to speak with certainty; since many of the descriptions of that author, from the paucity of species then known, are drawn up in such vague and general terms as to admit of application to several others besides the one originally alluded to. It is, however, somewhat remarkable that no one should ever have observed the striking disagreement between our English Bat and that to which the continental authors have continued to give the Linnean name, and the consequent impropriety of referring both these to the same species and making them synonymous. This difference resides not merely in the colour and general appearance of these two Bats, comparatively viewed,—in the shape of the auricle and its operculum, and in some of their relative dimensions,—but most palpably in their absolute size. In the detailed descriptions of the *Vespertilio murinus* given by Geoffroy and Desmarest, we find the average measurements of this species to to be nearly as follows:—Length of body three inches and a half; head about one inch; tail about two inches; and the extent of wing fifteen inches and upwards. Whereas, in our Common English Bat, the length, measured from the nose to the insertion of the tail, is only one inch and seven lines; that of the head six lines; of the tail fourteen; and the extent of wing rarely, if ever, exceeds eight inches and a half. It will surely be allowed that a discrepancy so great as this,—especially when viewed in connection with the other differences above alluded to, which are sufficiently obvious to all who investigate the matter to preclude the necessity of being more particularly pointed out,—is at once sufficient to establish the error of those naturalists who have considered these as belonging to the same species, and to warrant their separation in future.

Which of these two Bats has most claim to be considered as the true *Vespertilio murinus* of Linnæus, for the reason before given, it is difficult to decide. Nevertheless, if we may hazard a conjecture, I am inclined to think, from this circumstance of its larger dimensions, that the identity is greater in the case of the continental species than in ours. It is true, that Linnæus in his concise description says nothing direct about size; but since he refers to the *Vespertilio major* of Brisson*, which that author asserts to be about a foot in extent of wing, it would seem that he intended a species of nearly similar dimensions. As, however, it is very possible that in that day as well as in the present, synonyms were frequently copied down without pre-

* In fact, these two authors refer to one another. Brisson quotes the *sixth* edition of the *Systema Naturæ,* and Linnæus in the *twelfth* edition quotes Brisson.—Brisson was the first to affix any specific name to this Bat, the edition of the *Systema Naturæ* first mentioned having appeared before trivial names were established; and the term *major,* selected by him for this purpose, was afterwards changed by Linnæus in his later editions to that of *murinus,* in consequence of Brisson's observation "*murini coloris.*"

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vious examination, I would not rest too strongly upon this point: nevertheless, I conceive that under any circumstances the Linnean name should be suffered to rest with the continental species, of which there are so many excellent figures and details by Daubenton*, Buffon†, Geoffroy‡, and Desmarest§, rather than with our own, of which there is not a single delineation or description by any British naturalist sufficiently accurate to admit of its being recognised.

Indeed, on this subject, it is surprising to remark the way in which authors have contented themselves with copying the bare and meagre descriptions of their predecessors, without adding anything from their own observation. Of all our English writers, including Martin, Berkenhout, Bewick, Shaw, Stewart, and Donovan, there is scarcely one who has done more than repeat the general colour and dimensions of this Bat, as originally stated by Pennant, or perhaps merely translate the Linnean specific character. And even in our two latest publications by Mr. Griffith and Dr. Fleming||, though (in the former at least)

* *Mém. de l'Acad. des Sciences de Paris,* ann. 1759. p. 378. pl. 1. f. 1.

† *Hist. Nat.* tom. 8. p. 126. pl. 15. f. 1.

‡ *Ann. du Mus.* tom. 8. p. 191. pl. 47 & 48.

§ *Mammal.* (*Encycl. Méthod.*) p. 134. pl. 33. f. 2.

|| In the *Animal Kingdom* of Mr. Griffith the description appears to be a translation from Desmarest, or at least evidently belongs to the *Vespertilio murinus* of that author; yet along with references to Buffon and other continental writers, are associated as synonyms the *Common Bat* of Pennant and the *Short-eared English Bat* of Edwards; thereby showing that these were considered to be the same as the species described, notwithstanding that Pennant's dimensions of this Bat are set at two inches and a half for the length of the body, and nine inches for the extent of wing, while Mr. Griffith has annexed to his own, a length equalling *four* inches, and an expanse of nearly *eighteen!*

Dr. Fleming in his *History of British Animals* has fallen into the same mistake. He has likewise taken for his specific character of our Common Bat that belonging to the *Vespertilio murinus* of Geoffroy and Desmarest, annexing the usual references to Ray and Pennant; under the idea that all these authors were describing the same species.

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the description is somewhat more diffuse, there is still the error of confounding this species with the *Vespertilio murinus* of continental authors alluded to in the beginning of this paper.

It would seem, therefore, absolutely necessary to impose a new trivial name upon the Common Bat of this country and to treat it as nondescript, if there be really no further account of it than is to be found in the works of our British naturalists. But before taking such a step, it becomes necessary to inquire whether it may not be recognized among any other of the species described by foreign authors since the time of Linnæus, however distinct from that with which it has been always confounded. It does not seem likely that so common a species in this country should be peculiar to it, and not found on the continent, where all our other indigenous *Vespertilionidæ* are well known*; neither is it probable, that if it is to be met with in equal plenty abroad, it should have wholly escaped notice. Now on this point I am inclined to answer in the affirmative; and, though I give my opinion with much diffidence, I would ask, in what essential points our Common Bat differs from the *Pipistrelle* of Daubenton and succeeding writers. After a careful examination of very many specimens, and an accurate comparison of these with the descriptions annexed by Daubenton and Geoffroy to that species, I can see no material distinction between them. It is true that Daubenton's dimensions of the *Pipistrelle*, as well as those given by Desmarest in his *Mammalogie*, are somewhat less than in the generality of our English specimens: but such appear to have been taken from immature individuals; since the proportions between the several parts are still kept up, and the actual measurements agree in most particulars with those of one or two small specimens in my possession. Geoffroy, however,

* The *Vespertilio pygmæus,* discovered by Dr. Leach in Devonshire, appears as yet to be an exception.

however, makes this species larger; and the dimensions which he has assigned for the length of the head and tail and for the expanse of wing are scarcely at all different from the results at which I have arrived. I may add also, that in the British Museum there is a specimen of the *Pipistrelle**, sent by Dr. Leach from the north coast of Scotland, which is even larger than that described by Geoffroy; and with which I have compared more than once not only my own specimens of the Common Bat, but likewise those so named in the above Museum, after Pennant, without being able to detect any thing like a specific difference.

Rather, however, than dwell any further upon the identity of these species, or stop to point out every mark of similarity between them, I beg to subjoin a more accurate description of our Common Bat than is to be met with in any of our English authors; after which persons will be the better enabled to form their own opinions on this subject.

VESPERTILIO PIPISTRELLUS. *Geoff.*

V. vellere fusco-rufescente, subtùs pallidiori; auriculis ovato-triangularibus, extrorsùm emarginatis, capite brevioribus; trago surrecto apice obtuso; caudâ antibrachium longitudine æquanti, è membranâ interfemorali paululùm exsertâ.

Le Pipistrelle. *Daub. Mém. de l'Acad. des Scien.* 1759. *p.* 381. *pl.* 1. *f.* 3. *Buff. Hist. Nat. tom.* 8. *p.* 129. *pl.* 19. *f.* 1.

Vespertilio Pipistrellus. *Geoff. Ann. Mus. d'Hist. Nat. tom.* 8. *p.* 195. *pl.* 47. & 48. *Desmar. Mammal.* (*Encycl. Méthod.*) *p.* 139. *pl.* 33. *f.* 5. *Griff. Anim. King.* (*Synop.*) *p.* 80. *sp.* 251.

* Mr. Gray of the British Museum, informed me that he believed this specimen was named by Kuhl, which, if so, is strong testimony in favour of its being the same with the *Pipistrelle* on the continent, notwithstanding its superior size.

Dimensions.

Dimensions.

	Inches.	Lines.
Length of the body, measured from the nose to the root of the tail	1	7
——— of the head	0	6
——— of the tail	1	2
——— of the auricle	0	4
Breadth of the auricle at the broadest part .	0	3
Length of the tragus	0	2
Breadth of the tragus	0	$0\frac{3}{4}$
Length of the arm	0	$8\frac{1}{2}$
——— of the forearm	1	2
——— of the thumb	0	$1\frac{3}{4}$
——— of the thigh	0	5
——— of the shank	0	5
Distance measured from the carpus to the apex of the second finger	2	0
——— measured from the carpus to the apex of the fourth finger	1	6
Expansion of the flying membrane . . .	8	4
Exsertion of the tail beyond the interfemoral membrane	0	$0\frac{1}{2}$

Strongly resembling the *Noctule* in its general characters, but at once distinguished from that species by its inferior size, weighing only eighty-two grains. Head much depressed in front, convex behind, with the upper part of the occiput remarkably protuberant*: no occipital crest. Muzzle extending three lines beyond the ears, in young specimens rather elongated, which appearance wears off afterwards,

* I have compared the skull with Geoffroy's figure of that of the *Pipistrelle,* which it resembles in all essential particulars.

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from the enlargement of the head and the filling up of the sides of the face, when the profile is somewhat altered. Nose obtuse at the extremity, and slightly emarginate between the nostrils; these last reniform, with tumid edges: on each side of the nose, immediately above the upper lip, is a protuberant swelling, formed by a congeries of sebaceous glands, which, when cut through, are of a yellowish-white colour. Eyes round and very small, situate halfway between the above glands and the ears, and sunk deep in the head; over each, immediately above the anterior angle, is a small elevated wart furnished with a few black hairs: a transverse tuft of rather long upright hair on the forehead, which has the effect of making the head appear more elevated than it really is: rest of the face, including the cheeks, contour of the eyes, and space above the nose, almost naked, particularly in young specimens. Auricle broad, rather more than half as long as the head, oval, approaching to triangular, deeply notched on its external margin about midway down; tragus half the length of the auricle, oblong, and terminating in a rounded head, nearly straight or slightly bending inwards. In the upper jaw four incisors, on each side two, of which the first is longest; in the lower jaw six, each of which has three lobes; grinders five on either side, above and below; the first in the upper and the two first in the lower jaw with only one point; of these last-mentioned teeth, the second is longer than the first; the other grinders in the lower jaw have each five points, three on the inner and two on the outer margin, which last are alternately long and short. Fur rather long and silky, yellowish red on the forehead and at the base of the ears, on the rest of the upper parts reddish brown, with the lower half of each hair dusky; on the under parts the

the hair is wholly dusky, except at the extreme tips, which are of the same colour as above, but paler. In young specimens the fur is entirely of a dusky-brown or brownish-gray, in some instances almost black, without any tinge of red, which appears to come afterwards, and to increase in intensity with the age and size of the individual*. Nose, lips, ears, flying and interfemoral membranes, dusky.

To the above description of our Common English Bat, which has been drawn from an examination of many individuals of different sizes compared together†, I may, perhaps, be allowed to add two or three remarks in illustration of its habits. Pennant, and after him some other of our English authors, describe this species as retiring at the approach of winter into caves, ruined buildings, the roofs of houses, or hollow trees. This is by far too general an assertion. I believe that each of our British Bats has its own peculiar place of concealment, and that, under ordinary circumstances, their respective habits in this particular are always the same. As far as my own experience goes, I have found hollow trees the constant retreat of the *Noctule*, and the roofs of houses as uniformly resorted to by the Long-eared Bat; whilst the species under consideration I never met with but in the crevices of decayed brick-work, in the cracks of old gateways and door-frames, or behind the leaden pipes frequently attached to buildings for carrying off the rain. They seem peculiarly to delight in the two former situations,

* In the specimen of the *Pipistrelle* in the British Museum, the fur is of a remarkably red or foxy colour; and this individual is likewise distinguished by its size.

† The dimensions are all taken from the same individual, recently killed, and whilst all the parts were in their natural state. The expansion of the flying membrane varies in different specimens from seven inches and a half to eight inches and a half, which last measurement I never found it to exceed; so that Pennant's statement of *nine inches* for this part must be looked upon as considerably above the average.

collecting,

collecting, sometimes in prodigious quantities, wherever from the falling out of the mortar they are enabled to insinuate their bodies, and flocking thither, as well for the purpose of concealment during the day-time in the summer months, as for that of undergoing those more profound slumbers which are occasionally superinduced by the severities of winter.

Again: It is a common remark, that the brumal torpidity of the Bat is liable to be broken through by a sudden increase of temperature, and that these animals appear abroad at *all* seasons of the year, if the thermometer be above 44°: but as far as my observation goes, this takes place much more frequently at the commencement of winter than towards its conclusion; and it would seem to me, that though it requires a very reduced temperature,—probably one inch below freezing point,—to throw them into a state of complete torpidity, yet that when this has fairly taken place, one, much higher than would have proved sufficient to have put them on wing before its commencement, is necessary to awaken them from their slumbers. Accordingly, we find the Bat showing itself every evening throughout the months of November and December, if the weather be mild and open, and I have even noticed it flying with its usual activity when the thermometer has been down at 38°; and this will often continue to be the case till the setting-in of those severe frosts which usually occur soon after the commencement of the new year: but after the force of the winter has begun to abate, I have in vain looked for the Bat on wing till the beginning or near the middle of March, notwithstanding the temperature has often risen considerably above 50° of Fahrenheit

It is also worthy of note, that the whole of the above observation applies only to the species under consideration. The *Noctule* and the Long-eared Bat show themselves for a longer or shorter period during the summer months, according to circum-

 stances;

stances; but these, after having once withdrawn, are not generally seen again till the ensuing season*. Most probably their continuance abroad is regulated by the supply of food, which itself must depend in some measure upon the state of the weather: and from the circumstance of our common Bat being so much on wing in the dead season of the year, it seems likely that the prey of this species may consist chiefly of gnats and small *Tipulidæ*, which do not appear to be affected like other insects by the cold of winter.

I have only to add in conclusion, that if I am right in my remarks upon the identity of our Common Bat with the *Pipistrelle* of French authors, the true *Vespertilio murinus* must necessarily be suppressed as a British species, at least till further observation shall have detected it in this country.

* The early retreat of the *Noctule* was particularly noticed by White, who in his *Natural History of Selborne* (p. 76.) hints at the possibility of its migration. The same idea seems to be entertained by Dr. Fleming (*Phil. Zool.* ii. 29.); but as I have had this species brought to me from the hollows of trees late in the autumn, and in a very reduced state, I cannot assent to this myself. Pennant also (*Hist. Quad.* ii. 317.) mentions one that was taken during winter in Flintshire. Moreover, it may be added, that the Bat, though capable of supporting itself in the air for a considerable time by means of its flying membranes, seems on the whole but ill calculated for performing those extensive journeys which migration supposes.

XVI. *De-*

XVI. *Descriptions of the new Genera and Species of the Class Compositæ belonging to the Floras of Peru, Mexico, and Chile. By Mr. David Don, Libr. L.S.*

Read January 20, *and March* 17, 1829.

THE extensive herbaria formed in Peru, Quito, and Chile, by Ruiz, Pavon, and Tafalla, and the Mexican collections of Sessè and Mociño, having by fortunate circumstances come into the possession of Aylmer Bourke Lambert, Esq., whose unwearied zeal in the advancement of botanical science is already well known, I have thought that a description of the *Compositæ*, which form an important part of these collections, might not prove unacceptable to the Linnean Society. Perhaps no people have made greater sacrifices for science than the Spanish nation. Her expeditions and voyages of discovery were fitted out on a most munificent and extensive scale; but unfortunately, the results of them have in but few instances been given to the scientific world. Don Hipolito Ruiz and Don Josè Pavon, accompanied by two draftsmen, were charged with the botanical mission to Peru in 1777, which lasted eleven years; and their labours were afterwards continued by Don Juan Tafalla, a distinguished pupil of Ruiz, and formerly Professor of Botany at Lima, whose investigations were also extended to the province of Quito, and the fertile district of Guayaquil. Don Martin Sessè, Don Josef Mociño, and Don Vincente Cervantes, were charged with a similar mission to Mexico in the

 year

year 1788; but the botanical expedition for the purpose of exploring the vegetable riches of New Granada, under the direction of the celebrated Mutis, was organized on a much more extensive plan. From these several expeditions there has resulted an immense mass of materials, the greater part of which still remain unpublished, although many years have elapsed since their collection. The whole of the manuscripts belonging to the Peruvian expedition, having also come into Mr. Lambert's hands, I have been enabled to render the descriptions in some cases much more complete, and to add many circumstances relative to particular species, that could not have been ascertained from an inspection of the dried samples, which, however, are very perfect, and in most instances there are several duplicates of each species. Notwithstanding the labours of Humboldt and Bonpland, whose numerous discoveries have already been given to the world by my learned friend M. Kunth, through whose liberality, while at Paris in the autumn of 1821, I was permitted to examine a considerable part of the *Compositæ* contained in the herbarium of M. de Humboldt; a very small proportion of the species in this collection are identically the same with those I am about to describe.

I have been successful in determining many of the *Compositæ* figured in the work of Hernandez; and to the kindness of my inestimable friend Professor Lagasca I am indebted for pointing out to me the various genera which he himself has described. A small collection from Don Pablo de la Llave has made me acquainted with the genera described in the "*Descriptiones Novorum Vegetabilium.*" I have inserted a few species from other sources, partly with a view to point out their relative affinities, and more fully to illustrate the characters of certain groups; but although I may differ widely in regard to the generic distribution of the species, the trivial names given to them

them by their discoverers, if not previously applied to other species, I have scrupulously preserved. In the distribution of the species, and in the formation of the generic divisions, I have followed the comprehensive views of Mr. Brown and M. Cassini, whose important labours in this class are universally admitted: and having myself been engaged for several years studying this department of botany,—of which very few have had so extensive opportunities,—the characters of the groups which I shall have to propose in the sequel, may, therefore, with more confidence be relied on. In order to render the divisions more intelligible, I shall in the first place proceed to give a descriptive character of the class itself.

COMPOSITÆ. *Adans.*, *Brown.*

FLORES sæpiùs hermaphroditi, capitati, toro proprio inserti, sessiles, involucro è squamis (folia mutata) sæpè plurimis inclusi.

CALYX ovario arctè adhærens: *margo* obsoletus v. elevatus, plerumque scissus, aut in pappum formâ varium abeuns, nunc (in *Zinniâ*) corollam æmulans!

COROLLA monopetala, tubulosa, limbo 5-fida (rarò 4-fida), æstivatione valvata! laciniis 2 v. 3 connatis nunc bilabiata, aut latere interiore longitudinaliter rupta, explanata, ligulæformis: *nervis primariis* laciniis alternantibus!

STAMINA corollæ laciniis numero æqualia, iisdemque alterna: *filamenta* libera v. partim aut omninò corollæ tubo adhærentia, prope apicem articulata! *articulo superiore* persæpè dissimili: *antheræ* biloculares: loculis parallelis, longitudinaliter dehiscentibus: *valvulis* inæqualibus; *interiore* angustissimâ; basi truncatis v. decurrentibus, aut productis, apice in appendiculam planam confluentibus.

PISTILLUM:

Pistillum: *ovarium* inferum, indehiscens: *disco* epigyno: *ovulo* erecto, solitario, funiculis 2 pistillaribus manifestis suspenso: *stylus* e duobus conflatus, indivisus: *stigmata* 2, sæpiùs soluta, patentia.

Fructus (Achenium): *pericarpium* indehiscens, monospermum.

Semen: *testa* duplex; *exterior* coriacea v. crustacea; *interior* membranacea, vascularis, vasis propriis et spiralibus instructa: *albumen* nullum.

Embryo dicotyledoneus, erectus, seminis cavitati conformis: *cotyledones* oblongæ: *radicula* his persæpè brevior, obtusa, centripeta.

Plantæ polymorphæ in orbis temperatis vulgatissimæ.

The *Compositæ* constitute the most extensive and the most interesting portion of the vegetable kingdom; and their distribution is so universal, that they form a large proportion of the Flora of almost every country: but countries traversed by extensive mountain-chains, and situate within or near the tropics, are found to be most favourable to the development of the plants of this class: for in the Floras of Peru, Chile, and Mexico, they appear to constitute a sixth part of the whole phænogamous vegetation; and this estimate of their number is justified by an actual comparison both of the published and unpublished plants of these countries.

The *Compositæ* are related on the one hand to *Calycereæ*, *Dipsaceæ*, and *Valerianeæ;* and on the other to *Campanulaceæ* and *Goodenoviæ;* but the disposition of the primary vessels in the corolla essentially distinguish them from every other family. The plurality of styles, the inferior monospermous ovarium, and the presence of an epigynous disk, show at least a considerable degree of analogy, if not of affinity, to the *Umbelliferæ*,

to

to whose mode of inflorescence that of *Compositæ* may be compared. Singular instances of monstrosity are sometimes to be observed in *Tragopogon*, *Scorzonera*, &c., wherein the capitula have assumed the form of the compound umbel. I have already had an opportunity of showing that the other parts of fructification in this class frequently experience a remarkable degree of increase in number, and that the stigmata are generally unaffected by the number of the other parts of the flower.

I have now to state an interesting example of reduction of stamina in *Calliopsis bicolor*, a genus widely different from *Dahlia* and *Coreopsis*, with which it has been hitherto associated. In this genus most of the florets of the capitulum are quadrifid and tetrandrous; and, besides the primary vessels, there are others which occupy singly the axis of two or three of the laciniæ, but in no instance all of them. These secondary vessels evidently arise from the base, and not from the confluence of the primary trunks, as they become fainter near the apex of the laciniæ; and I am disposed to believe, that in many instances the secondary vessels take their rise with the primary trunks.

I have distributed the groups in accordance with their natural affinities, at least as far as this was practicable in a linear series: for the families appear evidently to return into each other, exhibiting a number of points of contact.

Fam. 1. Cichoraceæ. *Juss.*

Flosculi ligulati, hermaphroditi, uniformes: *ligula* apice 5-dentata, 6-nervia: *nervis* rectis, parallelis, parùm infra dentium sinus furcatis

Antheræ cristâ membranaceâ pellucidâ coronatæ, basi bisetæ (setis dentibusve membranaceis) s. ligulâ simplici truncatâ auctæ.

Stigmata libera, filiformia v. semicylindrica, obtusa, papillosa.

Achenia

ACHENIA nunc apice calva.
Plantæ lactescentes. Folia alterna. Flores sæpiùs lutei.

This family constitutes but a very small part of the *Compositæ* in the South American Flora, being scarcely in the proportion of one to forty-five, while in the European Flora they are generally as one to two. The *Cichoraceæ* are readily distinguished from the other families of *Compositæ* by their uniform, ligulate, hermaphrodite florets. The primary vessels are five in the tube, but at the sinus, where the corolla splits open and expands into the ligulate lamina, the interior nerve divides into two simple branches, which run along the opposite sides, either directly on the margin itself, or more frequently placed a little within the border. The apparently simple trunks of the intermediate vessels divide a little below the sinus of the teeth, and traverse their margins, uniting at the summit of each tooth; but I have only in one instance, that of *Prenanthes virgata* of Michaux, detected secondary vessels, and therefore conclude that they are rarely present in the plants of this family. The disposition of the vessels in the lamina of the corolla will be found an important character in distinguishing the *Cichoraceæ* from such individuals belonging to other families, whose florets may have assumed an analogous form.

Besides being lactescent, the alternate leaves, their nervation, and the inequality of their teeth, when present, the irregularity of the corolla in *Lobelia*, the cohesion of its antheræ, and its papillary stigmata, show that many analogies exist between this family and *Campanulaceæ*.

Trib. 1. HIERACEÆ. *Receptaculum* epaleatum. *Antheræ* basi interiore ligulâ simplici membranaceâ truncatâ auctæ! *Involucrum* polyphyllum.

HIERACIUM.

Hieracium.

Hieracii sp., *L.*

Involucrum imbricatum. *Receptaculum* subfavosum. *Achenia* apice simplicia. *Pappi radiis* simplici ordine copiosis, persistentibus, setaceo-pilosis.

Involucrum multiplici ordine polyphyllum, imbricatum: *squamis* sæpiùs adpressis. *Receptaculum* subfavosum: *scrobiculis* margine elevatis, ciliato-laceris. *Flosculi* plurimi: *fauce* extùs barbatâ. *Antheræ* appendiculâ oblongâ diaphanâ coronatæ, basi interiore ligulâ membranaceâ truncatâ sæpiùs lacerâ instructæ. *Stigmata* semicylindrica, obtusa, recurvata, cum dimidio superiore styli papilloso-hispidula. *Achenia* tetragona, apice simplicia: *angulis* sulcatis, lævibus. *Pappi radiis* singulo ordine digestis, copiosis, pilosis, rigidis, fragilibus, persistentibus, denticulis plurimis exasperatis, basi distinctis.

Herbæ *polymorphæ, radice perenni.* Flores *lutei, solitarii v. corymbosi.* Pappus *cinereo-fulvellus.*

1. H. *strigosum*, pilosum; foliis lineari-lanceolatis acutis denticulatis; caulinis sessilibus, paniculâ racemosâ, caule simplici fistuloso.

Hieracium hirsutum. *Herb. S. et M.*

In Mexico. *Sesse et Mocinno.* ♃.

Planta strigosa, pilis copiosis, longis, patulis vestita, hispidula. *Caulis* erectus, cubitalis, filiformis, simplex, fistulosus. *Folia radicalia* petiolata, palmaria, lanceolata, acuta, mucronulo obtuso, remotè denticulata, membranacea, viridia, subtùs pallidiora, basi attenuata; *caulina* sessilia, lineari-lanceolata, 3—4-pollicaria, nunc spithamæa. *Panicula* racemosa,

 strigosa,

strigosa, multiflora, spithamæa. *Flores H. cymosi*, citrini. *Pedunculi*, ut et *involucra*, pube copiosissimâ pilis glanduliferis interstinctâ vestiti; *inferiores* remotissimi. *Involucrum* nigricans, cylindricum: *squamis* triplici ordine imbricatis, pluribus (18—26), linearibus, obtusis, planis, adpressis, margine membranaceis; *intimis* subæqualibus. *Receptaculum* subfavosum. *Flosculi* involucrum longitudine æquantes, apice dentibus 5, linearibus, obtusis. *Antheræ* appendiculâ lanceolatâ, acutâ! membranaceâ coronatæ, basi interiore ligulâ exiguâ lineari truncatâ instructæ. *Stigmata* semicylindrica, obtusa, minutè papillosa. *Achenia* tetragona, sulcata, glabra, apice simplicia. *Pappus* pilosus, persistens, fulvellus: *radiis* duplici serie digestis, rigidis, denticulato-scabris.

2. H. *Lagopus*, villosissimum; foliis lanceolatis subintegerrimis glaucis, caule ramoso multifloro nudiusculo, ligulis 5-fidis.

In Mexico. *Sesse et Mocinno.* ♃.

Herba facie *H. cerinthoides*, paulò tamen minor, similiter cæspitosa et glauca. *Caulis* pedalis, erectus, teres, flexuosus, folio uno alterove tantùm ornatus, inde nudiusculus, infernè villosissimus. *Folia radicalia* petiolata, lanceolata, acuta, remotè denticulata, membranacea, utrinque villosa, demùm nudiuscula evadunt, basi attenuata, tripollicaria; *caulina* paucissima, multò minora, amplexicaulia, acuminata. *Petioli* ut et *Caudex*, qui ad leporis pedem non paulò refert, villis longis sericeis, exsiccatione aureis, copiosissimis vestiti. *Flores* laxè paniculati, citrini. *Pedunculi* filiformes, uniflori, pollicares. *Involucrum* cum *pedunculis*, tomento copioso glandulisque pedicellatis numerosissimis ornatum: *squamis* linearibus, acutis, multiplici ordine imbricatis,

bricatis, adpressis. *Receptaculum* leviter favosum, scabrum. *Flosculi* plurimi, ligulati, apice profundè 5-dentati, involucro multoties longiores: *laciniis* linearibus, obtusis. *Antheræ* appendiculâ ovatâ acutâ! membranaceâ coronatæ, basi ligulâ lineari, truncatâ instructæ. *Stigmata* semicylindrica, obtusa, minutè papillosa. *Achenia* tetragona, sulcata, glabra. *Pappus* pilosus, persistens, cinereus, fragilis: *radiis* simplici serie digestis, contiguis, rigidis, denticulis exasperatis.

I have already proposed* to separate certain species hitherto referred to *Hieracium*, and characterized by their flat, attenuated achenia surmounted by a dilated epigynous disk, and by their soft capillary pappus disposed in a double series. This group, which I have named *Hapalostephium*, comprises *Hieracium paludosum* and *pyrenaicum* of Linnæus, the *Hieracium macrophyllum* of Pursh, and the *Crepis Sibirica* of Linnæus. M. de La Peyrouse has referred the *H. pyrenaicum* to his *Lepicaune*, an unnatural assemblage, which, independent of the faulty name, deserves to be erased from the catalogue of genera. By the removal of these species, and the *Hieracium aureum* and *fruticosum* of authors, which do not even belong to the same tribe, the genus, although still very extensive, will scarcely admit of further division. The *Hieracium pusillum* of Pursh from Labrador I have ascertained by an examination of an authentic specimen to belong to the genus *Erigeron* of authors. The crest of the anthers in most of the species of this genus is obtuse; but in the two above described, and in *Hieracium murorum*, it is acute.

Trib. 2. Hypochœrideæ. *Receptaculum* paleis distinctis refertum. *Antheræ* basi bidentatæ. *Pappus* persistens. *Involucrum* polyphyllum.

* *Prod. Fl. Nep.* p. 165. *Edinb. New Phil. Journn.* April 1829, p. 307.

OREOPHILA.

HYPOCHŒRIDIS SP., *Kunth.*

Pappus plumosus, sessilis. *Involucrum* imbricatum.

Involucrum subrotundum, polyphyllum, imbricatum: *squamis* lanceolatis, obtusis, membranaceis; *exterioribus* apice lanuginosis. *Receptaculum* paleatum: *paleis* lanceolatis, scariosis, uninerviis, acumine longo, setaceo instructis. *Flosculi* lineari-ligulati: *tubo* tenui, ligulâ 5-dentatâ, 6-nerviâ, duplò longiore. *Antheræ* appendiculâ ligulatâ, membranaceâ coronatæ, basi dentibus 2, lanceolatis, acuminatis, membranaceis, æqualibus munitæ. *Stigmata* filiformia, recurvata, minutissimè papillosa. *Achenia* oblonga, ancipiti-compressa, lævia. *Pappus* sessilis: *radiis* simplici serie contiguis, filamentoso-plumosis, validis, inæqualibus, basi crassiore persistentibus.

Herba *perennis, cæspitosa, acaulis.* Radix *fusiformis, cortice fusco obducta, digiti minoris crassitie.* Folia *numerosa, in orbem acta, humifusa, petiolata, linearia, tunc lanceolata, obtusa, obtusè sinuato-dentata, coriacea, suprà glabra, subtùs sed præcipuè ad costam mediam pilosa, 2—3-pollicaria.* Flos *solitarius, sessilis, in foliorum medio latens, magnus, aureus.* Pappus *cinereus.*

Herba locis alpinis incola, unde nomen ab *ορος, ορεος, mons*, et *φιλεω, amo*, i. e. planta in montibus florescens.

1. O. *sessiliflora.*

Hypochœris sessiliflora. *Kunth in H. et B. Nov. Gen. et Sp. Pl.* iv. *p.* 2.

In Peruviæ summis alpibus Cordilleras de los Andes Hispanicè dictis. *Ruiz et Pavon.* ♃.

The uniform sessile pappus has led me to regard this plant as constituting

constituting a distinct genus, to which, it is very probable, the *Hypochæris sonchoides* of M. Kunth should also be referred. From *Hypochæris*, which must now be limited to *H. glabra* and *minima*, it will be necessary to separate *H. radicata* and *maculata*, essentially distinguished by having the pappus uniformly stipitate. This division, first proposed by Scopoli under the name of *Achyrophorus*, has been very properly adopted by Gærtner. The genus *Seriola* of Linnæus, the *Achyrophorus* of Vaillant, which also belongs to this family, is characterized by a simple polyphyllous involucrum, and by the rays of the pappus being dilated towards the base.

Trib. 3. Lactuceæ. *Receptaculum* epaleatum. *Antheræ* basi bidentatæ. *Pappus* fugax, mollissimus, capillaceus.

Chondrilla, *L.*

Involucrum simplici ordine polyphyllum, connivens, basi squamulis pluribus calyculatum. *Receptaculum* nudum. *Achenia* fusiformia, tuberculata. *Pappus* stipitatus.

Involucrum simplici ordine poly-(8—12)phyllum, cylindricum, connivens, basi squamulis pluribus (8—10) calyculatum: *foliolis* æqualibus, margine invicem se imbricatis. *Receptaculum* nudum. *Flosculi* indefiniti. *Antheræ* appendiculâ ligulatâ v. ovali diaphanâ coronatæ, basi acutè bidentatæ. *Stylus* hispidulus. *Stigmata* semicylindrica, obtusa, brevia, crassiuscula, minutissimè papillosa. *Achenia* fusiformia, subtetragona, hinc convexa, inde sulcata, concaviuscula, supernè tuberculata, apice in stipitem longum filiformem producta. *Discus epigynus* depresso-capitatus! *Pappus* fugax, tenuissimè capillaceus: *radiis* duplici ordine copiosissimis, basi solutis.

Herbæ foliis radicalibus *sæpiùs runcinatis*, floribus *citrinis*, *pedunculatis*.

Sect.

Sect. 2. *Involucri calyculo* polyphyllo, lineari-setaceo, patulo. *Flosculi* numerosi. *Herbæ perennes, caulibus nudiusculis, subunifloris.* Crinissa.

1. C. *pauciflora*, glabra; foliis runcinatis, caule subbifloro.
   Chondrilla pauciflora. *Herb. S. et M.*
   In Mexico. *Sesse et Mocinno.* ♃.

Herba aspectu *Apargiæ*, perennis, glabra. *Radix* fusiformis. *Caulis* erectus, cubitalis, teres, simplex, uniflorus, subinde ramo uno alterove instructus, nudiusculus, hinc inde folio minore ornatus. *Folia radicalia* patula, runcinato-pinnatifida, lævissima, viridia, 3-pollicaria, basi in petiolum attenuata: *lobis* remotis, lanceolatis, acutis, integerrimis; *caulina inferiora* radicalibus conformia; *suprema* in squamas pinnatifidas abeuntia. *Flores* magnitudine *Apargiæ Taraxaci*, solitarii, citrini. *Involucrum* simplici serie 12-phyllum, cylindraceum, glaucum, tenuissimè pubescens, longitudine unguiculare, basi squamis pluribus (8—10) lineari-setaceis, patulis, apice nigricantibus munitum: *foliolis* linearibus, membranaceis, sub apice tuberculo auctis. *Receptaculum* nudum. *Flosculi* plurimi (30), ligulati, 5-dentati: *ligulâ* 6-nerviâ, involucrum longè superante. *Antheræ* appendiculâ ovali obtusâ membranaceâ coronatæ, basi acutè bidenticulatæ. *Stigmata* brevia, semicylindrica, obtusa, cum styli apice minutè papillosa. *Achenia* fusiformia, hinc ventricosa, 4-sulcata, inde depressa, planiuscula, undique tuberculata. *Discus epigynus* apice annulo lanuginoso instructus. *Pappus* longè stipitatus, mollissimus, fulvellus: *radiis* tenuissimè capillaceis, duplici ordine copiosissimis, confertis, longitudine inæqualibus, basi solutis.

2. C. *Sessæana*, glabra; foliis linearibus acuminatis subintegerrimis, caule unifloro.

In

In Mexico. *Sesse et Mocinno.* ♃.

Herba perennis, cæspitosa, glabra. *Radix* fusiformis. *Caules* plures ex eadem radice, erecti, spithamæi, filiformes, uniflori, læves, folio unico, lanceolato, integerrimo, sessili ad medium v. paulò infrà, inde squamis aliquot lineari-setaceis muniti, apicem versus pubescentes. *Folia radicalia* plurima, sessilia, linearia, acuminata, glabra, integerrima, v. nunc subruncinata, dentibus paucis, magnis, retrorsis instructa, 2—3-uncialia, sesquilineam lata. *Flores* citrini, parùm minores. *Involucrum* simplici serie 12-phyllum, cylindraceum, glaucum, tenuissimè pubescens, unguiculare, basi squamis pluribus (8—10) lineari-setaceis, patulis, apice nigricantibus munitum: *foliolis* linearibus, membranaceis, sub apice tuberculo auctis. *Receptaculum* nudum. *Ligulæ* 5-dentatæ, 6-nerviæ, involucro ferè duplò longiores. *Antheræ* cristâ ovali membranaceâ coronatæ, basi bidenticulatæ. *Stigmata* brevia, crassiuscula, lineari-lingulata, pruinosa. *Achenia matura* nondùm vidi. *Pappus* omninò ut in præcedente.

The simple polyphyllous involucrum, independent of any other character, is alone sufficient to distinguish *Chondrilla* from *Lactuca*, its nearest ally. To the normal group of the genus, besides *Chondrilla juncea* of Linnæus, belong *Chondrilla latifolia* and *graminea* of the "*Flora Taurico-Caucasica*," and a fourth species contained in the Pallasian herbarium, marked "*Prenanthes nova*," and which possibly may prove to be the *Prenanthes aspera* of Schrader and Willdenow. It is very probable that *Chondrilla lævigata* of Pursh may prove a third aberrant species of this genus, as the description appears to indicate an intimate affinity to *C. Sessæana* above described.

TRACHODES.

Trachodes.

Involucrum imbricatum. *Receptaculum* læve. *Achenia* subfusiformia, transversè rugosissima. *Pappus* sessilis ; *radiis* basi solutis.

Involucrum multiplici ordine polyphyllum, imbricatum, cylindraceum, tubulatum: *squamis exterioribus* ovatis, obtusis, margine scariosis ; *intimis* 8, elongatis, lineari-ligulatis, conniventibus. *Receptaculum* læve. *Flosculi* indefiniti (20—24): *ligulis* 5-dentatis, 6-nerviis. *Antheræ* cristâ ovatâ acutâ! membranaceâ coronatæ, basi bidentatæ. *Stigmata* semicylindrica, obtusa, cum apice styli papilloso-hispidula! *Achenia* subfusiformia, tetragona, apice attenuato acutè quadrangulo, angulis prominulis, costisque solitariis v. binis insterstinctis, rugis transversis elevatis scabra. *Pappus* sessilis, capillaceus, mollissimus, fugax: *radiis* triplici ordine digestis, basi solutis ; *intimis* crassitie parùm dissimilibus.

Herba *biennis, e viridi cærulescens.* Caulis *bipedalis, erectus, rigidus, paniculatìm ramosus, teres, aculeis minutissimis scaber, basin versus purpureo-maculatus, vix calamum scriptorium crassitie adæquans.* Folia radicalia *vix spithamæa, subsessilia, spathulata, sinuato-runcinata, mucronata, margine copiosè spinuloso-denticulata, pollicem v. sesquipollicem lata ;* caulina *amplexicaulia, altiùs lobata :* lobis *triangulari-ovatis, acuminatis.* Flores *citrini? pedicellati,* Lactucæ virosæ *iis vix majores.* Pedicelli *squamis ovatis margine scariosis muniti.* Pappus *niveus.* Nomen ad plantæ asperitatem refert, *τραχωδης, scabrosus.*

1. T. *paniculatus.*
Sonchus paniculatus. *Herb. S. et M.*
In Mexico *Sesse et Mocinno.* ♂.

In

In *Sonchus* the rays of the pappus are united into bundles at the base, and the receptacle is rough and much dilated.

Trib. 4. SCORZONEREÆ. *Receptaculum* epaleatum. *Antheræ* basi bisetæ, appendiculâ exiguâ reniformi! coronatæ. *Stigmata* sæpiùs filiformia, papillosa. *Involucrum* simplex v. imbricatum.

PICROSIA.

Involucrum 8-phyllum. *Ligulæ* tridentatæ, 4-nerviæ! *Pappus* capillaris, stipitatus.

Involucrum simplici serie 8-phyllum, cylindricum, basi omninò nudum: *foliolis* ligulatis, obtusis, margine invicem se imbricatis, planis. *Receptaculum* planum, nudum. *Flosculi* plurimi: *tubus* tenuissimus, filiformis; *fauce* extùs villosiusculâ: *ligulâ* lineari, tridentatâ, 4-nerviâ. *Stamina* ferè omninò exserta: *filamenta* capillaria, libera: *antheræ* leviter coalitæ, basi bidenticulatæ, cristâ exiguâ brevissimâ coronatæ. *Stigmata* brevia, semicylindrica, obtusa, papilloso-pruinosa, arcuato-conniventia. *Achenia* fusiformia, sulcis plurimis longitudinaliter notata, glabra. *Pappus* longè stipitatus, capillaris, mollis, caducus: *radiis* duplici ordine confertis, scabriusculis, inæqualibus, basi solutis.

Herba *perennis, lævigata, glauca.* Caulis *erectus, pedalis, ramosus, teres, striatus, calamum scriptorium crassitie ferè adæquans.* Rami *paucissimi.* Folia *sessilia, lanceolata, integerrima, nunc remotissimè dentata, palmaria v. spithamæa, pollicem lata;* inferiora *basin versus angustata, sublingulata;* superiora *amplexicaulia, basi sagittata.* Flores *solitarii, pedunculati.* Involucrum *unciale, lævissimum:* foliolis *apice puberulis.* Flosculi *lutei? tenues, involucro longiores.* Pappus *semipollicem longus, cinereo-fulvus.* Nomen a πικρος, *amarus.*

 1. P. *lon-*

1. P. *longifolia.*

Tragopogon sp. nova. *Herb. R. et P.*

In Peruviæ alpibus. *Ruiz et Pavon.* ♃.

There is no genus with which this can well be compared: it has the involucrum of *Tragopogon,* and in habit it resembles *Cynthia virginica**, the *Troximon virginicus* of Gærtner; but the structure of its pappus and florets removes it from every genus to which it bears any affinity. The *Scorzonereæ* are well distinguished from the rest of *Cichoraceæ* by the very short, reniform appendage surmounting the anthers; that organ in most of the other tribes having an oblong form. This interesting genus concludes the family of *Cichoraceæ;* and we shall now proceed to the consideration of the *Labiatifloræ,* which constitute a much more numerous and interesting portion of the collection.

Fam. 2. Labiatifloræ. *Dec. et Lag.*

Flosculi difformes, plerumque tubulosi: *limbo* sæpiùs bilabiato-partito, multinervio.

Antheræ appendiculâ cartilagineâ v. callosâ, plerumque elongatâ terminatæ, basi biaristatæ.

Stigmata obtusa, papilloso-pruinosa, rariùs partim v. omninò connata.

Achenia pappo rarò destituta.

Plantæ non lactescentes. Folia alterna. Flores sæpiùs purpurei.

The *Labiatifloræ* were first proposed as a distinct group by Messrs. DeCandolle and Lagasca in the 19th volume of the "*Annales du Muséum.*" Professor Lagasca having communicated to M. DeCandolle his remarks on this family, together with the essential characters of many new genera belonging to it,

* *Edinb. New Phil. Journ.* l. c. p. 309.

it, the paper may therefore be considered as the joint production of these two distinguished botanists; but about the same period Professor Lagasca published at Orihuela a separate treatise on this family, which he therein denominates *Chænanthophoræ,* with the addition of a few more genera, and several of those occurring in the other memoir are there given under different names. The names comprised in the memoir inserted in the "*Annales du Muséum*" have however prevailed, from the more extensive circulation of the work, although the former has the right of priority by some months, as the latter occurs in the commencement of the nineteenth volume, which was published in 1812, the year after the separate treatise by Professor Lagasca had appeared. In the series of natural affinities the *Labiatifloræ* form the connecting link between the *Cichoraceæ* and *Carduaceæ;* and although an exact definition of them is scarcely attainable, yet they appear to me sufficiently distinct to entitle them to rank as a separate family. Some botanists, however, have doubted of the propriety of this separation, and still think that they ought to be reunited to the other families of *Compositæ;* but it is unnecessary here to argue against such an opinion,—derived more, probably, from the works of others, than from actual observation,—as little investigation is requisite to see that by this reunion, the limits hitherto well-defined between the *Cichoraceæ* and *Carduaceæ* would be completely removed: and as no advantage whatever can be derived from this arrangement, it is certainly preferable to retain them as a distinct group, and more especially as they evidently have throughout a very marked affinity.

The *Labiatifloræ,* with the exception of a few species chiefly belonging to the group *Perdiceæ,* are peculiar to the western hemisphere; and they constitute one fifth of the *Compositæ* of the South-American Flora, where they appear to occupy the

 place

place of the *Cichoraceæ* of the Northern hemisphere, to whom they bear a striking analogy both in habit and structure; but in the Chilian Flora, where this family is more especially abundant, they form nearly one-half of the whole class. I have ventured to give the descriptions of a few interesting species from Brazil belonging to this family, whose affinities seemed to justify their insertion in this memoir.

Trib. 1. TRIXIDEÆ. *Receptaculum* epaleatum. *Flosculi* uniformes, bilabiati, hermaphroditi. *Stigmata* soluta, semicylindrica, truncata, papillosa. *Plantæ sæpiùs fruticosæ, foliis integris.*

Sect. a. PAPPO PILOSO.

TRIXIS. *P. Br., Dec., Lag.*

PERDICII SP., *L.*

Receptaculum villosum. *Flosculi* indefiniti. *Involucrum* æquale.

Involucrum simplici v. duplici ordine poly-(5—16)phyllum, basi squamis paucissimis s. bracteis amplis munitum: *foliolis* subæqualibus. *Receptaculum* densè villosum. *Flosculi* indefiniti (5—25) hermaphroditi, bilabiati; *labio exteriore* ligulato, patulo, tridenticulato, 4-nervio (nervis rectis, lateralibus longè intramarginalibus); *interiore* revoluto, bipartito: *laciniis* lineari-lanceolatis, binerviis, apice puberulis. *Antheræ* in tubum connatæ, basi bisetosæ (setis simplicibus) apice appendiculâ lineari lanceolatâ acutâ coriaceâ coronatæ. *Stigmata* semicylindrica, truncata, recurva, apice papillosa, nervo manifesto. *Achenia* subteretia, nunc compressiuscula, undique papilloso-scabra: *disco epigyno* concavo, parùm dilatato, margine elevato, calloso. *Pappus* capillaris, caducus: *radiis* duplici ordine copiosis, basi solutis, denticulato-scabris.

Frutices

Frutices foliis *indivisis*, floribus *terminalibus numerosis*, *albis aut luteis*.

* *Involucri foliolis simplici serie dispositis.* Propriæ.

1. T. *cacaloides*, foliis petiolatis ellipticis subintegerrimis sericeis, involucro pentaphyllo: foliolis ligulatis obtusis flosculis brevioribus.

Perdicium cacaloides. *Kunth in H. et B. Nov. Gen. et Sp. Pl.* 4. *p*. 154.

In Peruviâ. *Ruiz et Pavon*. ♄.

Caulis fruticosus, erectus, ramosissimus, rigidus, cortice fuscescente obductus. *Ramuli* hirsuti. *Folia* petiolata, ex obovatâ ad ellipticam formam variantia, sed rariùs obovata, mucronulata, integerrima, nunc rariùs perparcè denticulata, utrinque sericeo-pubescentia, pollicem v. 2 pollices longa, è semipollicari ad unciam latitudine variantia. *Petioli* breves. *Flores* parvi, fasciculato-corymbosi, numerosissimi. *Pedicelli* sericeo-villosi. *Bracteolæ* ad basin involucri subsolitariæ, angustè lineares, obtusæ, pubescentes. *Involucrum* pentaphyllum: *foliolis* ligulatis, obtusis, æqualibus. *Receptaculum* copiosè villosum. *Flosculi* pauci (5—7), hermaphroditi, bilabiati, lutei; *labio exteriore* ligulato, obtusè tridenticulato; *interiore* bipartito, revoluto: *laciniis* linearibus, obtusiusculis, apice barbulatis. *Antheræ* appendiculâ lineari obtusiusculâ terminatæ, basi bisetæ: *setis* simplicibus. *Stigma* bifidum: *laciniis* recurvatis, truncatis, minutè papillosis. *Achenia* linearia, compressa, minutè papilloso-scabra. *Pappus* capillaris, flavescens, denticulis asper, caducus.

2. T. *calycina*, foliis petiolatis ovato-lanceolatis dentatis subtùs lanatis, involucro 10-phyllo: foliolis subulatis flosculis longioribus.

Perdicium

Perdicium calycinum. *Mart. Mss.*
In Bahiâ Brasiliensium. *Martius.* ♄.

Frutex facie *Æthoniæ fruticosæ**, erectus, rigidus, ramosissimus, fragilis. *Ramuli* teretes, undique villis copiosis glandulis minutis pedicellatis interstinctis vestiti. *Folia* alterna, petiolata, ovato-lanceolata, acuta, acutè dentata, tum dentibus approximatis subserrata, basi attenuata, subtùs copiosè villoso-lanata, suprà demùm nuda, viridia, bi- v. tripollicaria, semunciam v. ultra lata. *Corymbi* terminales, laxè divaricati. *Pedunculi* filiformes, minutè glandulosi, pollicares v. bipollicares, apicem versus crassiores, squamis aliquot (2—3) lineari-lanceolatis acuminatis muniti. *Involucrum* ferè *Kleiniæ*, simplex, decaphyllum minutè glandulosum, basi bracteolâ angustissimâ instructum: *foliolis* lineari-subulatis, erectis, acutis, flosculis longioribus. *Receptaculum* copiosè villosum. *Flosculi* 10—12, hermaphroditi, bilabiati; *labio exteriore* ligulato, patulo, acutè tridenticulato; *interiore* bipartito: *laciniis* lineari-lanceolatis, acutis, revolutis, apice imberbibus. *Antheræ* basi longè biaristatæ, appendiculâ lineari-lanceolatâ obtusiusculâ terminatæ. *Stigma* bipartitum: *laciniis* recurvatis, semicylindricis, apice truncatis, papilloso-puberulis. *Achenia* longa, teretiuscula, undique asperè papillosa, apicem versus paululùm angustiora. *Pappus* capillaris, cinereus, denticulis asper, caducus.

3. T. *corymbosa*, foliis petiolatis lanceolatis integerrimis puberulis, involucro 8-phyllo: foliolis lineari-lanceolatis acutis.
Perdicium corymbosum. *Herb. S. et M.*
In Mexico. *Sesse et Mocinno.* ♄.

Caulis lignosus, diffusè ramosissimus. *Rami* teretes, cortice striato cinereo-fusco obducti. *Folia* sparsa, petiolata, lanceolata,

* *Edinb. New Phil. Journ.* l. c. p. 309.

ceolata, mucronata, margine integerrima, nunc plana, subinde reflexa, utrinque cum ramulis pube subtili vestita, subtùs costâ prominulâ, reticulato-venosissima, membranacea, basi attenuata, sesqui- v. tripollicaria, semunciam v. paulò ultra lata. *Flores* lutei, copiosissimi, laxè corymbosi. *Pedunculi pedicelli*que densè pubescentes. *Bracteæ inferiores* per pedunculos sparsæ, foliis conformes; *superiores* sensim minores; *supremis* lineari-lanceolatis, acutis, basi attenuatis, margine revolutis, multò minoribus, involucrum munientibus. *Receptaculum* copiosè villosum. *Flosculi* 10—12, hermaphroditi, bilabiati; *labio exteriore* ligulato, obtusè tridenticulato, patulo; *interiore* bipartito: *laciniis* lineari-lanceolatis, revolutis, apice obtusis, barbulatis, marginibus primùm conglutinatis. *Antheræ* setis 2 capillaceis basi munitæ, apice appendiculâ lineari acutiusculâ ipsius antheræ longitudine coronatæ. *Stigma* bipartitum: *laciniis* semiteretibus, papilloso-pruinosis, apice truncatis, recurvis. *Achenia* teretia, minutè papillosa, et glandulosa. *Pappus* capillaris, flavescens, denticulis scaber, caducus.

** *Involucri squamis duplici ordine dispositis.*

4. T. *glutinosa*, foliis sessilibus oblongis integerrimis subtùs lanatis, floribus corymbosis, involucri foliolis lineari-lanceolatis coriaceis.

Perdicium brasiliense. *Mart. Mss.* non *L.*

In Brasiliæ provinciâ Minas Geraes vulgò dictâ. *Martius.* ♄.

Caulis fruticosus, erectus, ramosus. *Rami* teretes, cortice cinnamomeo obducti, pilis glandulisque copiosè ornati, viscosi, pennâ corvinâ vix crassiores. *Folia* alterna, sessilia, oblonga, v. lineari-lanceolata, mucronulata, integerrima, coriacea, suprà gramineo-viridia, reticulato-venosa, parcè incumbenti-pilosa, glandulosa, et glutinosa, subtùs copiosè cinereoreo-lanata, lanâ villosâ nunc lutescenti, sesqui- v. bipollicaria, semunciam lata. *Flores* corymbosi, magni, aurei. *Corymbus* simplex, terminalis pluri-(5—7)florus. *Pedunculi* robusti, uniflori, teretes, ut et *involucrum*, glandulis pedicellatis omninò induti, viscosissimi, foliolis aliquot (2—4) cæteris foliis simillimis, at perquàm minoribus, instructi. *Involucrum* duplici ordine polyphyllum: *foliolis* lineari-lanceolatis, acutis, obtusè carinatis; præthereà *bracteolæ* paucæ, lanceolatæ, acutæ, subtùs tomentosæ, breviores. *Receptaculum* densè villosum. *Flosculi* numerosi, hermaphroditi, tubo longo, limbo bilabiati: *labiis* revolutis; *exteriore* ligulato, obtusè 3-denticulato; *interiore* bipartito: *laciniis* lanceolato-linearibus, spiraliter convolutis. *Antheræ* appendiculâ lineari-lanceolatâ acutâ terminatæ, basi longè bisetæ: *setis* simplicibus, muticis. *Stigma* bifidum: *lobis* recurvis, semiteretibus, suprà canaliculatis, apice truncato, papilloso-barbulato. *Achenia* subteretia longiuscula, undique papilloso-scabra. *Pappus* pilosus, niveus, denticulis scaber.

This is totally distinct from the *Perdicium brasiliense* of Linnæus, as will hereafter appear.

5. T. *divaricata*, foliis lanceolatis acuminatis denticulatis basi auriculatis, floribus paniculatis, involucri foliolis lanceolatis membranaceis.

Perdicium divaricatum. *Kunth in H. et B. Nov. Gen. et Sp. Pl.* 4. *p.* 155. *t.* 355.

P. auriculatum. *Bot. Mag. t.* 2765.

In Peruviâ. *Ruiz et Pavon.* ♄.

Caulis fruticosus, teres, flexuosus, ut videtur scandens, divaricato-ramosissimus, cortice fulvello pubescente indutus. *Folia* alterna, sessilia, lanceolata, acuminata, margine denticulis

ticulis plurimis perexiguis instructa, membranacea, deorsùm attenuata, imâ basi auriculato-cordata, 3—5-pollicaria, latitudine pollicaria v. sesqui-pollicaria, suprà gramineo-viridia, nunc glabra, subtùs pallida, villosiuscula. *Flores* nutantes, paniculati, lutescentes. *Panicula* terminalis, divaricata, multiflora. *Pedunculi* flexuosi, *pedicelli*que copiosè pubescentes. *Bracteolæ* paucissimæ, lanceolato-subulatæ, recurvulæ, pubescentes. *Involucrum* duplici serie poly-(13—16)-phyllum, velutinum : *foliolis* lanceolatis, acuminatis, politis, membranaceis ; *intimis* plurimùm longioribus. *Receptaculum* villosum. *Flosculi* 12—14, bilabiati, hermaphroditi ; *labio exteriore* ligulato, 3-denticulato ; *interiore* bipartito : *segmentis* lanceolato-subulatis, apice puberulis. *Antheræ* appendiculâ lineari-lanceolatâ obtusiusculâ ipsâ antherâ longiore, basi setis 2 simplicibus munitæ. *Stigma* bipartitum : *laciniis* recurvis, apice truncatis, minutè papillosis. *Achenia* longiuscula, compressa, undique papilloso-glandulosa. *Pappus* capillaris, flavicans, caducus, denticulis scaber.

The figure given in the *Nova Genera et Species* is accurate as to the general character of the plant ; but the leaves are represented with a perfectly entire margin, which is clearly an error ; for there can be no question as to the identity of the two plants, and indeed the description of M. Kunth shows that the figure is faulty in this respect. I have no doubt that the *Perdicium auriculatum* given in the *Botanical Magazine* (tab. 2765.) is really this plant, and that it is not, as there erroneously stated, from Brazil, but had been imported from Peru.

*** *Involucrum basi bracteis 5 amplis foliaceis obvallatum : foliolis simplici ordine digestis. Flosculi plurimi.* Alcithoë.

6. T. *longifolia*, foliis petiolatis lanceolatis acuminatis integerrimis lævibus.

 Perdicium

Perdicium longifolium. *Herb. S. et M.*

In Mexico. *Sesse et Mocinno.* ♄ .

Caulis fruticosus. *Rami* cylindrici, pallidi, perparcè sericeo-pubescentes. *Folia* (Salicis) numerosa, alterna, brevissimè petiolata, lanceolata, acuminata, integerrima, submembranacea, utrinque, sed præsertim subtùs, adpressè villosiuscula, costâ prominulâ, venisque plurimis obliquis reticulatim ramosissimis manifestis, basi v. acutâ, v. (in *superioribus*) obtusâ, gramineo-viridia, plerumque palmaria, vix semipollicem lata. *Petioli* teretiusculi, lineam v. ultra longi. *Flores* terminales, corymbosi, aurei. *Corymbus* simplex, foliosus, multiflorus. *Pedunculi* copiosè glanduloso-pubescentes, unciales. *Bracteæ* 5, amplæ, foliaceæ, ovato-lanceolatæ, acuminatæ, glanduloso-pubescentes. *Involucrum* simplici ordine 8-phyllum : *foliolis* ligulatis, acutis, coriaceis, costatis, intùs sericeo-villosissimis, extùs atomis resinosis copiosissimis. *Receptaculum* copiosè villosum. *Flosculi* plures, (18—20) hermaphroditi, bilabiati ; *labio exteriore* ligulato, patulo, obtusè tridentato ; *interiore* bipartito, revoluto : *segmentis* lineari-lanceolatis, apice obtusis puberulisque. *Antheræ* appendiculâ ligulatâ obtusâ cartilagineâ antheram ipsam longitudine æquante, basi setis 2 simplicibus longis cuspidatis munitæ. *Stigma* bipartitum : *laciniis* recurvis, apice papilloso-barbatis, truncatis. *Achenia* teretiuscula, undique papilloso-scabra. *Pappus* capillaris, fulvellus, denticulis minutissimis scaber, fragilis, inæqualis, caducus.

7. T. *alata*, foliis decurrentibus ellipticis denticulatis scabris.

In Mexico. *Sesse et Mocinno.* ♄ .

Caulis fruticosus, erectus, rigidus, ramosus. *Rami* teretes, foliaceo-alati, copiosè pilosi, scabri. *Folia* alterna, longè per

caulem

caulem decurrentia, oblongo-ovata, acuta, mucronuloque corneo munita, utrinque papillis setosis exasperata, viridia, margine denticulata, costâ basi penitùs prominenti apicem versus perexili, venis prominulis obliquis ramosissimis, 2—3-uncialia, unciam v. sesquiunciam lata. *Flores* terminales, plures, corymbosi. *Corymbus* simplex. *Pedunculi* teretes, validi, densè glanduloso-pilosi, semunciales. *Bracteæ* 5, amplæ, foliaceæ, ovato-lanceolatæ, acuminatæ, copiosè glandulosæ, pollicares v. sesquipollicares, vix semipollicem latæ, involucro longiores, atque obvallantes. *Involucrum* simplici serie 8-phyllum : *foliolis* lineari-lanceolatis, acuminatis, coriaceis, apice membranaceis, papilloso-glandulosis. *Receptaculum* densè pilosum. *Flosculi* aurei, plurimi (24) hermaphroditi, bilabiati, omnibus majores; *labio exteriore* ligulato, elliptico, tridenticulato; *interiore* profundè bipartito: *segmentis* linearibus, obtusis, pilosiusculis, spiraliter revolutis. *Antheræ* basi bisetæ: *setis* simplicibus, aristatis: *appendiculâ* ligulatâ, obtusâ, cartilagineâ, ipsâ antherâ breviore. *Stigma* bipartitum: *lobis* recurvatis, apice truncatis et papillosis. *Achenia* teretiuscula, papilloso-scabra, spadicea. *Pappus* capillaceus, denticulis scaber, caducus, niveus.

8. T. *involucrata*, foliis ovato-lanceolatis integerrimis subtùs sericeo-villosissimis.

In Mexico. *D. Paullus de La Llave.* ♄.

Caulis fruticosus, ramosus. *Rami* teretes, undique villosissimi. *Folia* alterna, sessilia, conferta, ovato-lanceolata, acuminata, integerrima, uninervia, venis angulo acuto obliquis, plurimis; membranacea, suprà viridia, glandulis pedicellatis copiosè ornata, subtùs sericeo-villosissima, pollicaria. *Flores* magni, in apice ramulorum pauci (4—5), corymbosi.

Involucrum copiosè glandulosum, serie simplici 8-phyllum, bracteis amplis, foliaceis, ovato-lanceolatis, mucronatis obvallatum: *foliolis* lineari-lanceolatis, mucronatis, nervosis. *Receptaculum* copiosè villosum. *Flosculi* aurei, copiosi, bilabiati, hermaphroditi, æquales: *tubo* intùs hirsuto; *labio exteriore* ligulato, patulo, apice tridenticulato; *interiore* altè bipartito: *segmentis* linearibus, revolutis, apice obtuso, barbato. *Filamenta* compressa, glabra. *Antheræ* appendiculâ ipsius antheræ longitudine, ligulatâ, coriaceâ terminatæ, basi longè biaristatæ: *aristis* nudis, lineari-setaceis. *Stylus* filiformis, glaber. *Stigmata* semicylindrica, truncata, minutè papillosa. *Achenia* longitudine ferè involucri, angusta, tetragona, minutè papilloso-scabra. *Pappus* pilosus, fulvo-cinereus: *radiis* duplici ordine digestis, creberrimè denticulatis, basi solutis, deciduis.

This genus constitutes the transition from the *Cichoraceæ* to the more aberrant groups of the *Labiatifloræ*. The habit and the general resemblance of its flowers to those of the former family, justify the place which I have assigned to it. I have followed Lagasca and DeCandolle in restoring the old name of *Trixis*, first applied to designate the original species of this genus by Dr. Patrick Browne; but the genus having been united to *Perdicium* by Linnæus, the name was subsequently used by Swartz to denote the *Baillieria* of Aublet. The third section may probably be reckoned sufficiently distinct to constitute another genus; but this point I shall leave 'till further observations shall determine.

Cleanthes.

Perdicii sp., *L.*

Receptaculum glabrum! *Flosculi* indefiniti. *Involucrum* æquale.

Involucrum simplici v. duplici ordine polyphyllum: *foliolis* subæqualibus.

æqualibus. *Receptaculum* convexum, glabrum. *Flosculi* indefiniti, hermaphroditi, bilabiati; *labio exteriore* elliptico, obtusè tridenticulato, 4-nervio, patulo; *interiore* bipartito: *laciniis* lanceolatis, acutis, binerviis, revolutis, sæpè margine conglutinatis. *Stamina* tubo inserta: *filamenta* glabra; *articulo superiore* teretiusculo: *antheræ* appendiculâ lineari-lanceolatâ, acutâ, cartilagineo-membranaceâ coronatæ, basi bisetosæ: *setis* compressis, attenuatis, simplicibus, æqualibus. *Stylus* filiformis, glaber, basi bulbosus. *Stigmata* semicylindrica, apice truncata, minutè papillosa, recurvata. *Achenia* subfusiformia, compressa, undique papilloso-scabra, 5-costata: *costis* callosis. *Discus epigynus* dilatatus, concavus. *Pappus* pilosus, persistens: *radiis* duplici ordine copiosis, denticulato-scabris.

Herbæ *perennes, habitu omninò* Hieracii. Caulis *multiflorus.* Folia *indivisa;* radicalia *maxima, petiolata.* Flores *corymbosi.* Pappus *cinereus.*

1. C. *brasiliensis*, pilosissima; caule angulato, involucri foliolis lanceolatis obtusis.

Perdicium brasiliense. *Linn. Mant.* 115. *Vahl. in Act. Soc. Hist. Nat. Haf.* 1. *p.* 12.

In Brasiliâ. *Arduini.* ♃.

Herba perennis, tota pilis basi callosis copiosè vestita, hispidula. *Caulis* erectus, angulatus, supernè sulcatus, apice ramosus, pedalis. *Folia radicalia* petiolata, patula, elliptico-oblonga, aut spathulata, sinuato-dentata (dentibus tuberculo calloso terminatis, productis, tunc rarò paulò retrorsis), basi attenuata, costâ mediâ subtùs prominulâ nervisque angulo acuto obliquè transversis instructa, palmaria, sesquiunciam lata; *caulina* plura, multoties minora, sessilia, lineari-lanceolata, margine dentata, revoluta, tuberculo calloso terminata,

terminata, uncialia v. biuncialia. *Petioli* unciales, subtùs carinati, basi valdè dilatati. *Flores* plures (7) corymbosi, magnitudine *Hieracii Sabaudi*. *Pedunculi* sulcati, bipollicares, uniflori, undique densè pilosi et glandulosi, basi sæpiùsque supra medium bracteolâ lineari-lanceolatâ canaliculatâ muniti. *Involucrum* hispidissimum, duplici ordine poly-(14—18)phyllum : *foliolis* ligulatis, obtusis, basi subtùs obtusè carinatis, apice planis membranaceis latioribusque. *Flosculi* lutei, numerosi, hermaphroditi, bilabiati: *tubo* glanduloso, basi 5-angulo, fauce dilatato ; *labio exteriore* elliptico-oblongo, obtusè tridenticulato, 4-nervio, nervis intermediis profundè bipartitis ; *interiore* bipartito : *segmentis* lanceolatis, acutis, revolutis, nervis 2 longè intramarginalibus. *Filamenta* glabra ; *articulo superiore* teretiusculo, duplò breviore. *Antheræ* appendiculâ lineari, obtusâ, subfalcatâ, cartilagineâ coronatæ basi bisetosæ : *setis* complanatis, attenuatis, æqualibus. *Stylus* glaber, basi callosâ. *Stigmata* linearia, truncata, minutè papillosa, recurva. *Achenia* subfusiformia, undique papilloso-scabra. *Discus epigynus* concavus. *Pappus* pilosus, cinereus : *radiis* duplici ordine copiosissimis, denticulato-scabris, deciduis.

The foregoing description of this interesting, and hitherto obscure plant, is taken from the original specimen preserved in the Linnæan herbarium, which together with the extensive collections and library of the late Sir James Edward Smith have now become the property of the Linnean Society. The acquisition of these collections will add much to the honour and credit of the Society, and will tend greatly to advance the science of Natural History in this country. Now that the number of species is so much increased, it is impossible in extensive genera to determine satisfactorily the older ones, without having recourse to the authentic materials on which they were founded.

2. C. *hie-*

2. C. *hieracioides*, glabriuscula; caule subnudo tereti, involucri foliolis cuneato-lanceolatis acutis.

In Brasiliâ. *Sello.* ♃.

Planta herbacea, leviter papillosa, virens. *Radix* perennis, è fibris pluribus, fili emporetici crassitie composita. *Caules* è radice plures, erecti, teretes, subfiliformes, apice tantùm ramosi, foliis ferè destituti, sesquipedales, pennam corvinam crassitie vix adæquantes. *Folia radicalia* maxima, petiolata, patula, oblongo-spathulata, repanda, vix ac ne vix sinuata, uninervia, basi attenuata, suprà prope marginem præsertim scabriuscula, aculeis minutissimis callosis, subtùs ad costam pilosa, palmaria, latitudine ferè biuncialia; *caulina* paucissima (2 v. 4) plurimùm minora, semiamplexicaulia, lineari-lanceolata, mucronulata, denticulata, uncialia. *Flores* plures (5—7) corymbosi. *Pedunculi* longi, simplices v. bifidi, copiosè papilloso-glandulosi. *Bracteæ* lineares, mucronulatæ. *Involucrum* simplici ordine poly(10-)phyllum: *foliolis* cuneato-lanceolatis, acutis, concavis, extùs copiosè papilloso-glandulosis, scabris. *Receptaculum* nudum. *Flosculi* plures, hermaphroditi, albi? *tubo* glanduloso: *limbo* eodem breviore, bilabiato; *labio exteriore* elliptico, obtusè tridenticulato, 4-nervio, patulo; *interiore* bipartito: *laciniis* lanceolatis, acutis, binerviis, revolutis, sæpè margine conglutinatis. *Antheræ* appendiculâ lanceolatâ acutâ, cartilagineo-membranaceâ coronatæ, basi longè bisetosæ. *Stylus* filiformis, glaber, basi bulbosus. *Stigmata* semicylindrica, recurvata, apice truncata, parùm dilatata, minutèque papillosa. *Achenia* subfusiformia, compressa, papilloso-scabra, 5-costata. *Pappus* pilosus, cinereus, persistens: *radiis* duplici ordine copiosis, scabris, rigidulis.

Very near akin to the preceding species; but in that the stem is angular and somewhat leafy, and the whole plant clothed with bristly

bristly hairs. The flowers are also larger; and the leaflets of the involucrum nearly twice the number, and arranged in a double series. The genus, which appears to be a very natural one, is essentially distinguished from *Trixis* by the naked receptacle.

PROUSTIA. *Lag. et Dec.*

Receptaculum pilosum. *Flosculi* 5. *Pappi radiis* penicillatis. *Involucrum* polyphyllum, imbricatum.

Involucrum tubulosum, polyphyllum: *squamis* ellipticis, integerrimis, multiplici serie adpressè imbricatis. *Receptaculum* parvum, copiosè pilosum. *Flosculi* 5, hermaphroditi, bilabiati; *labio exteriore* ligulato, tridenticulato, 4-nervio, patulo, demùm revoluto; *interiore* profundè bipartito: *segmentis* lineari-lanceolatis, binerviis, obtusiusculis, revolutis, primùm conglutinatis. *Antheræ* in tubum connatæ, basi bisetæ: *setis* simplicibus v. ramulosis: *appendicula terminalis* linearis, acutiuscula, cartilaginea. *Stigma* bilobum: *lobis* apice truncatis, papilloso-pruinosis, recurvis. *Achenia* cuneata, compressa, pilosa v. teretiuscula et papillosa: *disco epigyno* dilatato. *Pappus* persistens: *radiis* duplici ordine copiosis, apice penicillatis.

Arbusculæ v. Frutices *ramosissimi*. Folia *alterna, indivisa*. Flores *thyrsoidei v. fasciculato-corymbosi, purpurei aut lutei.*

* *Floribus thyrsoideis purpureis, acheniis pilosis, pappo colorato.* Propriæ.

1. P. *pyrifolia*, foliis petiolatis cordato-rotundis ovalibusve subtùs tomentosis.

Proustia pyrifolia. *Lag. et Dec. in Ann. Mus.* 19. *p.* 70. *t.* 4.

In Chili prope Talcahuana (*Ludovicus Née*); ad Coquimbo. *Caldcleugh.* ♄.

Arbuscula erecta, ramosissima, tempore florendi ornatissima. *Rami*

Rami teretes, à casu foliorum nodosi, tomento cinereo deciduo vestiti. *Folia* omninò *Mali* v. *Cydoniæ*, alterna, petiolata, subrotundo-cordata v. ovalia, abruptè mucronulata, mucronulo brevissimo conico, margine integerrima, v. nunc sæpè dentibus pluribus mucronulatis instructa, coriacea, basi nunc rotundata, tunc obsoletiùs cordata, suprà viridia, nitida, glandulisque elevatis copiosè ornata, reticulato-venosissima, subtùs tomento denso cinereo, demùm flavicanti et partim deciduo, instructa, sesqui- v. ferè tri-pollicaria, unciam aut sesquiunciam lata. *Petioli* teretes, densè tomentosi, suprà depressiusculi, 3 lineas longi, basi crassiore remanenti, inde rami tuberculati. *Flores* purpurei, in thyrso amplo copiosissimi, glomerati, hinc comosi. *Rachis* et *pedicelli* omninò lanati. *Involucrum* oblongo-cylindricum, polyphyllum : *squamis* ovalibus, obsoletè mucronulatis, coriaceis ; *extimis* ovatis, levissimè lanuginosis, margine ciliatis, adpressè et decussatim imbricatis. *Receptaculum* punctum pilosum. *Flosculi* 5, hermaphroditi, bilabiati ; *labio exteriore* ligulato, acutè tridenticulato, parùm revoluto ; *interiore* profundè bipartito, spiraliter revoluto : *laciniis* linearibus, acutis, primùm marginibus leviter conglutinatis. *Antheræ* appendiculâ lineari acutâ cartilagineâ terminatæ, basi bisetæ : *setis* linearibus, compressis, basi ramulosis. *Stigma* bilobum : *lobis* crassis, recurvulis, apice obtusis, minutè papilloso-pruinosis. *Achenia* pilosa. *Pappus* purpureus : *radiis* basi solutis, apice penicillatis.

2. P. *oblongifolia*, foliis petiolatis oblongis subtùs tomentosis.
In Peruviâ. *Ruiz et Pavon.* ♄.

Præcedenti similis. *Rami* teretes, flexuosi, post foliorum lapsum nodulosi, tomento cinereo caduco primò vestiti, glandulisque elevatis persistentibus perparcè muniti. *Folia* alterna, petiolata,

tiolata, oblonga, mucronata, mucrone brevi subulato recto, margine integerrima v. parcè denticulata, coriacea, suprà viridia, lucida, reticulato-venosissima, venis siccitate prominulis, subtùs densè cinereo-tomentosa, ferè bipollicaria, 9 lineas v. parùm ultra lata. *Flores* glomerati, in thyrsum confertum ovatum dispositi. *Pedunculi* et *pedicelli* brevissimi, densè lanati. *Involucrum* polyphyllum, decussatim imbricatum; *squamis exterioribus* ovatis, acutiusculis, concavis; *interioribus* oblongis, obtusis, pariter coriaceis, levissimè lanuginosis. *Flosculi* 5, omninò ut in *præcedente*. *Antheræ* basi bisetæ: *setis* basi ramulosis: *appendiculâ* lineari, acutiusculâ. *Stigma* bilobum: *lobis* semiteretibus, obtusis, crassis, minutè papillosis. *Achenia* pilosa. *Pappus* fusco-purpureus: *radiis* apice penicillatis, imâ basi connexis.

This species is intimately allied to the preceding; but its oblong, and much narrower leaves, appear to constitute a specific distinction.

** *Floribus pappoque albis, acheniis papilloso-scabris, teretiusculis.*

3. P. *reticulata*, foliis sessilibus oblongo-cuneatis serrulatis glabris, thyrso composito laxo.

Proustia reticulata. *Lag. Mss.*

Perdicium serrulatum. *Herb. S. et M.*

In Mexico. *Sesse et Mocinno.* ♄.

Frutex erectus, rigidus, ramosissimus. *Rami* sulcati, glabri. *Folia* sessilia, oblongo-cuneata, quandoque obovata, argutè serrulata, coriacea, basin versus integerrima, utrinque glabra, siccitate lutescenti-viridia, costâ venisque ramosissimis prominulis reticulata, subtùs punctis numerosissimis resinosis ornata, 3 pollices longa, unciam v. sesquiunciam lata; *rameis* lineari-oblongis, mucronulatis, vix pollicaribus.

Flores

Flores glomerati (glomeruli 4—9-flori), in thyrsum laxum, obtusè pyramidatum digesti, albi, siccitate flavescentes. *Involucrum* tubulosum, imbricatum, ferè semunciale: *squamis* ovalibus, obtusis, ciliatis, adpressis. *Receptaculum* pilosum. *Flosculi* 5, hermaphroditi, bilabiati; *labio exteriore* ligulato, obtusè 3-denticulato; *interiore* bipartito: *segmentis* lineari-lanceolatis, obtusis, revolutis, primùm conglutinatis. *Antheræ* appendiculâ lanceolatâ muticâ cartilagineâ coronatæ, basi bisetæ: *setis* simplicibus, setaceo-subulatis, acutissimis, ipsâ antherâ longioribus. *Stigma* bilobum, minutè papilloso-pruinosum. *Achenia* cuneata, compressa, minutè papillosa. *Pappus* albus, demùm flavescens, deciduus: *radiis* tenuissimis, apice penicillatis.

4. P. *mexicana*, foliis amplexicaulibus cordatis acuminatis denticulatis membranaceis, corymbis fasciculatis, involucri squamis ovato-lanceolatis acuminatis.

Proustia mexicana. *Lag. Mss.*

Perdicium mexicanum. *Herb. S. et M.*

In Mexico. *Sesse et Mocinno.* ♄.

Rami erecti, sulcati, pube glandulosâ vestiti. *Folia* alterna, amplexicaulia, cordato-ovata v. oblonga, acuminata, argutè copiosèque spinuloso-denticulata, tunc subserrata, membranacea, reticulato-venosa, utrinque asperè papillosa, viridia, subtùs et ramuli, præcipuè juventute, atomis resinosis aureo-micantibus adspersa, pollicaria v. bipollicaria, unciam lata. *Flores* fasciculato-corymbosi. *Pedicelli* squamis ovato-lanceolatis, acuminatis, recurvulis, minutè glandulosis muniti. *Involucra* oblonga, tubulosa, polyphylla, copiosè glandulosa: *squamis* ovato-lanceolatis, acuminatis, adpressis. *Flosculi* 5, hermaphroditi, bilabiati, albi; *labio exteriore* ligulato, acutè tridentato; *interiore* bipartito: *laciniis* linearibus,

bus, obtusiusculis, revolutis. *Antheræ* basi setis longis, simplicibus, acutis munitæ, appendiculâ lineari-lanceolatâ, obtusiusculâ terminatæ. *Stigma* bifidum: *laciniis* semiteretibus, truncatis, recurvis, papilloso-pruinosis. *Achenia* teretiuscula, papilloso-scabra. *Pappus* albus: *radiis* denticulis scabris, imâ basi connexis, apice subsimplici!

*** *Flores laxè spicati, rosei. Achenia cuneato-trigona, villosa. Pappus capillaris, fusco-purpureus.* Harmodia.

5. P. *cuneifolia*, foliis lanceolato-cuneatis mucronulatis dentatis coriaceis glabris, floribus spicatis.

In Chili ad Coquimbo. *Caldcleugh.* ♄.

Frutex erectus, rigidus, facie proteaceâ. *Rami* teretes, glabri, foliosi. *Folia* alterna, petiolata, bipollicaria, lanceolato-cuneata, mucronulata, coriacea, rigida, glabra, subtùs costâ prominente venisque conspicuis reticulata, margine nunc integerrima, nunc denticulata, illinc dentibus paucis majoribus ad apicem instructa, infernè attenuata, vix semipollicem lata. *Flores* sessiles, solitarii v. per paria remotiusculi, bracteâ lineari-lanceolatâ mucronatâ foliaceâ suffulti, hinc quasi axillares, in spicam terminalem, nunc basi ramosam, palmarem dispositi. *Involucra* polyphylla, imbricata, parcè lanuginosa: *squamis* ovalibus ellipticisve, obtusis, concavis, coriaceis, margine præcipuè lanuginosis, adpressis. *Receptaculum* villosum. *Flosculi* 5, hermaphroditi, bilabiati, rosei; *labio exteriore* ligulato, acutè tridentato; *interiore* bipartito, revoluto: *laciniis* linearibus, obtusis. *Antheræ* basi setis 2, longis, simplicibus, acutis auctæ, appendiculâ ligulatâ, acutiusculâ, cartilagineâ terminatæ. *Stigma* bifidum: *lobis* lingulatis, obtusis, minutè papillosis, recurvis. *Achenia* cuneata, trigona, sericeo-villosa.

villosa. *Pappus* fusco-purpureus, mollissimus: *radiis* longis, capillaceis, apice puberulis.

Acourtia.

Receptaculum nudum. *Flosculi* indefiniti. *Pappi radiis* penicillatis. *Involucrum* polyphyllum, imbricatum.

Involucrum turbinatum, multiplici ordine polyphyllum, imbricatum: *squamis* lanceolatis, mucronatis, adpressis, integerrimis, basi dilatatâ cum rachi articulatis, deciduis! *Receptaculum* nudum, scrobiculatum. *Flosculi* plurimi (25—30) hermaphroditi, bilabiati, æquales; *labio exteriore* ligulato, obtusè tridentato, 4-nervio; *interiore* bipartito, revoluto: *segmentis* linearibus, obtusis, binerviis. *Antheræ* appendiculâ lineari-lanceolatâ, acutiusculâ, cartilagineâ terminatæ, basi bisetosæ: *setis* simplicibus, obtusis. *Stigmata* linearia, truncata, apice papillosa. *Achenia* teretiuscula, (semuncialia) undique papilloso-scabra: *disco epigyno* parùm dilatato, planiusculo. *Pappi radiis* simplici serie contiguis, deciduis, apice penicillatis.

Planta *fruticosa, habitu omninò* Serratulæ, *glauca.* Caulis *sesqui- v. tri-pedalis, erectus, rigidus, teres, paniculatim ramosus.* Rami *sulcati, glabri, virides, nunc sanguinolenti, pennæ corvinæ crassitie.* Folia *alterna, amplexicaulia, cordato-oblonga, quandoque supernè latiora, subspathulata, mucrone calloso instructa, margine spinuloso-serrata, posticibus rotundatis, substantiâ cartilaginea, rigida, utrinque nuda, reticulato-venosissima, 2—4-uncialia, pollicem v. sesquipollicem lata;* summis *multò minoribus, sæpiùsque integerrimis.* Flores *in apice ramulorum plures* (3—10) *corymboso-glomerati,* Serratulæ coronatæ *magnitudine.* Pedunculi *teretes, glabri, semipollicares.* Involucra *sæpè sanguineo-colorata.* Flosculi *purpurei:*

purpurei: nervis *infra sinus laciniarum dichotomis.* Pappus *niveus.*

1. A. *formosa.*
In Mexico. *Sesse et Mocinno.* ♄.

This genus agrees with the preceding in the structure of its involucrum, and with *Trixis* in the indefinite number of its florets; but it is distinguished from both by its naked receptacle, and from *Clarionia* by the structure of its pappus, by its equal florets, as well as by its widely different habit.

I have dedicated this very distinct and interesting genus to Mrs. A'Court, of Heytesbury House, Wilts, whose botanical taste and knowledge have long merited for her this compliment.

Clarionia. *Lag. et Dec.*

Perezia. *Lag. Amen. Nat.* 1. *p.* 31.

Receptaculum nudum. *Flosculi* indefiniti. *Pappus* capillaris. *Involucrum* polyphyllum, imbricatum.

Involucrum oblongum, cylindricum, multiplici ordine polyphyllum, imbricatum. *Receptaculum* nudum. *Flosculi* omnes hermaphroditi, bilabiati; *marginales* majores, radium æmulantes; *labio exteriore* longo, ligulato, 4-nervio, obtusè tridenticulato, patulo; *interiore* profundè bipartito: *segmentis* lineari-angustissimis, binerviis, apice attenuatis, spiraliter revolutis, primò margine conglutinatis, uti sæpiùs perfacilè pro unico et simplici habitis; *disci* multoties breviores; *labio exteriore* elliptico, concavo, obtusè tridenticulato; *interiore* bipartito, spiraliter revoluto: *segmentis* similiter conglutinatis, at latioribus. *Filamenta* capillaria, glabra, articulo manifesto. *Antheræ* appendiculâ lineari, acutâ, cartilagineo-

cartilagineo-membranaceâ terminatæ, basi bisetæ: *setis* inæqualibus, validiusculis, mucronatis, simplicibus. *Stigmata* linearia, truncata, revoluta, suprà canaliculata, apice parùm dilatato, papilloso. *Achenia* teretiuscula v. compressa: *disco epigyno* dilatato. *Pappus* persistens, pilosus: *radiis* duplici ordine copiosis, scabris, apice simplicibus.

Herbæ *perennes*. Flores *solitarii, magni, rubri v. albi.*

* *Caulescentes foliis indivisis.*

1. C. *spathulata*, foliis planis spathulatis.
   Clarionia spathulata. *Lag. Mss.*
   In Chili. *Ruiz et Pavon.* ♃.

Herba cæspitosa. *Caulis* pedalis, erectus, simplicissimus, aliquandò ramulum unicum protrudit, uniflorus, filiformis, glaber, crassitie pennæ corvinæ, apicem versus glandulis pedicellatis copiosè ornatus. *Folia radicalia* ferè omninò *Othonnæ cheirifoliæ*, numerosa, spathulata, plana, coriacea, margine integerrima v. crenulata, utrinque lætè viridia, glaberrima, subtùs costâ validâ venisque reticulatis instructa, basin versus in petiolum attenuata, sesquipollicaria, ad laminam latitudine unguem adæquantia; *caulina* sparsa, plurimùm minora, stricta, subadpressa, lingulata, margine integerrima ac cartilaginea, basi dilatatâ et denticulatâ, unguicularia v. nunc (præsertim inferiora) ferè uncialia. *Flos* terminalis, solitarius. *Involucrum* triplici ordine polyphyllum, imbricatum: *squamis* ligulatis, integerrimis, adpressis, minutè glandulosis; *interioribus* mucronulatis, longioribus. *Flosculi* hermaphroditi, bilabiati, albi; *labio exteriore* longo, ligulato, obtusè tridenticulato, 4-nervio; *interiore* bipartito: *segmentis* angustissimis, revolutis, binerviis. *Antheræ* appendiculâ lineari, acutâ, colloratâ,

loratâ, cartilagineâ terminatæ, basi bisetæ: *setis* longissimis, linearibus, complanatis, filamentoso-aristatis. *Stylus* inclusus. *Stigma* bipartitum: *segmentis* linearibus, truncatis, recurvis, apice papillosis. *Achenia* ancipiti-compressa, adpressè sericeo-villosissima. *Pappus* pilosus, inæqualis, creberrimè denticulatus, fusco-cinereus.

Near akin to *Clarionia lactucoides*, the *Perdicium lactucoides* of Vahl (*Act. Havn.* 1. *pars* 2. *p.* 11. *t.* 5.), which however is readily distinguished by having the radical leaves on long footstalks, lanceolate, and obtuse. In other respects both plants are much alike.

2. C. *recurvata*, foliis recurvatis linearibus rugosis margine revolutis spinuloso-denticulatis.

Perdicium recurvatum. *Vahl. l. c.* 1. *p.* 13. *t.* 7. (bona.)

In Chili. *Ruiz et Pavon.* ♃.

Caulescens, sempervirens, fruticulosa. *Caules* palmares, densè foliosi. *Folia* undique versa, basibus valdè dilatatis, margine membranaceo-ciliatis, imbricata, sursùm recurvato-patula, linearia, spinulâ cartilagineâ albâ apiculata, nitida, viridia, margine revoluta, suprà transversim reticulato-rugosa, costâque latâ planiusculâ instructa, utrinque glandulis minutis pedicellatis, præsertim ad costam, munita, in periphæriâ paginæ superioris præcipuè denticulis plurimis spinulosis, cartilagineis, albis, unicâ serie digestis, aliisque rarò adspersis, ornata, pollicaria, sesquilineam lata. *Pedunculus* solitarius, terminalis, tripollicaris, erectus, filiformis, uniflorus, pube glandulosâ asperulus, foliolis aliquot sparsis, linearibus, costâ validâ carinatis, spinuloso-mucronatis, margine ciliatis, adpressis munitus. *Involucrum* campanulatum, unciale: *squamis* multiplici ordine adpressè imbricatis,

catis, ligulatis, spinuloso-mucronatis, extùs papilloso-glandulosis, asperiusculis; *exterioribus* margine spinuloso-ciliatis; *interioribus* margine membranaceis, integerrimis. *Flosculi* hermaphroditi, bilabiati, albi; *labio exteriore* ligulato, 3-denticulato, 4-nervio; *interiore* bipartito, membranaceo, spiraliter revoluto. *Antheræ* appendiculâ lineari-lanceolatâ acutâ, basi longè bisetosæ. *Stigma* exsertum, bipartitum: *segmentis* semicylindricis, recurvatis, apice latiore truncato, minutè papilloso. *Achenia* ancipiti-compressa, glabra. *Pappus* pilosus, inæqualis, creberrimè denticulatus, fusco-brunneus.

** *Acaules foliis pinnatifidis, acheniis elongatis, teretiusculis.* Palesia.

3. C. *runcinata*, foliorum segmentis rotundatis spinoso-serratis undulatis, scapis elongatis, involucri squamis integerrimis.

Perezia runcinata. *Lag. Mss.*

In Mexico. *Sesse et Mocinno.* ♃.

Radix fusiformis. *Caudex* brevissimus, lanatus. *Folia* plurima, radicalia, breviter petiolata, spathulato-oblonga, runcinato-pinnatifida, membranacea, utrinque viridia, punctis elevatis aspera, siccitate tactu arida (an similiter in *vivis?*) 3—5-pollicaria, unciam v. sesquiunciam lata: *lobis* latis, rotundatis, crebrè inæqualiterque spinoso-serratis, undulatis. *Scapi* erecti, filiformes, scabri, uniflori, folia longitudine æquantes, apicem versus paululùm crassiores. *Involucrum* multiplici ordine polyphyllum, imbricatum: *squamis* lanceolatis, pungenti-mucronatis, integerrimis, rigidis, aliisque similibus per scapi superius dimidium sparsis. *Receptaculum* nudum. *Flosculi* omnes hermaphroditi, bilabiati, nervis infra laciniarum sinus profundè bipartitis; *exteriores* multò majores; *labium exterius* maximum, ligu-

 latum,

latum, patulum, apice tridenticulatum, nervis 4 æqualiter distantibus; *interius* profundè bipartitum: *segmentis* lineari-lanceolatis, binerviis, apice spiraliter revolutis. *Antheræ* appendiculâ lanceolatâ acutâ cristatæ, basi longè bicornutæ. *Stigmata* linearia, revoluta, suprà canaliculata, apice truncato, dilatato, papilloso. *Achenia* teretiuscula, papilloso-muricata, semuncialia: *disco epigyno* dilatato, calloso. *Pappus* longus, pilosus, cinereo-fulvellus: *radiis* duplici ordine confertissimis, scabris, apice simplicibus, inæqualibus.

4. C.? *virens*, foliorum segmentis ellipticis spinuloso-ciliatis planis, flore sessili, involucri squamis dentatis.

In Peruviæ summis alpibus Cordilleras de los Andes Hispanicè dictis. *Ruiz et Pavon*. ♃.

Herba ex habitu *Cl. Magellanicæ* affinis videtur, acaulis, cæspitosa, intensè clarèque virens. *Radix* e fibris compluribus longis crassiusculis composita. *Folia* in orbem acta, numerosa, patentissima, profundè pinnatifida, circumscriptione lanceolata, membranacea, tactu arida, rigentia, sesqui- v. bipollicaria, semunciam lata, basi tenuissimè membranaceo-ciliatâ, costâ validâ infernè latiore subtùs convexâ: *segmentis* ovalibus, planis, margine ciliis plurimis cartilagineis, setaceo-spinulosis ornatis, apice aristâ tenui, longiusculâ, rectâ instructis, utrinque oculo armato punctis numerosis, minutissimis adspersis. *Flos* solitarius, sessilis. *Involucrum* polyphyllum: *squamis* oblongis, mucronatis, spinuloso-dentatis. Cætera mihi ignota.

HOMOIANTHUS.

HOMOIANTHUS. *Bonpl., Dec.*

HOMANTHIS. *Kunth.*

PEREZIÆ SP., *Lag.*

PERDICII SP., *Vahl.*

Receptaculum tuberculatum. *Pappus* pilosus. *Involucrum* duplici ordine polyphyllum, subæquale.

Involucrum hemisphæricum, duplici ordine polyphyllum : *foliolis* longitudine æqualibus ; *exterioribus* dentatis ; *interioribus* integerrimis, mucronatis. *Receptaculum* tuberculis truncatis margine fimbriatis instructum. *Flosculi* subæquales, hermaphroditi, bilabiati ; *labio exteriore* elliptico, concavo, marginibus induplicatis, obtusè tridenticulato, substantiâ crassiusculo, cartilagineo ; *interiore* membranaceo, bipartito : *laciniis* linearibus, spiraliter revolutis. *Filamenta* complanata, glabra, articulo manifesto. *Antheræ* appendiculâ lineari-lanceolatâ acutâ cristatæ, basi bisetæ : *setis* simplicibus, attenuatis. *Stylus* filiformis. *Stigma* inclusum, bifidum : *lobis* semicylindricis, apice truncatis, papilloso-pruinosis. *Achenia* compressa, densè hirsuta. *Pappus* pilosus : *radiis* duplici serie digestis, denticulato-scabris, basi solutis, deciduis.

Herbæ *perennes.* Folia *pinnatifida.* Flores *solitarii v. corymbosi.* Flosculi *cærulei v. albi.* Pappus *sordidè fulvus.* Achenia *villis adpressis ferrugineis nitidis tecta.*

1. H. *pinnatifidus,* inermis ; foliorum segmentis ovalibus obtusis ciliatis imbricatis, caule unifloro foliis breviore.

Homoianthus. *Dec. in Ann. Mus.* xix. *p.* 65. *t.* 3. *f.* 2.

Homanthis pinnatifidus. *Kunth in H. et B. Nov. Gen. et Sp. Pl.* 4. *p.* 308.

Chætanthera pinnatifida. *H. et B. Pl. Æqu.* 2. *p.* 170. *t.* 136.
Perezia pinnatifida. *Lag. Mss.*
In Peruviæ alpibus summis frigidissimis. *Ruiz et Pavon.* ♃.

Herba perennis, subacaulis, cæspitosa. *Radix* e fibris compluribus filo emporetico crassitie æqualibus, longissimis composita. *Caules* plures, foliis duplò breviores, erecti, simplices, uniflori, teretes, supernè pilosi, vix pennam anserinam crassitie æquantes. *Folia radicalia* plurima, in orbem acta, patula, petiolata, profundè pinnatifida, circumscriptione linearia, obtusa, costâ dilatatâ, subtùs convexâ, nervosâ, bi- v. tri-pollicaria: *segmentis* subrotundo-ovalibus, obtusis, inæquilateris, coriaceis, suprà punctis numerosis elevatis asperis, subtùs glabris, margine setaceo-ciliatis, sæpiùs conduplicatis, invicem se imbricatis, unguicularibus; *caulina* paucissima (2—3) lineari-lanceolata, duplicato-serrata, serraturis aristatis, semuncialia, 2 lineas lata, petiolis longioribus membranaceis paginam ipsam latitudine penissimè æquantibus. *Petioli* lineares, dilatati, nervosi, margine membranacei, basin versus latiores, subtùs striati, 2—3-unciales, 3—4 lineas lati. *Flores* terminales, solitarii, albi. *Involucrum* hemisphæricum, duplici ordine poly-(24—30)phyllum, æquale: *foliolis exterioribus* duplicato-serratis (serraturis aristatis) foliis caulinis subsimilibus; *intimis* ligulatis, apice rotundatis, mucronato-aristatis, margine membranaceis, integerrimis. *Receptaculum* an tuberculatum? *Flosculi* omnes hermaphroditi, æquales, bilabiati; *labio exteriore* ovali-oblongo, obtusè tridenticulato, substantiâ crassâ cartilagineâ, marginibus inflexis concavo; *interiore* membranaceo, bipartito: *laciniis* linearibus, attenuatis, spiraliter revolutis. *Filamenta* complanata, glabra. *Antheræ* basi setis 2 simplicibus attenuatis auctæ, appendiculâ

diculâ lineari-lanceolatâ acutâ atro-purpureâ terminatæ. *Stigma* bilobum, inclusum: *lobis* semicylindricis, truncatis, minutè papillosis, recurvis. *Achenia* elliptica, compressiuscula, densè hirsuta. *Pappus* pilosus, creberrimè denticulatus, fulvellus, deciduus.

2. H. *multiflorus*, spinosus; foliis dentato-pinnatifidis, floribus corymbosis.

Homoianthus. *Dec. l. c. t.* 3. *f.* 6.

Homanthis multiflorus. *Kunth l. c.* 4. *p.* 14.

Chætanthera multiflora. *H. et B. l. c.* 2. *p.* 168. *t.* 135.

In Peruviæ locis alpinis frigidis Provinciarum Cantæ, Tarmæ, Huanuci, Huamalies, Jaujæ, et Huarochiri. *Ruiz et Pavon.* ♃.

Radix fusiformis. *Caulis* pedalis v. cubitalis, erectus, foliosus, teres, villis mollibus articulatis viscidis copiosè vestitus, crassitie digiti minoris. *Folia* alterna, sessilia, bi- v. tripollicaria, lineari-lanceolata, dentato-pinnatifida, coriacea, suprà pube glandulosâ, subtùs villis articulatis copiosè vestita: *dentibus* magnis, triangulari-ovatis, simplicibus v. rariùs tricuspidatis, spinulâ albâ rectâ terminatis. *Flores* terminales, numerosi (20—30) in corymbum digesti. *Pedunculi* crassi, lanati, bracteati. *Involucrum* duplici ordine poly-(10—16)phyllum: *foliolis* ovato-lanceolatis, spinuloso-acuminatis, glanduloso-tomentosis; *intimis* margine lato scarioso apice producto, hinc abruptè emarginato-truncatis cum mucrone; *extimis* margine inde unidentatis. *Receptaculum* convexum, tuberculatum: *tuberculis* truncatis, margine fimbriatis. *Flosculi* albo-cærulei, quàm in præcedente triplò minores, hermaphroditi, æquales, bilabiati; *labio exteriore* elliptico-oblongo, concavo, subcartilagineo, obtusè tridenticulato; *interiore* membranaceo, bipartito: *laciniis* lanceolato-

lanceolato-linearibus, acutiusculis, primùm conglutinatis, demùm spiraliter revolutis. *Antheræ* basi setis 2 simplicibus munitæ: *appendiculâ* lineari-lanceolatâ acutâ atro-violaceâ. *Stigma* bifidum: *laciniis* semicylindricis, apice latiore, truncato, minutè papilloso. *Achenia* cuneato-oblonga, pilis rufis hirsutissima. *Pappus* pilosus, fulvus: *radiis* creberrimè denticulatis, mucronulo simplici nudo apiculatis.

Obs. Planta *Scorzoneræ peruvianæ* nomine a Ruizio inscripta. Floret tempore pluviarum. Vulgò *Escorzonero.* Maximè refrigerans et cordialis est: usus ejus communissimus est in omni Regno Peruviano. *Ruiz Mss.*

This genus is intimately allied to the preceding; but its tuberculate receptacle, the consistence and greater uniformity of its florets, and its involucrum composed of a double series of nearly equal scales, appear to constitute a sufficient generic distinction. Intimately allied to the last species is the *Perdicium squarrosum* of Vahl (*Act. Havn.* i. *par.* 2. *p.* 11. *t.* 6.), which is, however, distinguished by its more slender habit; by the more numerous and closely disposed segments of its leaves; and lastly, by having much fewer flowers on longer peduncles, disposed in a loose spreading corymbus.

b. Pappo Plumoso.

Leuceria. *Lag. et Dec.*

Flosculi marginales radiati. *Pappi radiis* plumosis simplici serie dispositis. *Involucrum* imbricatum.

Involucrum semiglobosum, triplici circiter serie polyphyllum, imbricatum. *Receptaculum* nudum, scrobiculatum. *Flosculi* plurimi, hermaphroditi, bilabiati; in periphæriâ majores ligulâ longiore patulo et hinc radium constituentibus; *labio exteriore* ligulato, 4-nervio, tridentato; *interiore* profundè bipartito: *segmentis* lineari-angustissimis, obtusiusculis,

culis, spiraliter revolutis, margine primùm conglutinatis. *Antheræ* appendiculâ lanceolatâ terminatæ, basi longè bisetæ: *setis* tenuissimis, simplicibus. *Stigmata* semicylindrica, apice dilatato, truncato, papilloso. *Achenia* cuneata, compressa, pilosa. *Pappi radiis* plumosis, simplici ordine contiguis, basi conferruminatis.

Herbæ *caulescentes, niveo-lanatæ, radice sæpè annuâ.* Folia *rarò indivisa.* Flores *pedunculati, purpurei, albi, aut flavi.* Ligulæ nervi *exteriores longè intramarginales.* Pappus *niveus.*

* *Involucri squamis multiplici serie imbricatis; intimis intramarginalibus, scariosis, paleas mentientibus.* Propriæ.

1. L. *acanthoides*, caule subsimplici, foliis amplexicaulibus pinnatifidis spinuloso-mucronatis.

In Chili. *Ruiz et Pavon.* ♃.

Herba perennis, niveo-canescens. *Radix* fusiformis, crassa, fusca. *Caulis* cubitalis, strictus, simplex, teres, gracilis, uno latere erubescens, lanugine niveo et setulis numerosis glanduliferis obsitus, crassitie vix pennam corvinam adæquans. *Folia radicalia* ferè *Arctotis tristis*, longè petiolata, profundè pinnatifida, niveo-lanata, palmaria: *segmentis* oblongis, mucronulatis, tridentatis, v. rariùs sinuato-dentatis, unguicularibus; *caulina* amplexicaulia, pinnatifida, subtùs lanuginosa, suprà pallidè viridia, et lanugine ferè destituta, punctis elevatis glanduliferis, scabriuscula, pollicaria v. sesquipollicaria: *laciniis* ovato-lanceolatis, spinuloso-mucronatis, margine revolutis, integerrimis. *Flores* plures (3—5 v. 7) longè pedunculati, in corymbum digesti, terminales. *Involucrum* semiglobosum, ut et pedunculi tripollicares, lanuginosum, glandulisque pedicellatis munitum: *squamis* multiplici ordine imbricatis, lanceolatis, muticis v. mucronulatis, membranaceis, adpressis. *Receptaculum* scrobiculatum.

Flosculi

Flosculi cyanei, omnes hermaphroditi, bilabiati, tubo cylindrico limbo æquali; *labio exteriore* elliptico, obsoletè tridenticulato; *interiore* bipartito, spiraliter revoluto: *laciniis* linearibus, obtusiusculis, primùm margine conglutinatis. *Antheræ* basi longè bisetæ, appendiculâ lineari-lanceolatâ obtusâ terminatæ. *Stigma* bipartitum: *laciniis* semicylindricis, apice dilatato-truncatis, minutè papillosis, recurvis. *Achenia* cuneato-compressa, pilosa. *Pappus* niveus, caducus: *radiis* plumosis, basi leviter connexis.

2. L. *divaricata*, caule diffusè ramosissimo, foliis amplexicaulibus inciso-pinnatifidis.

In Chili ad Coquimbo. *Caldcleugh.* ⊙.

Caulis tripedalis, erectus, ramosissimus, divaricatus, uti cum totâ ferè herbâ glandulis pedicellatis confertissimis necnon lanugine albâ parciori instructus. *Folia caulina* (superiora tantùm vidi) remotè alterna, amplexicaulia, inciso-pinnatifida, subtùs costâ prominenti instructa, lanugine niveâ vestita, suprà opaco-viridia, glandulosa, uncialia v. sesquiuncialia; *segmentis* lanceolatis, cuspidatis, margine revolutis, integerrimis; *imis duobus* sagittæ more porrectis. *Flores* laxè paniculati. *Pedunculi* filiformes, uti cum *involucro* copiosissimè glandulosi atque lanuginosi, sesquipollicares. *Involucrum* subglobosum, truncatum: *squamis* multiplici ordine imbricatis; *exterioribus* ovato-lanceolatis, obtusis, adpressis; *intimis* longioribus, acutis. *Receptaculum* scrobiculatum. *Flosculi* flavi, omnes hermaphroditi, bilabiati; *marginales* plures (15—16) radium æmulantes; *labio exteriore* ligulato, tridenticulato, in radio majore patulo, in disco revoluto; *interiore* bipartito: *segmentis* lineari-angustissimis, membranaceis, primò conglutinatis, revolutis. *Filamenta* capillaria, glabra. *Antheræ* basi setis 2 tenuissimis simplicibus

plicibus longis auctæ, appendiculâ lineari acutâ antherâ ipsâ longiore terminatæ. *Stigma* bipartitum: *segmentis* semicylindricis, revolutis, apice dilatato-truncatis, papilloso-pruinosis. *Achenia* oblonga, compressa, undique setulosa. *Pappus* albus, fugax: *radiis* plumosis, simplici ordine digestis, imâ basi connexis.

** *Involucri squamis duplici ordine dispositis, subæqualibus.* Cassiopea.

3. L. *cinerea*, foliis petiolatis pinnatifidis: lobis subrotundis dentatis, involucri squamis mucronulatis.

In Chili, aridis arenosis ad urbem Conceptionis. *Ruiz et Pavon.* ⊙.

Herba facie *Senecionis viscosæ*, niveo-lanata. *Radix* capillaceo-fibrosa. *Caulis* erectus, teres, ramulosus, altitudine perquàm varius, bi- v. tri-pollicaris, nunc palmaris v. spithamæus. *Folia* alterna, petiolata, cuneato-oblonga, sinuoso-pinnatifida, subtùs densiùs lanata, basi attenuata, uncialia v. sesquiuncialia: *segmentis* subrotundo-ovatis, nunc trapezoideo-ovatis, mucronulatis, margine paulùlum reflexis, dentibusque inæqualibus mucronulatis instructis, 3 lineas longis. *Petioli* lineares, margine membranaceo-alati, subtùs convexiusculi, striati, hinc inde lanati, vix unciales. *Flores* pauci (3—5) magnitudine et facie ferè *Senecionis elegantis*, pedunculosi, rubicundi. *Involucrum* globosum, duplici v. raro subtriplici ordine polyphyllum, imbricatum: *squamis* ellipticis sive elliptico-oblongis, mucronulatis, membranaceis, adpressis, longitudine subæqualibus, extùs glanduloso-pubescentibus, apice sanguineo-coloratis. *Flosculi* omnes hermaphroditi, bilabiati; *labio exteriore* ligulato, elliptico-oblongo, tridentato; *interiore* bipartito, revoluto: *segmentis* linearibus, obtusiusculis, margine congluti-

 natis.

natis. *Antheræ* basi setis longis, tenuissimis, simplicibus auctæ, appendiculâ lanceolatâ acutâ terminatæ. *Achenia* cuneata, compressa, pilis brevibus adpressiusculis vestita. *Pappus* niveus, fugax: *radiis* leviter plumosis, imâ basi connexis.

4. L. *pulchella*, foliis amplexicaulibus pinnatifidis: laciniis ovato-lanceolatis margine revolutis subintegerrimis, involucri squamis acuminatis.

In Chili ad Coquimbo. *Caldcleugh.* ⊙.

Herba niveo-lanata, glandulis pedicellatis copiosè munita. *Radix* fibrosa, annua. *Caulis* erectus, ramosus, teres, 4—5-uncialis. *Folia radicalia* petiolata, patula, cuneata, dentata; *caulina* amplexicaulia, sinuato-pinnatifida, mucronulata, uncialia, margine revoluta, subtùs niveo-lanata, suprà viridia, glandulisque copiosis ornata, vix lanuginosa: *segmentis* ovatis v. lanceolatis, simplicibus, aut rarò denticulatis, apice mucronulatis. *Flores* pedunculati, rubicundi, magnitudine præcedentis. *Pedunculi* tomentosi et glandulosi, filiformes, graciles, uniflori, pollicares v. sesquipollicares. *Involucrum* hemisphæricum, copiosè glandulosum, atratum: *squamis* duplici serie digestis, lanceolatis, acuminatis, adpressis, subæqualibus. *Flosculi* omnes hermaphroditi, bilabiati; *labio exteriore* ligulato, patulo, tridenticulato; *interiore* bipartito, revoluto: *laciniis* lineari-angustissimis, primùm margine conglutinatis. *Antheræ* appendiculâ lineari obtusiusculâ membranaceâ terminatæ, basi bisetæ: *setis* simplicibus, basi cuspidatis, antherâ ipsâ paulò brevioribus. *Stigma* bipartitum: *segmentis* semicylindricis, recurvatis, apice dilatato-truncatis, minutè papillosis. *Achenia* hispidula. *Pappus* albus, caducus: *radiis* plumosis, imâ basi connexis.

5. L. *glan-*

5. L. *glandulosa*, foliis sessilibus sinuato-dentatis, involucri squamis mucronulatis.

Cum præcedente. *Caldcleugh.* ⊙.

Herba lanugine albâ glandulisque pedicellatis copiosissimis prædita. *Radix* fibrosa, annua. *Caulis* erectus, ramosus, teres, gracilis, spithamæus v. pedalis. *Folia radicalia* brevissimè petiolata, cuneato-oblonga, patentia, acutè sinuato-dentata, sesqui- v. tri-pollicaria; *caulina inferiora* conformia, sed remotiùs dentata (dentibus mucronulo obtuso terminatis); *superiora* lanceolata, acuminata, nunc integerrima, subamplexicaulia, nunc rariùs tripartita! *Flores* plures, longè pedunculati, intensè rubicundi, necnon majores quàm in præcedente. *Pedunculi* recti, filiformes, uniflori, undique, uti *involucrum*, copiosè lanuginosi atque pilis glandulosis patulis prædit. *Involucrum* semiglobosum, truncatum, duplici ordine imbricatum: *squamis* oblongis, mucronulatis, subæqualibus, adpressis, margine membranaceis. *Receptaculum* scrobiculatum. *Flosculi* omnes hermaphroditi, bilabiati; *labio exteriore* ligulato, tridenticulato, superficie asperiusculâ; *interiore* bipartito: *segmentis* lineari-attenuatis, revolutis, primùm margine conglutinatis; *marginales* multoties majores, radium æmulantes. *Antheræ* appendiculâ lineari-lanceolatâ acutiusculâ membranaceâ terminatæ, basi bisetæ: *setis* simplicibus, acutis, ipsâ antherâ pauld brevioribus. *Stigma* bipartitum: *laciniis* recurvis, apice dilatato-truncatis, papilloso-pruinosis. *Achenia* cuneata, compressa, pilosissima. *Pappus* niveus, fugax: *radiis* eleganter plumosis, imâ basi in annulum connexis.

The *Trixis senecioides* of Dr. Hooker's Exotic Flora belongs, as we have elsewhere stated, to this genus, whose receptacle is certainly naked; for the paleaceous scales attributed to its cir-

 cumference

cumference are clearly nothing more than the scales composing the inner series of the involucrum. The plumose pappus compared with that of the inner floret of the partial capitula of *Polyachyrus*, a genus hereafter to be described, the form and structure of their corolla, the outer lamina of which is traversed in both by four distant slender nerves, and the habit of the plants themselves, show that there is a considerable degree of affinity between these two genera.

Ptilurus.

Flosculi æquales. *Pappi radiis* plumosis, duplici serie dispositis. *Involucrum* subæquale.

Involucrum duplici ordine poly-(18—20)phyllum, subæquale: *foliolis* ovato-lanceolatis, trinerviis, apice membranaceo acuminato radiatis. *Receptaculum* nudum. *Flosculi* omnes hermaphroditi, tubulosi, bilabiati, æquales; *labio exteriore* ligulato, 4-nervio, obtusè tridenticulato; *interiore* bipartito, demùm revoluto: *segmentis* linearibus, obtusis, binerviis. *Antheræ* coalitæ, basi longè bisetosæ: *setis* simplicibus: *appendiculâ* lineari-lanceolatâ, acutâ. *Stigma* bipartitum: *laciniis* semicylindricis, recurvis, apice dilatato-truncatis, pruinosis. *Achenia* elliptico-oblonga, compressa, densè papilloso-glandulosa, apice angustata, disco parvo. *Pappi radiis* crassiusculis, eleganter plumosis, mollissimis, duplici ordine digestis, basi dilatatâ imbricatis! deciduis.

Herba *perennis, humilis, cæspitosa, facie* Dauci *v.* Athamantæ, *setulis erectis, glanduliferis, copiosissimè instructa.* Radix *fusiformis, ramosa.* Caulis *erectus, teres, subramosus, triuncialis, vix calami scriptorii crassitie.* Folia *supradecomposita, densè glandulosa, pollicaria v. sesquipollicaria:* segmentis *linearibus, obtusis, sesquilineam longis.* Petioli *foliis longiores, maximè dilatato-membranacei;* inferiorum foliorum *latiores*

latiores et longiores, basibus caulis partem inferiorem imbricatim tegentes. Flores *terni, brevissimè pedunculàti, magni, semiglobosi.* Involucrum *villis longis articulatis copiosè lanatum :* foliolis *ovato-lanceolatis, acuminatis, æqualibus, discum paulò superantibus.* Flosculi *albi.*

Obs. Nomen ad pappi structuram refert, a *πτιλος pluma*, et *ουρα cauda.*

1. P. *daucifolius.*

In Peruviæ summis alpibus Cordilleras de los Andes Hispanicè dictis. *Ruiz et Pavon.* ♃.

This is another instance of the many analogies that might be pointed out between the *Compositæ* and *Umbelliferæ ;* its leaves, their dilated petioles clasping the stem ; the pubescence, and indeed the whole habit, has much the air of an umbelliferous plant ; and without the flowers the acutest botanist would not be censurable for mistaking it for one of that family. The structure of its involucrum, the equality of its florets, and the rays of the pappus arranged in a double series, with dilated imbricate bases, abundantly distinguish it from *Leuceria*, to which it otherwise comes nearest in affinity.

c. Pappo paleaceo.

Triptilion. *Ruiz et Pavon.*

Receptaculum villosum. *Flosculi* 5. *Involucrum* polyphyllum, imbricatum.

Involucrum tubulosum, polyphyllum, imbricatum : *squamis* lanceolatis, apice spinoso-mucronatis ; *extimis* squarrosis. *Receptaculum* parvum, densè villosum. *Flosculi* 5, hermaphroditi, bilabiati ; *labio exteriore* pataloideo, tridenticulato, 4-nervio (nervis arcuatis), radium perbreve patulum constituenti ; *interiore* membranaceo, bipartito, duplò breviore, revoluto :

revoluto: *laciniis* lineari-lanceolatis, obtusiusculis, binerviis, margine primò conglutinatis. *Antheræ* appendiculâ lanceolatâ, acutâ, membranaceâ! terminatæ, basi bisetæ: *setis* simplicibus, nudis, attenuatis. *Stigma* bipartitum: *segmentis* semicylindricis, recurvis, apice truncato, papilloso. *Achenia* triquetra, sursùm crassiora. *Pappi radiis* 3 (nariùs 5) paleaceis, linearibus, canaliculatis caducis: *apicibus* penicillato-plumosis v. ciliatis, involucro longioribus, recurvato-patulis.

Herbæ *ramosissimæ, decumbentes, squarrosæ.* Folia *alterna, sessilia, simplicia, spinoso-mucronata.* Flores *fasciculato-corymbosi, aut rarò subsolitarii, cyanei v. albi.* Pappus *niveus aut flavicans.*

* *Pappi radiis apice penicillatis.* Propriæ.

1. T. *spinosum*, foliis pinnatifidis, floribus fasciculatis, pappi radiis apice penicillatis.

Triptilion spinosum. *Ruiz et Pavon Gen. Pl. Fl. Per. et Chil. p.* 102. *t.* 22. *Syst.* 1. *p.* 185.

In Chili campis et collibus, præsertim circa Conceptionis urbem (*Ruiz et Pavon*); ad urbem S. Jacobi Chilensium. *Caldcleugh.* ♃.

Herba diffusè ramosissima, squarrosa. *Radix* fibrosa. *Caules* plures, decumbentes, flexuosi, graciles, teretes, rigidiusculi, undique copiosè pilosi, spithamæi v. pedales. *Folia* sparsa, sessilia, circumscriptione lanceolata, margine revoluta, utrinque pilosa, substantiâ cartilaginea, rigentia, tactu arida, subtùs costâ manifestè prominente, reverà tamen avenia, semunciam v. unciam longitudine æquantia; *inferiora* pinnatifida; *superiora* inciso-dentata, sive rarò integerrima: *laciniis* paucis, lanceolatis, apiceque folii ipsius mucrone spinoso elongato stricto armatis. *Flores* confertissimi,

tissimi, fasciculato-corymbosi. *Involucrum* imbricatum, unguiculare: *squamis bracteis*que lanceolato-subulatis, apice patulo elongato triquetro spinoso-mucronatis; *interioribus* adpressis, margine dilatato-membranaceis. *Receptaculum* punctum densè villosum. *Flosculi* 5, hermaphroditi, radium perbreve, pulchrè cyaneum, colore persistente, constituentes; *labio exteriore* subrotundo-ovali, patulo, subtùs concavo, obtusè tridenticulato; *interiore* pallidè luteo, bipartito, revoluto, exteriore duplò breviore: *laciniis* lineari-lanceolatis, obtusiusculis, margine primùm conglutinatis. *Antheræ* appendiculâ lanceolatâ acutâ membranaceâ apice cæruleâ terminatæ, basi bisetosæ: *setis* simplicibus, nudis, attenuatis. *Stigma* bipartitum: *segmentis* linearibus, subtùs convexis: *apice* dilatato-truncato, minutè papilloso. *Achenia* pyramidato-trigona, basi attenuata, glabra. *Pappus* exsertus, niveus, pulcherrimus: *radiis* 3, paleaceis, linearibus, canaliculatis caducis, apice recurvato-patulo, penicillato-plumoso.

Obs. Vulgò dicitur Siempreviva ob colorem florum permanentem quorum usus est communissimus ad ornamentum. Floret Januario et Februario. Planta valdè amara est, et ad ardores urinæ atque dolores nephriticos levigandos utilissima. *Ruiz Mss.*

2. T. *diffusum*, foliis lineari-lanceolatis integerrimis, floribus diffusè corymbosis, pappi radiis apice penicillatis.

In Chili ad Coquimbo. *Caldcleugh.* ♃.

Herba diffusè ramosissima. *Caules* decumbentes, filiformes, lenti, supernè ramisque virgatis copiosè pilosi, spithamæi v. dodrantales. *Folia* sparsa, sessilia, lineari-lanceolata, spinuloso-mucronata, subtùs pilosa, margine revoluta, integerrima, aut rarò dente uno alterove instructa, uncialia, sesqui-

sesquilineam v. 2 lineas lata. *Flores* laxè diffusèque corymbosi. *Involucri squamis exterioribus* lineari-subulatis, apice triquetro spinuloso-mucronatis, patulis, squarrosis; *intimis* membranaceo-dilatatis, extùs pilosiusculis. *Flosculi* radio subrotundo-ovali, albo? Cætera ut in præcedente.

This is intimately allied to the preceding species, of which it may ultimately prove to be only a variety; but I must leave this question undecided until further observations shall determine whether the characters by which they are here separated, are permanent.

** *Pappi radiis apice ciliatis.*

3. T. *cordifolium*, foliis subrotundo-cordatis margine setaceo-spinosis, floribus subternis.

Triptilion cordifolium. *Lag. in Bot. Reg. t.* 853.

In Chili. *D. Place.* ⊙.

Herba radice tenuissimè fibrosâ, annuâ, diffusè ramosissima, lætè virens. *Caules* filiformes, valdè flexuosi, pubescentes. *Folia* sparsa, sessilia; *inferiora* subrotundo-cordata, amplexicaulia; *superiora* subrotunda v. rhombea; cartilagineo-membranacea, costâ prominente venisque reticulatis ad oram confluentibus, hinc marginata, utrinque leviter pubescentia, viridia, margine spinis longis setaceis, rectis, divaricato-patulis, solitariis, geminis, aut fasciculatim ternatis armata, ad apicem semper trinis approximatis, et tunc tricuspidata. *Flores* numerosi, dispersi, in apice ramulorum subsolitarii v. terni, sessiles. *Involucrum* virens, pubescens, polyphyllum, imbricatum, squarrosum: *squamis* lanceolatis, spinoso-mucronatis, carinatis, inæqualibus. *Receptaculum* punctum villosum. *Flosculi* 5, hermaphroditi, bilabiati, tubo luteo; *labio interiore* bipartito, demùm revoluto, luteo: *laciniis* lanceolatis, acuminatis, primùm conglutinatis;

conglutinatis; *exteriore* subrotundo, patulo, albo, subtùs concavo, apice tridenticulato. *Antheræ* appendiculâ lanceolato-attenuatâ, apice obtusulâ, membranaceâ, terminatæ, basi bisetæ: *setis* lineari-angustissimis, acutis, simplicibus, ipsâ antherâ brevioribus. *Stigma* bipartitum: *laciniis* angustissimis, semicylindricis, apice minutè papillosis, truncatis. *Achenia* turbinato-trigona, glabra. *Pappi radiis* paleaceis, linearibus, canaliculatis, apice recurvis, ciliatis, flavicantibus.

*** *Acheniis villosis, pappi radiis apice ciliatis.*

4. T. *glomerulosum*, foliis propriis ovatis: acumine trigono spinoso; secundariis glomeratis muticis, floribus solitariis sessilibus.

Triptilion glomerulosum. *Lag. Amen. Nat.* 1. *no.* 1.

In Chili summis alpibus Cordilleras de los Andes Hispanicè dictis. *Ruiz et Pavon.* ♄.

Planta cæspitosa, suffrutescens. *Caules* procumbentes, lignosi, rigidissimi, sesqui- v. tripollicares, crassitie ferè calami scriptorii, undique glomerulis sphæricis foliorum secundariorum simulque propriis persistentibus muniti, inde tuberculati, hinc spinosi. *Folia propria* basi latè dilatata, ovata, imbricata, margine membranacea, apice in acumen trigonum, spinâ subulatâ, rigidâ, validâ, rectâ terminatum producta, persistentia; *cætera* (secundaria scilicet) in capitulis (ramulis abortivis) axillaribus congesta, minuta, ovalia, obtusissima, subtùs carinata, margine valdè incrassata, apice recurvata, similiter persistentia. *Flores* terminales, solitarii, sessiles. *Involucrum* polyphyllum, undique imbricatum: *squamis* ovatis, carinatis, margine dilatatis, scarioso-membranaceis, apice spinâ conicâ, validâ, perbrevi armatis, adpressis. *Receptaculum* densè villosum. *Flosculi* 5, hermaphroditi, bilabiati,

bilabiati, lactei; *labio exteriore* petaloideo, orbiculato, obtusè tridenticulato, 4-nervio, patulo; *interiore* bipartito: *segmentis* lanceolato-attenuatis, apice obtusulis, revolutis. *Antheræ* appendiculâ ovato-lanceolatâ, acutâ, membranaceâ terminatæ, basi bisetæ: *setis* linearibus, acutis, complanatis, simplicibus, ipsâ antherâ ferè duplò brevioribus. *Stigma* bipartitum; *segmentis* recurvis, apice truncatis, minutè papillosis. *Achenia* trigona, undique villosissima. *Pappi radiis* 3, paleaceis, linearibus, canaliculatis, caducis: *apice* recurvato, ciliato, niveo.

This curious genus agrees with *Proustia*, before described, in the definite number of its florets, in its hairy receptacle, and in its imbricate involucrum; but I have placed it here principally on account of the structure of its pappus, although the difference of this organ is more apparent than real: for the paleæ, which crown the fruit of this genus, are evidently formed by the confluence of innumerable fibres, whose extremities even in this instance are free.

Trib. 2. Jungeæ. *Receptaculum* paleatum, paleis distinctis. *Flosculi* uniformes, bilabiati, hermaphroditi. *Stigmata* soluta, angusta, obtusa, vix papillosa. *Frutices foliis sæpiùs lobatis; floribus paniculatis.*

Jungia, *L.*

Dumerilia. *Lag. et Dec.*

Martrasia. *Lag. Amen. Nat.* 1. *p.* 36.

Involucrum simplex. *Pappus* plumosus.

Involucrum simplici ordine polyphyllum, basi squamulis aliquot munitum: *foliolis* æqualibus, basi callosis. *Receptaculum* paleis distinctis, involucri squamis conformibus copiosè refertum.

fertum. *Flosculi* numerosi, bilabiati, hermaphroditi; *labio exteriore* ligulato, tridenticulato, nunc trifido; *interiore* bipartito: *segmentis* lineari-lanceolatis, obtusis, revolutis. *Antheræ* appendiculâ lineari-lanceolatâ acutâ cartilagineâ coronatæ, basi bisetæ: *setis* brevibus, acutis, simplicibus. *Stigmata* soluta, linearia, truncata, pruinosa, non papillosa. *Achenia* triquetra, papilloso-scabra. *Pappus* mollis, fugax: *radiis* simplici ordine digestis, copiosis, imâ basi coalitis, gracilibus, plumosis.

Frutices (Peruviani) *facie peculiari, ferè ad* Vitem *accedunt.* Folia *alterna, petiolata, latissima, multiloba.* Flores *parvi, lutei v. nivei, sæpiùs terminales copiosissimi.* Pappus *niveus.*

The numerous points of accordance, both in habit and structure, evidently existing between *Dumerilia* and *Jungia*, induced me to suggest the probability of the identity of these two genera, in which opinion I was agreeably surprised to find myself anticipated by Sprengel; but the acquisition by this Society of the Linnæan herbarium has afforded me the opportunity of setting this question at rest by an examination of the specimen of the original species of *Jungia* described in the *Supplementum Plantarum*, which removes all doubt as to their identity. Several capitula being closely associated together at the extremity of the divisions of the panicle, and the presence of small bracteæ at their base, have no doubt suggested to Linnæus the idea of a compound capitulum.

1. J. *ferruginea*, foliis subtùs densè tomentosis: lobis subæqualibus rotundatis, floribus corymbosis, ligulis revolutis tridenticulatis.

Jungia ferruginea. *Linn. Suppl. p.* 390.

In ruderatis et ad margines agrorum in Provinciâ Cantæ Peruvianorum. *Ruiz et Pavon.* ♄.

Planta fruticosa, subscandens, sarmentosa. *Caulis* ramosus, teres, glaber. *Rami* cylindrici, flexuosi, densè pannoso-tomentosi, fulvescentes. *Folia* remotè alterna, petiolata, 5—7-loba, circumscriptione orbiculato-cordata, suprà pilis brevibus recumbentibus aspera, subtùs venis prominentibus varicosa, tomento albo copiosissimo obruta, holosericea, 2—3 uncias longa, latitudine æqualia: *lobis* rotundatis, repando-crenatis, nunc integerrimis. *Petioli* unciales, teretes, densè fulvescenti-tomentosi, basi crassiore inappendiculati, pennam corvinam crassitie cæterùm æquantes. *Corymbi* terminales, compositi, densè fulvescenti-tomentosi. *Involucra* sphærica, basi bracteolis aliquot lineari-subulatis munita: *squamis* simplici ordine plurimis (15—20) lanceolatis, acuminatis, tomentosis, æqualibus, margine membranaceis, induplicatis, dorso convexis. *Paleæ* plurimæ, lanceolatæ, acutæ, membranaceæ, obtusè carinatæ, dorso apiceque nigricante puberulis. *Flosculi* 30 circiter, lutei, hermaphroditi, bilabiati: *labiis* revolutis; *exteriore* elliptico-oblongo, obtusè tridenticulato; *interiore* bifido: *laciniis* linearibus, obtusis. *Antheræ* appendiculâ lineari-lanceolatâ acutâ cartilagineâ coronatæ, basi bisetæ: *setis* brevibus, acutis, simplicibus. *Stylus* tenuis, glaber. *Stigmata* lineari-lingulata, truncata, pruinosa. *Achenia* longiuscula, triquetra, papilloso-scabra. *Pappus* fugax, albus: *radiis* tenuissimis, plumosis.

Obs. Rami hujus plantæ ad sarmenta Vitis non paulò referunt. Vulgò *Vingri-Vingri*. Floret Februario et Martio. Flores valdè fragrantes, lutei. *Ruiz Mss.*

The *Dumerilia paniculata* of DeCandolle is distinguished from this species by the lobes of its leaves being longer, somewhat acute, and the margin more deeply and abruptly crenated, and finally by the trifid ligulate lip of the corolla, which in this is terminated by three small teeth only.

2. J. *spec-*

2. J. *spectabilis*, foliis pubescentibus: lobis acutis, floribus radiatis glomerato-paniculatis, ligulis patulis tridenticulatis.
In Guayaquilâ. *Tafalla.* ♄.

Planta fruticosa, floribus niveis copiosissimis foliisque latissimis viridibus ad florendi tempus ornatissima. *Rami* teretes, obsoletè velutini. *Folia* remotè alterna, petiolata, subrotundo-cordata, 7—9-loba, membranacea, subtùs copiosè pubescentia, reticulato-venosa, suprà minutè papilloso-setulosa, asperiuscula, 3—5-uncialia, tunc ferè spithamæa; *ultima* plurimùm minora, 5-loba, basi vix emarginata: *lobis* semi-ovatis, mucronulatis, acutè dentatis s. rariùs integerrimis; *intermedio* paululùm majore. *Petioli* bipollicares, teretes, velutini, basi inappendiculati, concavi. *Flores* terminales, copiosissimi, glomerato-paniculati, nivei, pulcherrimi. *Pedicelli* squamulosi, pubescentes. *Bracteolæ* lineares, obtusæ, patulæ, velutinæ. *Involucra* ovalia, insertione depresso-umbilicata: *squamis* simplici ordine digestis, pluribus (10—12) lanceolatis, acutis, leviter pubescentibus, dorso convexis, margine membranaceis induplicatis, basi callosâ subtorulosis. *Paleæ* plurimæ, distinctæ, elliptico-oblongæ, acutiusculæ, obtusè carinatæ, pubescentes. *Flosculi* 21 circiter, bilabiati, hermaphroditi; *exteriores* majores, radium constituentibus; *labio exteriore* elliptico, tridenticulato patulo, nunquàm revoluto; *interiore* bipartito, revoluto: *segmentis* lanceolato-linearibus, acutis. *Antheræ* appendiculâ lineari acutâ terminatæ, basi bisetæ: *setis* brevibus, acutissimis, simplicibus. *Stigmata* linearia, revoluta, apice truncata, pruinosa. *Achenia* longiuscula, triquetra, papilloso-scabra. *Pappus* niveus, caducus: *radiis* apice tantùm plumosis.

PLEOCARPHUS.

Pleocarphus.

Involucrum imbricatum. *Pappus* capillaris.

Involucrum triplici serie polyphyllum, imbricatum: *squamis* lanceolatis, acuminatis, membranaceis; *interioribus* sensim majoribus. *Receptaculum* paleatum: *paleis* distinctis, lanceolatis, acutis v. truncatis lacerisque, rigidis, carinatis, margine scariosis. *Flosculi* plures, hermaphroditi, bilabiati; *labio exteriore* ligulato, tridentato, quadrinervio, revoluto; *interiore* bipartito: *laciniis* lanceolatis, acutis, binerviis, revolutis. *Filamenta* gracillima, glabra. *Antheræ* in tubum connatæ, appendiculâ lineari-lanceolatâ obtusâ cartilagineâ terminatæ, basi longè bisetæ: *setis* simplicibus. *Stylus* filiformis, glaber. *Stigma* bipartitum: *segmentis* semicylindricis, obtusis, revolutis, minutè papillosis. *Achenia* angusta, pentagona, copiosè papilloso-micantia, scabra: *disco epigyno* dilatato, planiusculo. *Pappus* capillaris, persistens: *radiis* duplici ordine copiosissimis, denticulis minutissimis scabris, apice paulò crassiore vix penicillatis.

Caulis *fruticosus, erectus, ramosus, teres.* Rami *cylindrici, undique glandulis pedicellatis copiosè induti, rufescentes.* Folia *alterna, sessilia, linearia, obtusula, v. mucronulo perbrevi sæpè aucta, margine revoluta, utrinque glandulis capitatis pedicellatis copiosè vestita;* primaria *sesqui- v. bipollicaria, basi aliis 2 stipulas mentientibus, sublunatis, semi-ovatis, obtusis, margine exteriore revolutis, persistentibus appendiculata;* ramea *breviora atque angustiora, basi nuda, attenuata, vix tamen petiolata.* Flores *lutei, in ramulis pedunculati, solitarii, aut sæpiùs copiosissimi, tunc racemi v. paniculæ modum æmulantes.* Pedunculi *uniflori, teretes, ut cum involucro glandulosi,* 4—6 *lineas longi.* Corollæ nervi *longè infra sinus loborum dichotomi, hinc ramis intramarginalibus.* Pappus *cinereus.*

Nomen

Nomen ad receptaculum crebrè paleatum refert, a πλεος *refertus*, et καρφος *palea*.

1. P. *revolutus*.
   In Chili ad Coquimbo. *Caldcleugh.* ♄.

This curious and well-marked genus has been referred to the *Jungeæ* entirely from its similarity of structure in the parts of fructification: for its habit certainly indicates no affinity to *Jungia*, unless we regard the stipule-like appendages of the leaves of *Pleocarphus* and some species of the former genus as pointing out a connexion.

Trib. 3. POLYACHYREÆ. *Receptaculum* paleatum. *Flosculi* uniformes, hermaphroditi, bilabiati. *Stigmata* linearia, truncata, apice papillosa. *Achenia* difformia. *Herbæ foliis pinnatifidis*.

a. PAPPO DIFFORMI.

POLYACHYRUS. *Lag. et Dec.*

Involucella tetraphylla, biflora, in capitulum congregata. *Flosculi* inæquales. *Pappus* flosculo interiori elongatus, plumosus.

Capitulum compositum, globosum, basi squamis aliquot ovato-lanceolatis mucronatis rigidis munitum. *Involucella* plurima, tetraphylla, biflora, paleis ovato-lanceolatis, mucronatis, lanugine interstinctis interjecta: *foliolis* imbricatis, ovali-oblongis, apice emarginato-truncatis, scariosis, coloratis, conniventibus; *exteriore* latiore, basi gibbosâ. *Receptaculum partiale* nudum. *Flosculi* singulo involucello gemini, hermaphroditi, bilabiati, inæquales (exteriore minore); *labio exteriore* ligulato, obtusè tridenticulato, patulo; *interiore* profundè bipartito: *laciniis* lineari-lanceolatis, acutis, spiraliter revolutis. *Antheræ* appendiculâ lineari-

lanceolatâ

lanceolatâ acutâ terminatæ, basi biaristatæ: *aristis* lineari-lanceolatis, deorsùm attenuatis. *Stigma* bifidum: *lobis* lineari-cuneatis, truncatis, plano-convexis, minutè papillosis, revolutis. *Achenia exteriora* cuneato-oblonga, papilloso-scabra; flosculis verò majoribus (interioribus) longiora, subtetragona. *Pappus* difformis; achenio exteriori brevissimus, setaceus, denticulatus, basi solutâ caducus, fusco-cinereus: interiori verò elongatus, plumosus, niveus, involucellum superans, subpersistens, radiis basi crassiore conferruminatis, apice mucronulo simplici.

Herba *habitu omninò* Echinopsidis, *lanâ niveâ mollissimâ densè obruta.* Caulis *cubitalis, erectus, ramosus, teres.* Folia *alterna, basi auriculatâ amplexicaulia, palmaria, runcinato-pinnatifida, vix ultrà semunciam lata, suprà parciùs lanata:* segmentis *rhombeo-ovatis, dentatis, margine recurvis, mucronulo reflexo-adpresso terminatis.* Capitula *sphærica, pedunculata, corymbosa.* Pedunculi *erecto-patuli, teretes, lanati, pollicares v. sesquipollicares.* Involucella *nudiuscula, nitida, sanguineo-colorata.* Flosculi *rosei.*

1. P. *sphærocephalus.*
In Peruviâ. *Ruiz et Pavon.* ⊙.

The capitulum in this genus consists of a congregation of smaller capitula, each containing two flowers. It is precisely analogous to that of *Echinops*, and may be compared to the compound umbel in other plants. Expansion first takes place in the florets of the apex of the capitulum, as Mr. Brown has already remarked in that of the before-mentioned genus. The compound capitulum, the two unequal florets, each of which is furnished with a distinct kind of pappus, sufficiently distinguish this genus from the following.

b. Pappo

b. PAPPO UNIFORMI.

GASTROCARPHA.

Involucrum 5-phyllum. *Receptaculum* paleatum: *paleis* difformibus; *exterioribus* cucullatis, basi gibbosâ, apice truncatis cum mucronulo flosculum quasi involucello proprio obvallantibus. *Flosculi* hermaphroditi, bilabiati, æquales. *Pappus* paleaceus, brevissimus, polyphyllus.

Involucrum 5-phyllum (nunc 6-phyllum): *foliolis* ovatis, mucronatis, æqualibus. *Receptaculum* paleatum: *paleæ* difformes; *exteriores* 8, periphæricæ, simplici ordine digestæ, foliaceæ, dilatatæ, cucullatæ, marginibus ciliatis, ferè collapsis, flosculos marginales sigillatim, quasi involucello proprio, includentes, apice truncatæ, mucronuloque instructæ, extùs basi gibbosâ, reticulatim varicosæ; cæteræ interiores, lineari-lanceolatæ, scariosæ, canaliculatæ, apice acuminato simplici, v. bi- aut tri-cuspidato. *Flosculi omnes* hermaphroditi, bilabiati, subæquales (periphæricis paulò majoribus) extùs pilosiusculi; *labio exteriore* ligulato, tridenticulato, patulo; *interiore* multò minore, profundè bipartito, revoluto, laciniis linearibus, acutis: *tubo* limbo breviore, apice paululùm dilatato. *Filamenta* capillaria, teretia, glabra, elastica, articulo manifesto. *Antheræ* coalitæ, flavæ, appendiculâ lineari-lanceolatâ, acutâ, albâ, antheræ ipsius longitudine terminatæ, basi longè bisetæ: *setis* simplicibus, attenuatis. *Stylus* filiformis, lævis, basi bulbosus. *Stigma* bipartitum: *lobis* linearibus, compressis, extùs bisulcatis, apice truncato, papilloso-hispidulo, parùm dilatato. *Achenia* difformia: *marginalia* obovata, dorso gibbosa, lævia; *disci* pentagona, minutè papillosa. *Pappus* uniformis, paleaceus, brevissimus, polyphyllus: *foliolis* lanceolatis, mucronatis,

cronatis, ciliatis, rigidis, simplici serie contiguis, persistentibus, basi solutis.

Herba *erecta, ramosa, virens, copiosè glanduloso-villosa, tempore florendi formosa, odorem moscho similem redolens; radice fibrosâ, annuâ.* Caulis *teres, flexuosus, spithamæus v. pedalis; in hortis tamen sæpè 5 pedes attingens.* Folia *alterna, profundè runcinato-pinnatifida, suprà opaca, subtùs lucida, bi- v. tri-pollicaria: in hortis sæpè spithamæa v. pedalia;* caulinis superioribus *basi auriculatâ amplexicaulibus:* segmentis *lanceolatis, mucronatis, undulatis, lobatis, acutèque dentatis.* Flores *diffusè paniculati, pedicellati.* Involucrum *foliaceum, virens, hirtellum.* Flosculi *plures* (12—16) *singulo involucro, nivei.* Nob. in Sw. Br. Fl. Gard. t. 229.

1. G. *runcinata.* Nob. in l. c.

Moscharia pinnatifida. *Ruiz et Pavon Syst. Veg. Fl. Peruv. et Chil.* 1. *p.* 186? *Gen. p.* 103?

In Chili ad Coquimbo (*Caldcleugh*), ad Valparaiso (*D. Bridges*). ⊙. (v. v. etiam in hort.)

Whether this be really the *Moscharia pinnatifida* of Ruiz and Pavon I must leave for the present undetermined, as there exists no specimen of it in their herbarium; and the description of the parts of fructification, both in the published account of the genus and also in the manuscripts of Ruiz, cannot be reconciled to *Gastrocarpha.*

Trib. 4. Chætanthereæ. *Receptaculum* epaleatum. *Flosculi* difformes; *radii* fœminei. *Antherarum setis* subplumosis! *Stigmata* crassa, obtusa, partim connata. *Herbæ* (*Chilenses*) *plerumque caulescentes, floribus solitariis, magnis, radiatis.*

Chætanthera.

CHÆTANTHERA.

CHÆTANTHERÆ SP., *Ruiz et Pavon.*

Involucrum polyphyllum, subæquale. *Pappi radiis* capillaceis, simplici ordine dispositis.

Involucrum depressum, multiplici ordine polyphyllum: *squamis* subæqualibus, numerosissimis, foliaceis, perornatè spinuloso-ciliatis; *intimis* membranaceis, integerrimis. *Receptaculum* nudum. *Flosculi radii* plurimi, fœminei, bilabiati, staminibus sterilibus; *labio exteriore* ligulato, obtusè trilobo, 4-nervio, subtùs villosissimo; *interiore* bipartito: *laciniis* lineari-angustissimis, binerviis apice filo longo spirali terminatis; *disci* hermaphroditi, tubulosi, bilabiati: *labiis* subæqualibus; *exteriore* obtusè tridentato; *interiore* ovato, emarginato. *Antheræ* appendiculâ lanceolatâ acutâ terminatæ, basi longè bisetæ: *setis* puberulis. *Stigma* fœmineis bifidum: *lobis* cymbiformibus, obtusis, conniventibus; hermaphroditis inclusum: *lobis* adpressis, plano-convexis. *Achenia* ovalia, papilloso-micantia. *Pappus* capillaris: *radiis* copiosis, inæqualibus, persistentibus, scabriusculis, simplici ordine dispositis, imâ basi conferruminatis.

Herba *radice fibrosâ annuâ.* Caulis *spithamæus, erectus, simplex v. rariùs divisus, teres, pubescens.* Folia *alterna, sessilia, ferè uncialia, latè linearia, spinuloso-ciliata, suprà villosa, subtùs glabra! uninervia, viridia.* Flos *terminalis, solitarius, raró altero laterali, sessilis.* Involucrum *virens, magnitudine nucis Avellanæ:* squamis, *tanquàm foliis, suprà villosulis,* subtùs *nudis, politis! lanceolatis, uninerviis;* intimis *linearibus, mucronatis, maculo atrato, extùs ad apicem, notatis.* Flosculi *lutei.* Pappus *fusco-cinereus.*

 1. C. *ciliata.*

1. C. *ciliata.*
   Chætanthera ciliata. *Ruiz et Pavon Syst. Veg. Fl. Peruv. et Chil.* 1. *p.* 190. *Gen. t.* 23.
   In Chili collibus et campis versus Guilquilemu oppidum copiosè. *Ruiz et Pavon.* ⊙.

Chætanthera is here limited to the species on which the genus was originally founded by Ruiz and Pavon. It is sufficiently characterized by its involucrum, composed of a series of loose, foliaceous, and nearly equal scales, and by its capillary pappus. A comparison of the leaves and the scales of the involucrum of this plant affords a most satisfactory explanation of the origin of the latter. There being no sample of this plant in the collections of Ruiz and Pavon, the above description has been drawn up from a specimen presented to Mr. Lambert by Mr. Brown.

Proselia.

Chætantheræ sp., *Ruiz et Pavon.*

Perdicii sp., *Willd.*

Involucrum imbricatum. *Pappi radiis* setaceis, simplici ordine dispositis.

Involucrum triplici circiter serie polyphyllum, imbricatum, campanulatum: *squamis* adpressis, lanceolatis, mucronatis, integerrimis; *exterioribus* gradatim minoribus. *Receptaculum* planum, nudum. *Flosculi radii* plures, fœminei, bilabiati, staminibus sterilibus; *labio exteriore* amplo, ligulato, 4-nervio, obtusè tridenticulato, subtùs sericeo-villosissimo; *interiore* tenuissimo, bipartito: *segmentis* primò margine conglutinatis, inde unicum simulantibus, binerviis apice in filo longo, spirali attenuatis; *disci* hermaphroditi, tubulosi, limbo bilabiati; *labio exteriore* elliptico, obtusè tridentato; *interiore* lanceolato, bifido. *Antheræ* appendiculâ lineari acutâ cartilagineâ

cartilagineâ terminatæ, basi bisetæ: *setis* inæqualibus, puberulis. *Stylus* teres. *Stigma* clavatum, bilobum: *lobis* crassis, obtusis, conniventibus. *Achenia* lineari-oblonga, ancipiti-compressa, tuberculis minutis crystallizatis copiosè ornata. *Pappus* setaceo-pilosus, subpersistens: *radiis* simplici ordine dispositis, denticulis exasperatis, apice attenuatis, basi conferruminatis.

Planta *perennis, suffrutescens.* Caules *ex eadem radice plures, adscendentes, simplices, teretes, viminei, læves, rigidiusculi, fragiles, palmares v. spithamæi, imâ basi lanuginosi et lignosi.* Folia *linearia, supernè paululùm dilatata, subcuneata, spinuloso-dentata, coriacea, rigida, sericeo-villosa, apice tricuspidata, dente medio longiori, uncialia v. sesquiuncialia;* radicalia *plurima, erecta, infernè marginibus involutis, penè filiformia, hinc prout petiolata;* caulina *sparsa, breviora, decidua, ob basin tanquàm cum caule articulatam.* Flos *terminalis, solitarius, sessilis.* Involucrum *basi foliis nonnullis bracteatum:* squamis *extùs villosis, apice nigro-coloratis, subinde sphacelatis.* Flosculi *aurei, extùs quandoque purpurascentes.* Pappus *flavo-cinereus.*

Nomen a *προσηλιος apricus*, quod huic plantæ aptè convenit, propterea in arenosis et campis apricis se delectare videtur.

1. P. *serrata.*
   Chætanthera serrata. *Ruiz et Pavon l. c. p.* 191.
   C. Chilensis. *Dec. in Ann. Mus.* 19. *p.* 70. *t.* 3. *f.* 8. *Lag. Amen. Nat.* 1. *p.* 38.
   Perdicium Chilense. *Willd. Sp. Pl.* 3. *p.* 2118.
   In arenosis prope urbem Conceptionis et in Rere provinciâ Chilensium. *Ruiz et Pavon.* ♃.

This genus differs essentially from the preceding by its imbricate involucrum, composed of many unequal, adpressed, entire scales,

scales, and in the structure of its pappus. M. DeCandolle's description and figure of this plant above referred to, are very faithful; but both he and Professor Lagasca, in adopting the name of Willdenow, who had referred it to *Perdicium*, were evidently ignorant of its being the *Chætanthera serrata* of Ruiz and Pavon.

BICHENIA.

Involucrum imbricatum. *Flosculi radii* labio exteriore multinervio! *Pappi radiis* triplici ordine dispositis, apice penicillatis.

Involucrum polyphyllum, inordinatè imbricatum: *squamis* lanceolatis, acuminatis, adpressis; *intimis* elongatis, radium æquantibus. *Receptaculum* planum, nudum. *Flosculi radii* plurimi (15—18), ligulati, bilabiati, fœminei, staminibus sterilibus; *labio exteriore* amplo, cuneiformi, obtusè tridentato, coriaceo, glabro, multi-(10 v. 15)nervio; *interiore* exiguo, membranaceo, bipartito: *segmentis* lineari-filamentosis, spiraliter revolutis; *disci* hermaphroditi, tubulato-bilabiati: *labiis* longitudine æqualibus; *exteriore* ligulato, obtusè trilobo; *interiore* bipartito: *segmentis* linearibus, obtusis, erectis. *Filamenta* linearia, complanata, nervo medio manifestè subcarinata. *Antheræ* appendiculâ ligulatâ, mucronulatâ, coriaceâ terminatæ, basi bisetæ: *setis* ramulosis, plumosis, extremitate simplici, elongatâ. *Stigma* clavatum, bilobum: *lobis* brevissimis, crassis, conniventi-applicatis, pruinosis. *Achenia* angusta, compresso-tetragona, undique copiosè papillosa. *Pappus* pilosus, subpersistens: *radiis* inæqualibus, triplici ordine digestis, apice penicillatis, leviter plumosis.

Herba *perennis, acaulis, cæspitosa, lanâ albâ, villosâ, molli, siccitate lutescente, omninò induta.* Folia *ferè* Pedicularium *quarundam, numerosa, radicalia, petiolata, interruptè bipinnatifida,*

natifida, suprà demùm nudiuscula ac viridia; bi- v. tri-pollicaria ; segmentis primariis *remotis, linearibus, obtusè pinnatifido-dentatis, uncialibus, margine parùm revolutis ;* aliis *interjectis, brevissimis, simplicibus, integerrimis s. rariùs unidentatis.* Petioli *unciales, teretiusculi, basi dilatato-concavi, atque invicem se imbricati.* Scapi *erecti, cylindrici, simplicissimi, uniflori, undique copiosè fulvescenti-lanati, apicemque versus squamis aliquot lanceolatis, acuminatis muniti, crassitie pennæ corvinæ, longitudine palmares v. spithamæi.* Flos *terminalis, solitarius, facie et magnitudine* Galardiæ bicolori *omninò similis, aureus.* Involucrum *densè lanatum :* squamis *fuscescentibus.* Pappus *niveus.*

1. B. *aurea.*
In Chili ad Coquimbo. *Caldcleugh.* ♃.

A highly interesting addition to this group, for the discovery of which we are indebted to Alexander Caldcleugh, Esq., F.R.S. and L.S., who amid other more important avocations has not neglected the interests of science during his residence in a part of Chile hitherto but little explored, but has added much to our knowledge of the Chilian Flora, which, as we have already seen, is rich in this department of botany.

I have dedicated this genus to my much-valued friend James E. Bicheno, Esq., F.R.S., the zealous Secretary of this Society, whose merits as a botanist, and whose liberal views in every department of science, justly entitle him to this compliment.

Bichenia is most satisfactorily distinguished by its penicillate pappus, the rays of which are disposed in a triple series, and by the ligulate florets of the circumference being furnished with an indefinite number of nerves, which are from 10 to 15, and apparently all primary, as they are of equal size, traversing in straight parallel lines the corolla from the base to the apex, where they become

become confluent. They occupy the centre of the laciniæ, and, unlike the other plants of this family, there are no vessels terminating in, or branching off from the sinus.

TYLLOMA.

Involucrum imbricatum. *Flosculi marginales* unilabiati! *Pappus* capillaris: *radiis* simplici ordine dispositis.

Involucrum ovatum, polyphyllum, multiplici ordine imbricatum: *squamis* integerrimis, mucronulatis, lævibus, coriaceis, adpressis; *interioribus* oblongis, apice coloratis. *Receptaculum* nudum. *Flosculi marginales* pauci, fœminei, unilabiati, vix radiati, obtusè tridentati; *disci* hermaphroditi, tubulosi, extùs sericeo-villosi, limbo bilabiati: *labiis* abbreviatis; *exteriore* obtusè tridentato; *interiore* bifido, lobis lanceolatis, acutis, erectis. *Stamina* tubo infra medium inserta: *filamenta* angusta, complanata, glabra, apice attenuata: *antheræ* in tubum coalitæ, basi bisetæ: *setis* longis, ramulosis, subplumosis: *appendicula terminalis* lanceolato-linearis, acuminata, cartilaginea, antherâ ipsâ brevior. *Stylus* filiformis, glaber. *Stigma* clavatum, bilobum: *lobis* abbreviatis, conniventibus, crassis, obtusis, pruinosis, margine incrassatis. *Achenia* trigona, papilloso-muricata. *Pappus* capillaris, deciduus: *radiis* simplici ordine contiguis, subæqualibus, basi apiceque puberulis.

Herba *multicaulis, lanugine laxâ parciùs instructa.* Radix *ramosa, annua.* Caudex *brevissimus.* Caules *procumbentes, cylindracei, purpurascentes,* 2—4-*unciales.* Folia *alterna, subsessilia, in apice ramulorum aggregata, cæterùm sparsa, cuneato-lanceolata, limbata, integerrima, complicata, flexuosa, valdè coriacea, colore glauco cærulescentia, utrinque glandulis majusculis, pedicellatis, sparsis munita, subtùs costâ validâ basi valdè dilatatâ, hinc carinata, semuncialia;* juniora *præcipuè*

suprà

suprà lanigera : limbo *recurvato-patulo, circumscriptione cordato, periphæriâ callosâ rotundatâ luteolâ marginato, mucronulo perbrevi corneo apiculato.* Flores *terminales, solitarii, sessiles, foliis numerosis bracteati.* Involucrum *longitudine vix ultrà semipollicare :* squamis interioribus *apice purpurascentibus.* Flosculi *rosei.* Pappus *niveus.*

Nomen a τυλος *callus,* et λωμα *margo*; ob folia orâ callosâ cincta.

1. T. *limbatum.*
In Chili ad Coquimbo. *Caldcleugh.* ⊙.

Trib. 5. Perdiceæ. *Receptaculum* epaleatum. *Flosculi* difformes; *marginales* fœminei: *stigmatibus* semicylindricis, obtusis, sæpiùs lævibus. *Antherarum setis* plerumque nudis. *Herbæ perennes, acaules, scapis plerumque unifloris.*

Chaptalia. *Vent., Dec.*

Perdicii sp., *Thunb.*

Tussilaginis sp., *Mich.*

Flosculi periphæriæ fœminei, ligulati, radiati; *disci* masculi, bilabiati.

Involucrum campanulatum, multiplici serie imbricatum: *squamis* lanceolatis, acutis, membranaceis, adpressis. *Receptaculum* nudum. *Flosculi* in *periphæriâ* plurimi, fœminei, sæpiùs duplici ordine digesti; *extimis* elongatis, ligulatis, radiatis (labio interiore nullo v. minimo); *interioribus,* dùm adsint, conformibus, sed multoties minoribus, ligulis linearibus integerrimis, labello interiore minimo bidenticulato; *disci* masculi, tubulosi, bilabiati: *labiis* revolutis; *exteriore* tridentato; *interiore* bipartito: *segmentis* lanceolatis, acuminatis. *Antheræ* appendiculâ ligulatâ obtusâ coriaceâ

 terminatæ

terminatæ, basi longè biaristatæ: *aristis* simplicibus, setaceis. *Stigma* masculis inclusum, clavatum, bilobum; fœmineis longè exsertum, bipartitum: *segmentis* brevibus semicylindricis, obtusis, recurvis, undique pruinosis. *Achenia* elliptico-oblonga, ancipiti-compressa. *Pappus* pilosus, fulvellus, persistens: *radiis* duplici serie digestis, copiosis, creberrimè denticulatis.

Herbæ (Amer. et Asiat.) *acaules, perennes, niveo-lanatæ.* Folia *simplicia, coriacea.* Flores *sæpiùs albi.*

* *Flosculi fœminei duplici ordine dispositi, difformes, labello interiore aucti. Foliis integerrimis.*

1. C. *oblonga*, foliis petiolatis oblongis, involucris hirsutissimis.
Perdicium oblongum. *Herb. R. et P.*
In Peruviæ alpibus prope Panao. *Ruiz et Pavon.* ♃.

Herba cæspitosa. *Radix* crassa, præmorsa, fibris numerosissimis, aliis crassis, aliis capillaceis, instructa. *Folia* longè petiolata, lanceolata, v. elliptico-oblonga, obtusa, coriacea, basi parùm attenuata, margine angusto, revoluto, denticulis semi-ovatis, obtusis, nudis, reflexo-adpressis ornato; suprà leviter lanuginosa, demùm nuda, costâ latiusculâ, nervis transversis venisque reticulatis instructa, subrugosa; subtùs lanâ intertextâ, niveâ, siccitate fulvescente, densè vestita; 2—5-uncialia, unciam v. sesquiunciam lata. *Petioli* simplices, semiteretes, undique copiosè lanati, 3—6-unciales. *Scapus* solitarius, teres, validior quàm in cæteris sequentibus, uniflorus, undique lanâ copiosissimâ fulvescente instructus, squamis plurimis, præsertim apicem versus, lanceolatis, obtusiusculis, nudis, nitidis, coloratis munitus, pedalis v. ultrà. *Involucrum* campanulato-patens, polyphyllum, imbricatum: *squamis* lanceolatis, acutis, adpressis,

pressis, sanguineo-coloratis; *exterioribus* lanuginosis; *intimis* elongatis, acuminatis, radiatis. *Flosculi* albi; *radii* plurimi, 30 circiter, fœminei, duplici ordine dispositi, lineari-ligulati; *extimis* multoties majoribus, involucri squamis intimis vix longioribus, obtusè tridenticulatis, radium distinctum constituentibus; *labio interiore* minimo, bipartito: *laciniis* angustè linearibus, obtusulis, inæqualibus, rectis; *disci* masculi, tubulosi, bilabiati; *labio exteriore* ligulato, obtusè 3-dentato; *interiore* bifido: *laciniis* lanceolato-linearibus, obtusis. *Antheræ* basi bisetæ, appendiculâ lineari-ligulatâ cartilagineâ coronatæ. *Stigma* masculis inclusum bilobum, clavatum; fœmineis exsertum, bifidum: *lobis* obtusis, papilloso-pruinosis. *Achenia* elliptica, ancipiti-compressa, glabra: *disco epigyno* dilatato, planiusculo. *Pappus* capillaris, cinereo-fulvellus, denticulis scaber.

2. C. *ovalis*, foliis petiolatis ovalibus, involucris hirsutissimis.
Perdicium ovale. *Herb. R. et P.*
In Peruviâ ad Huassahuassi et Churapallanam. *Ruiz et Pavon.* ♃.

Herba cæspitosa. *Radix* compacta, fibris numerosissimis, longissimis, fuscis. *Folia* plura, radicalia, petiolata, ovalia v. subrotundo-ovalia, coriacea, orâ angustissimâ, recurvatâ, denticulis ovatis, obtusis, nudis, adpressè reflexis, costâ mediâ, validâ, nervisque transversis atque venis prope marginem anastomosantibus; suprà demùm calva, viridia, lucida; subtùs densè fulvo-lanata: *basi* transversâ, v. attenuatâ; 2 v. 2½ pollices longa, sesquiunciam lata. *Petioli* semiteretes, simplices, sesquiunciales, undique fulvo-lanati. *Scapus* dodrantalis, erectus, filiformis, uniflorus, undique lanâ fulvâ copiosè vestitus, squamisque nonnullis lanceolatis, obtusis, membranaceis, nudis, adpressis munitus. *Flos*

 nutans,

nutans, albus. *Involucrum* quadruplici circiter serie polyphyllum, campanulatum: *squamis* lanceolatis, mucronulatis, adpressis, margine apiceque sanguineo-coloratis; *intimis* radiantibus. *Flosculi radii* plurimi, fœminei, duplici ordine digesti (serie interiore plurimùm minore); *extimis* 20 circiter ligulatis, obtusè tridenticulatis; *labio interiore* minuto, obtusè bidentato; *disci* masculi, bilabiati: *labiis* revolutis; *exteriore* ligulato, obtusè tridenticulato; *interiore* bipartito: *segmentis* lanceolatis, attenuatis. *Antheræ* basi longè biaristatæ, appendiculâ ligulatâ, obtusâ coronatæ. *Stigma* masculis inclusum clavatum, bilobum; radiis bifidum: *laciniis* semicylindricis, obtusis, recurvis, pruinosis. *Achenia* elliptica, compressa, glabra: *disco epigyno* dilatato. *Pappus* capillaris, denticulis scaber, fulvellus.

3. C. *rotundifolia*, foliis petiolatis subreniformibus, involucris lævibus.

In stagnatis altis frigidis Peruviæ ad Pillao. *Ruiz et Pavon.* ♃.

Herba cæspitosa, facie et magnitudine *Tussilagini alpinæ* omninò accedens. *Radix* præmorsa, fibris atro-fuscis, longis, crassis instructa. *Folia* plurima, radicalia, petiolata, nunc subrotunda basi integrâ, nunc cordata v. subreniformia, obtusa, suprà demùm nuda, costâ validiusculâ, nervis obliquè transversis peragrata, indè reticulato-venosa, rugosa, subtùs lanâ niveâ, siccitate fulvâ, copiosè vestita, orâ perangustâ, revolutâ, denticulisque plurimis, obtusis, nudis, reflexo-adpressis munitâ, unguicularia, v. nunc rariùs pollicaria. *Petioli* filiformes, simplicissimi, lanati, sesqui- v. bi-pollicares. *Scapus* altitudine maximè varians, nunc tripollicaris, nunc dodrantalis, v. rariùs ferè pedalis, filiformis, solitarius, uniflorus, gracilis, lanâ villosissimâ rufescente, squamis pluribus,

pluribus, lanceolatis, obtusulis, nudis, coloratis, adpressis munitus. *Flos* magnitudine *Tussilaginis prædictæ*, albus, nutans. *Involucrum* polyphyllum, imbricatum, campanulatum: *squamis* lanceolatis, acutis, membranaceis, adpressis, demùm glabris, lucidulis, viridibus, raró sanguineo-coloratis; *intimis* longioribus, radiatis. *Receptaculum* nudum. *Flosculi radii* duplici ordine digesti, fœminei, in serie exteriore 20 circiter, ligulati, radium distinctum constituentes, obtusè tridenticulati: *labio interiore* minimo, bipartito: *laciniis* acutis, lineari-angustissimis, inæqualibus, rectis; *interiore serie* consimili, at plurimùm minore, discum vix superante; *disci* tubulato-bilabiati, hermaphroditi, fauce dilatati; *labio exteriore* brevi, ligulato, obtusè tridentato; *interiore* bipartito: *laciniis* lineari-lanceolatis, acutiusculis, revolutis. *Antheræ* basi bisetæ: *setis* simplicibus: *appendiculâ* lineari-ligulatâ, obtusâ, subcoriaceâ. *Stigma* disci flosculis bilobum, clavatum, papillosum; radiis bifidum: *laciniis* brevibus, semicylindricis, obtusis, pruinosis. *Achenia* lineari-oblonga, compressa, glabra, apice angustata: *disco epigyno* dilatato. *Pappus* capillaris, fulvellus, denticulis scaber.

** *Flosculi marginales simplici ordine uniformes, fœminei, ligulati, unilabiati! Foliis sessilibus, pinnatifidis.*

4. C. *lyrata*, foliis sessilibus lyratis ciliato-denticulatis.
Hieracium stipitatum. *Herb. S. et M.*
In Mexico. *Sesse et Mocinno.* ♃.

Herba cæspitosa. *Radix* crassa, fibris compluribus longissimis instructa. *Folia* plurima, radicalia, sessilia, in orbem acta, patentia, spathulata, lyrata, membranacea, suprà demùm nuda, viridia, subtùs densè niveo-tomentosa, margine undulata, denticulisque setaceis copiosè ornata, bi- v. tripollicaria,

caria, sesquipollicem lata: *lobis* abbreviatis, rotundatis; *terminali* amplo, elliptico, mucronulato. *Scapus* solitarius, gracilis, filiformis, lanuginosus, squamis paucissimis lineari-bus acuminatis munitus. *Flos* minor, albus? nutans. *Involucrum* 4-plici circiter serie polyphyllum, imbricatum: *squamis* lineari-subulatis, dein glabratis. *Receptaculum* nudum. *Flosculi radii* simplici ordine uniformes, ligulati, fœminei, apice acutiusculo, integro; *labio interiore* nullo; *disci* copiosi, hermaphroditi, tubulato-bilabiati; *labio exteriore* ligulato, revoluto, obtusè tridentato; *interiore* bipartito: *laciniis* lineari-lanceolatis, obtusis, spiraliter revolutis. *Antheræ* basi longè biaristatæ, appendiculâ lineari-angustâ obtusâ terminatæ. *Stylus* filiformis. *Stigma* masculis inclusum, clavatum, bilobum; radii sexsertum, bifidum: *lobis* brevibus, obtusis, pruinosis. *Achenia* oblonga, compressa, pilis brevissimis vestita. *Pappus* pilosus, fulvellus, denticulis scaber.

*** *Involucri squamis ellipticis, obtusis, disco brevioribus. Flosculi marginales simplici ordine dispositi: labello bipartito, spirali. Antherarum setis ramulosis. Stigmatis lobis brevibus. Foliis petiolatis, integris.* Eurytis.

5. C. *heterophylla*, foliis lanceolatis planis dentatis integerrimisve, scapo esquamato, involucri squamis obtusis disco brevioribus.

Onoseris heterophylla. *Spreng. Syst.* 3. *p.* 503?

In Monte Video. *Sello.* ♃.

Herba acaulis, lanâ adpressâ niveâ obruta. *Folia* plurima, radicalia, erecto-patentia, petiolata, lanceolata, acutiuscula, coriacea, margine obtusè dentata v. integerrima, costâ mediâ validâ, venis angulo acuto obliquis, plerumque inconspicuis,

inconspicuis, basi attenuata, utrinque plana, palmaria, vix pollicem lata; *adultiora* lanâ fugaci nudiuscula. *Petioli* bipollicares, canaliculati, supernè angusti, basi dilatati, imbricati et villosi. *Scapus* erectus, filiformis, apice in discum dilatatus, uniflorus, squamis omninò destitutus, spithamæus v. dodrantalis. *Flos* erectus, magnus, aureus. *Involucrum* hemisphæricum, triplici ordine adpressè imbricatum: *squamis* ovatis, obtusis, coriaceis; *intimis* oblongis, disco duplò brevioribus! quandoque extimis duabus elongatis bracteas simulantibus. *Flosculi radii* plurimi (17—20), fœminei, elongati, bilabiati, staminibus sterilibus; *labio exteriore* maximo, ligulato, tridentato, coriaceo, nervis secundariis manifestis; *interiore* bipartito: *segmentis* linearibus, obtusis, spiraliter convolutis, primùm margine conglutinatis; *disci* masculi, tubulosi, tubo 5-angulo: *limbo* bilabiato: *labiis* subæqualibus; *exteriore* obtusè tridentato, 4-nervio; *interiore* bipartito, segmentis linearibus, obtusiusculis, binerviis, apice revolutis. *Filamenta* articulo inferiore minutè papilloso. *Antheræ* appendiculâ ligulatâ acutiusculâ cartilagineâ coronatæ, basi bisetosæ: *setis* compressis, basi ramulosis, vix plumosis. *Stylus* 5-angulus. *Stigma* bilobum: *lobis* obtusis, brevissimis, pruinosis. *Achenia* ancipiti-compressa, densè adpressè pilosa. *Pappus* capillaris, persistens, cinereus: *radiis* denticulatis, scabris, duplici ordine digestis, copiosissimis.

Besides the *Chaptalia integrifolia*, which wants the inner lobe to the marginal florets, and consequently agrees in this respect with my second section, *Perdicium piloselloides* of Vahl and *Perdicium tomentosum* of *Flora Japonica* belong also to this genus. This latter species has all the characters of my second section; but *C. integrifolia* having the female flowers disposed in a double series,

series, will constitute perhaps another section. The *Chaptalia maxima* of the *Prodromus Floræ Nepalensis* has been improperly referred by me to this genus, being really a species of *Perdicium*, as constituted by Lagasca and DeCandolle. The *Chaptalia runcinata* of M. Kunth having the centre florets with a regular five-cleft limb appears to belong more properly to the following genus.

Onoseris. *Dec.*

Onoseridis sp., *Willd., Kunth.*

Atractylidis sp., *L.*

Flosculi periphæriæ fœminei, radiati, bilabiati; *disci* hermaphroditi, tubulosi: *limbo* regulari, 5-fido.

Involucrum hemisphæricum, triplici ordine polyphyllum, imbricatum. *Receptaculum* nudum. *Flosculi radii* fœminei, bilabiati, staminibus sterilibus; *labio exteriore* maximo, ligulato, tridentato; *interiore* tenuissimo, sæpiùs bipartito, spiraliter convoluto; *disci* hermaphroditi, tubulosi: *limbo* regulari, 5-fido: *laciniis* linearibus, obtusis, binerviis. *Antheræ* appendiculâ lineari-lanceolatâ cartilagineâ coronatæ, basi bisetosæ. *Stigma* bilobum: *lobis* obtusis, pruinosis. *Achenia* ancipiti-compressa, sericeo-villosa. *Pappus* capillaris, persistens: *radiis* duplici ordine digestis, denticulato-scabris.

Herbæ *acaules, lanatæ.* Scapo *simplici v. diviso.* Flores *sæpiùs purpurei.*

1. O. *brevifolia*, foliis subsessilibus ellipticis denticulatis scabris venosissimis, flosculis radii labello interiore indiviso.

In Monte Video. *Sello.* ♃.

Radix præmorsa fibris compluribus prælongis instructa. *Caudex* brevissimus, fulvo-villosissimus. *Folia* subsessilia, humo adpressa,

adpressa, elliptica, obtusa, margine copiosè denticulata, subcoriacea, reticulato-venosissima, rugosa, subtùs pilosa, suprà punctis elevatis scabra, utrinque viridia, pollicaria v. sesquipollicaria. *Scapus* rectissimus, filiformis, cubitalis, undique lanâ adpressâ niveâ obtectus, squamis paucis brevissimis adpressis instructus. *Flos* erectus. *Involucrum* hemisphæricum, triplici ordine polyphyllum, imbricatum: *squamis* lanceolato-linearibus, setaceo-acuminatis, extùs lanuginosis; *intimis* disco longioribus. *Receptaculum* nudum, scabriusculum. *Flosculi* lutei? *radii* plures, bilabiati, fœminei, singulo ordine dispositi, staminibus sterilibus, radium distinctum constituentibus; *labio exteriore* amplo, ligulato, obtusè tridentato, 4-nervio; *interiore* lineari-angustissimo, obtuso, canaliculato, erecto, binervio; *disci* copiosi, tubulosi, 5-fidi, hermaphroditi: *segmentis* linearibus, obtusis, erectis, binerviis. *Filamenta* gracilia, lævia. *Antheræ* appendiculâ lineari-lanceolatâ mucronatâ cartilagineâ coronatæ, basi bisetosæ: *setis* ramulosis, subplumosis. *Stigma* utriusque bilobum: *lobis* brevibus, adpressis, obtusissimis, pruinosis. *Achenia* linearia, ancipiti-compressa, sericeo-villosa. *Pappus* capillaris, persistens, sordidè cinereus: *radiis* duplici ordine copiosis, denticulato-scabris.

This genus, constituting an intermediate group between *Chaptalia* and *Leria*, differs from the former in the regularity of the limb of the florets of the disk, and from the latter in the female florets of the circumference forming a distinct radius, and being arranged generally in a single series. The *Onoseris purpurata* of Willdenow, and the *hieracioides* and *speciosa* of M. Kunth, are clearly referable to the genus, and perhaps also the *Chaptalia runcinata*; but I doubt whether any of the other plants hitherto included in it are really species of this genus.

 LERIA.

Leria. *Dec.*

Tussilaginis sp., *L.*

Flosculi disci masculi, tubulosi, 5-fidi; *marginales* fœminei, filiformes: *limbo* abbreviato.

Involucrum hemisphæricum, triplici v. quadruplici serie polyphyllum, imbricatum: *squamis* linearibus, acuminatis, adpressis, apice coloratis. *Receptaculum* nudum. *Flosculi disci* masculi, tubulosi, 5-fidi: *laciniis* æqualibus; *marginales* fœminei, multiplici ordine numerosissimi, tunc difformes, extimis ligulatis, unilabiatis, inæqualiter tridentatis vix radiantibus; nunc simplici ordine pauciores, cæterisque filiformibus, supernè gradatim coarctatis: *limbo* parvo, bilabiato: *labiis* erectis, abbreviatissimis; *exteriore* tridentato; *interiore* bipartito. *Antheræ* basi longè bisetæ, appendiculâ lineari-ligulatâ, subcoriaceâ terminatæ. *Stigma* masculis inclusum, clavatum, bilobum; fœmineis longè exsertum, bipartitum: *laciniis* filiformibus, lævibus. *Achenia* fusiformia, infernè compressa, 5-costata, apice attenuata. *Pappus* tenuissimè capillaris, nunc stipitatus: *radiis* inæqualibus, denticulatis.

Herbæ *perennes, niveo-lanatæ.* Folia *simplicia.* Scapi *uniflori.*

1. L. *nutans*, foliis sessilibus sinuatis, flosculis fœmineis difformibus, pappo stipitato.

Leria nutans. *Dec. in Ann. Mus.* 19. *p.* 68.

Tussilago nutans. *Linn. Amœn. Acad.* 5. *p.* 406. *Sp. Pl. p.* 1213.

Dens leonis folio subtùs incano, flore purpureo. *Sloan. Hist.* 1. *p.* 255. *t.* 150. *f.* 2.

Aster primulæ veris folio, flore singulari purpureo. *Plum. Sp.* 14. *t.* 41. *f.* 1. (bona.)

In Mexico. *Sesse et Mocinno.* ♃.

Herba

Herba perennis, cæspitosa, acaulis, densè niveo-lanata. *Radix* præmorsa, fibris compluribus, longissimis (5—6-uncialibus), filiformibus, validis, radiculosis. *Folia* plurima, radicalia, impetiolata, spathulata, nunc sinuata, nunc lyrata, margine minutissimè denticulata, membranacea, suprà demùm nuda, viridia, subtùs niveo-tomentosa, infernè angustata, 3—4-pollicaria, nunc spithamæa, unciam v. 2 uncias lata; *lobo terminali* maximo, oblongo, obsoletè mucronulato. *Scapi* plures, filiformes, uniflori, undique copiosè niveo-lanati, palmares v. rariùs dodrantales. *Flos* terminalis, solitarius, nutans, roseus, diametro pollicem v. ultrà adæquans. *Involucrum* hemisphæricum, polyphyllum: *squamis* linearibus, acuminatis, quadruplici circiter serie imbricatis, apice coloratis. *Receptaculum* nudum. *Flosculi centrales* pauci, masculi, tubulosi, supernè vix dilatati, regulariter 5-fidi; *cæteris* fœmineis, numerosissimis, tenuissimè filiformibus; *extimis* ligulatis, unilabiatis, inæqualiter tridentatis, involucro paulò longioribus, subinde radiatis; *interioribus* limbo parvo bilabiatis: *labiis* abbreviatis, erectis; *exteriore* tridentato; *interiore* bipartito: *laciniis* linearibus, obtusis, erecto-patulis. *Antheræ* basi setis tenuissimis longis auctæ, appendiculâ lineari, obtusâ coronatæ. *Stylus* masculis inclusus: *stigmate* clavato, bilobo, lobis abbreviatis crassis, obtusis, conniventibus; fœmineis longè exsertus: *stigmate* bipartito, segmentis filiformibus, obtusis, recurvis, lævibus. *Achenia* fusiformia, minutè papillosa, basi compressâ, 5-costatâ, apice in stipitem filiformem prodeuntia. *Pappus* subinde stipitatus, tenuissimè capillaceus, fulvellus: *radiis* inæqualibus, minutissimè denticulatis, triplici ordine digestis, copiosissimis.

2. L. *spathulata*, foliis petiolatis integris, flosculis masculis indefinitis.

 Cacalia

Cacalia spathulata. *Herb. S. et M.*
In Mexico. *Sesse et Mocinno.* ♃.

Herba cæspitosa. *Folia* plurima, radicalia, petiolata, lanceolato-spathulata aut elliptico-oblonga, membranacea, denticulata, suprà demùm calva, viridia, subtùs niveo-lanata, mollissima, 2—3-pollicaria, basi attenuata; *juniora* margine revoluta. *Petioli* lineares, plani, membranaceo-alati, pollicares v. bipollicares. *Scapi* cubitales, subsolitarii, filiformes, uniflori, squamis destituti, undique lanuginosi. *Flos* nutans. *Involucrum* polyphyllum: *squamis* triplici circiter serie imbricatis, lanceolatis, acuminatis, coriaceis, lanuginosis. *Receptaculum* nudum. *Flosculi disci* copiosissimi, masculi, tubulosi, 5-fidi, longitudine unguiculares, nervis ad sinum divisis, fauce parùm dilatatâ: *laciniis* lingulatis, apice nervis marginalibus validis confluentibus incrassatis, obtusis, nervis secundariis recurrentibus ad basin laciniarum usque manifestis! *peripharici* fœminei, pauci, simplici ordine digesti, uniformes, tenuissimè filiformes, bilabiati, non radiati, fauce coarctati: *labiis* minutis; *interiore* bifido, laciniis linearibus, revolutis; *exteriore* ligulam abbreviatam, linearem, obtusè tridentatam constituente. *Antheræ* basi bisetæ (setis inæqualibus cuspidatis) appendiculâ lineari-ligulatâ, obtusâ, cartilagineâ coronatæ. *Stigma* masculis bilobum, lobis brevibus, crassis, obtusissimis, minutè papillosis; fœmineis longè exsertum, bipartitum: *laciniis* semicylindricis, obtusis, lævibus, recurvis. *Achenia* fusiformia, compressa, pilosiuscula, apice tantùm angustata: *disco epigyno* dilatato. *Pappus* capillaris, fulvellus, nec stipitatus: *radiis* inæqualibus, minutè denticulatis, duplici ordine copiosissimis.

This interesting genus is also allied to the *Inuleæ* and *Cichoraceæ*.

choraceæ. Its entire capitulum may be compared with that of *Gnaphalium*, and its soft stipitate pappus with that of *Lactuca*, thus showing that the genus is to be regarded as constituting an osculant group between the three families. The modification of the apex of the achenium proves that the stipitate pappus is not a character of generic importance in *Leria*.

Trib. 6. DIAZEUXEÆ. *Receptaculum* subpaleatum. *Flosculi* (rarò dioici !) *disci* hermaphroditi, tubulosi, 5-dentati ; *radii* ligulati, fœminei, nunc bilabiati. *Antherarum setis* nudis. *Plantæ sæpè fruticosæ, capitulis plerumque solitariis, magnis, pedunculatis.*

DIAZEUXIS.

ATRACTYLIDIS SP., *L.*

ONOSERIDIS SP., *Willd.*

Flores dioici ! *Receptaculum* alveolatum.

Flores dioici ! *Involucrum* sphæroideum, multiplici serie imbricatum : *squamis* innumeris, lanceolatis, acuminatis, coriaceis, rigidis, adpressis. *Receptaculum* alveolatum : *alveolis* margine laciniato-fimbriatis. *Flosculi masculi* creberrimi, cylindrico-tubulati, 5-nervii, limbo 5-fidi : *laciniis* linearibus, obtusis, canaliculatis, recurvato-patulis, nervis prominentibus apice confluentibus, hinc margine apiceque incrassatis : *ligulis* plurimis, accessoriis, patulis, substantiâ coriaceis, obtusè trilobis, 6-nerviis (nervis per paria laciniarum discum occupantibus, paribus intermediis magis approximatis) nunc neutris unilabiatis, nunc pistillo (an sterili ?) staminum rudimentis, labioque interiore simplici, angustissimo, canaliculato, obtuso, binervio, coriaceo, recurvato, basi dilatato auctis ; *fœminei* copiosissimi, filiformes, 5-nervii, coriacei, basi callosâ, difformes ; *centrales* limbo æquali, 5-partito ;

5-partito; *marginales* non radiantes, limbo irregulari, ob laciniam quintam (interiorem) profundiùs sejunctam, indè quasi bilabiati: *segmentis* linearibus, obtusis, subsecundis, canaliculatis, nervis prominulis, summo apice confluentibus. *Filamenta* lineari-angustissima, compressa, glabra. *Antheræ* semi-exsertæ, in tubum connatæ, appendiculâ lineari-lanceolatâ, obtusâ, coriaceâ, rigidâ, ipsâ antherâ breviore coronatæ, basi longè biaristatæ: *aristis* linearibus, setaceo-acuminatis, canaliculatis, antherâ longioribus, æqualibus. *Stylus* filiformis, basi bulbosus. *Stigma* masculis pentagonum! obtusum, indivisum; ligulis tereti-clavatum, læve, exsertum; fœmineis bipartitum, exsertum: *lobis* lineari-lingulatis, obtusis, pruinosis, persæpè spiraliter convolutis. *Achenia* lineari-oblonga, compressa, glaberrima. *Pappus* masculis cinereus, caducus: *radiis* inæqualibus, paleaceo-setaceis, complanatis, longissimis, denticulis spinulosis exasperatis, apice acuto, nunc subpenicillato, infrà medium flexuosis, simplici tantùm ordine digestis; fœmineis capillaris, persistens, albus: *radiis* triplici serie confertissimis, denticulato-scabris, longioribus basi latiore subpaleaceâ.

Frutices *niveo-lanati.* Folia *alterna, petiolata, integra.* Flores *terminales, plerumque solitarii, sessiles, magni, purpurei, cernui.*

Nomen a *διαζευξις separatio,* et generi huic imposuit, ob flores raros esse dioicos in hac familiâ.

This is without doubt the most remarkable genus of the whole family. It is diœcious, and, in the structure of the capitula and pappus of the male and female flowers, it differs as much as *Antennaria.* The male capitula are very much smaller, and besides the male florets of which they are composed, there is a single series of ligulate florets, either with or without pistilla, and

and having imperfect stamina. The florets of the female capitulum differ in the disposition of their laciniæ; for in the central ones the limb is regularly five-cleft, whereas in those of the circumference it is somewhat bilabiate, the inner segment being more deeply separated than the rest. The two sexes of this plant might be readily mistaken for two distinct genera. The *Atractylis mexicana* of Linnæus I have ascertained to be the male sex of a third species of this genus. Of this interesting plant, for which I propose the name of *Diazeuxis Mutisiana*, I have had an opportunity of examining the original sample in the Linnæan herbarium.

1. D. *trinervis*, foliis lanceolatis acuminatis triplinerviis, floribus solitariis.
   Aster trinervis. *Herb. R. et P.*
   In Guayaquilâ Peruvianorum. *Tafalla.* ♄.

Frutex erectus, ramosus, niveo-lanatus, sempervirens, omnium speciosissimus. *Rami* teretes, striati, lanugine albâ fugaci vestiti. *Folia* alterna, breviter petiolata, lanceolata, acuminata, margine denticulis plurimis acutis ornata, nunc rarò integerrima, 5-nervia, nervis lateralibus extimis ferè obsoletis, hinc quasi triplinervia, membranacea, basi obtusâ, suprà denudata, lætè viridia, et lucida, subtùs lanâ implexâ copiosissimâ niveâ, demùm fulvescenti, vestita, 3—5-pollicaria, pollicem v. sesquipollicem lata. *Petioli* suprà canaliculati, 2—3 lineas longi, basi paulò dilatati. *Flores* terminales, solitarii, sessiles, nutantes, purpurei; *fœminei* magnitudine et facie ferè *Cnici centauroides*, diametro 2-pollicares; *masculi* triplò minores. Cætera omninò ut in charactere generico.

2. D.? *ser-*

2. D.? *serrata*, foliis ovato-lanceolatis acutis dentato-serratis penninerviis, floribus glomeratis.

Carduus mitis. *Herb. S. et M.*

In Mexico. *Sesse et Mocinno.* ♄.

Frutex erectus, ramosus. *Rami* sulcato-angulati, undique omninò albo-lanati. *Folia* alterna, brevissimè petiolata, spithamæa, ovato-lanceolata, acuta, dentato-serrata, dentibus triangulari-ovatis, mucronatis, leviter antrorsùm uncinatis, aliis minimis interjectis, penninervia, nervis obliquè transversis, costâque mediâ validâ prominentibus, suprà demùm calva, viridia, punctisque elevatis copiosissimis asperiuscula, subtùs lanâ albâ densè implexâ copiosissimè vestita, 5—7-pollicaria, 2—3 uncias lata, basi acutâ integerrimâ. *Petioli* crassi, brevissimi, vix sesquilineam longi. *Flores* terminales, plures (5—10), sessiles, glomerati. *Involucra* globosa, densè lanata: *squamis* multiplici ordine lanceolatis, acuminatis, rigidis, adpressis. *Receptaculum* planum, scrobiculatum, angulis elevatis, acutis exasperatum. *Flosculi* perfecti nondùm observati: *pappo* setaceo, scabro.

Having only seen specimens of this with the capitula in a very young state, it has been placed here solely from the habit of the plant itself and from the structure of its involucrum. What relates to the florets still remains undetermined.

CENTROCLINIUM.

Receptaculum aculeatum. *Flosculi disci* tubulosi, hermaphroditi; *radii* ligulati, fœminei.

Involucrum subglobosum, multiplici ordine imbricatum: *squamis* lanceolatis, acuminatis, coriaceis, adpressis. *Receptaculum* aculeatum: *aculeis* subulatis, callosis, rigidis, brevibus, in circulis plurimis dispositis. *Flosculi disci* hermaphroditi, tubulosi,

tubulosi, æquales, 5-dentati, latere interiore profundiùs fissi, hinc limbus perinde obliquus: *segmentis* lanceolato-linearibus, obtusis, erectis, nervis primariis validis, apice confluentibus, inde incrassatis; *radii* fœminei, plures (10—14), rudimentis staminum omninò destituti, bilabiati; *labio exteriore* (ligulâ) longissimo, obtusè trilobato, coriaceo, subtùs lanato, 6-nervio, nervis per paria utriusque lobi discum occupantibus, strictis, parallelis, apice confluentibus; *interiore* profundè bipartito, membranaceo, spiraliter revoluto: *segmentis* lineari-filamentosis, margine primùm conglutinatis. *Filamenta* glandulosa. *Antheræ* basi aristis 2 longis, attenuatis, munitæ, appendiculâ lanceolato-lineari, acutâ, coriaceâ, rigidâ coronatæ. *Stylus* filiformis, basi depresso-bulbosus. *Stigma* hermaphroditis bilobum: *lobis* lingulatis, minutè papillosis; fœmineis tereti-clavatum (lobis primò arctè applicatis), pruinosum. *Achenia* pentagona, demùm glabrata. *Pappus* fuscescens, basi fulvus; *radiis exterioribus* brevibus, pilosis; *interioribus* duplici serie longissimis, setaceis, supernè dilatato-complanatis, denticulatis, deciduis.

Frutex *ramosissimus, sempervirens, candidissimus.* Rami *teretes.* Folia *alterna, petiolata, lanceolata, acuminata, dentata, coriacea, penninervia, nervis obliquè transversis, suprà demùm nuda, viridia, polita, subtùs copiosè ut et rami niveo-tomentosa, mollissima, basi cuneatâ, integerrimâ, sesqui- v. nunc ferè tripollicaria, unciam, aut et dimidium ad medium lata.* Petioli *semicylindrici, 2 v. 3 lineas longitudine æquantes.* Flores *purpurei? solitarii, longè pedunculati.* Pedunculus *cylindricus, primò quasi terminalis, sed prodeunte ramulo revera lateralis, 5—10-uncialis.* Radius *pollicaris.*

Nomen a κεντρον *stimulus,* et κλινη *lectus,* et ab ipso receptaculum

culum spinulosum, hujus stirpis optimum characterem constituens, designare volui.

The *Onoseris salicifolia* of M. Kunth may possibly belong to this genus; but not having had an opportunity of examining a sample of it, I am unable to determine this point at present. It cannot belong to *Onoseris*, which has the habit of the *Perdiceæ*, and with which tribe the genus must be associated.

1. C. *albicans*.
Hieracium albicans. *Herb. R. et P.*
In Peruviâ. *Ruiz et Pavon*. ♄.

CHÆTACHLÆNA.

Receptaculum favosum. *Flosculi disci* hermaphroditi, tubulosi, 5-dentati; *radii* fœminei, ligulati.

Involucrum semiglobosum, polyphyllum: *squamis* numerosissimis, quadruplici circiter serie imbricatis, lanceolatis, in setam longam, recurvato-patentem prodeuntibus. *Receptaculum* favosum, dentato-scabrum. *Flosculi radii* plures, fœminei, ligulati, unilabiati, trilobati, 6-nervii (nervis per paria discum laciniarum occupantibus) fœminei? staminum rudimentis; *disci* hermaphroditi, tubulosi, 5-dentati, tubo infra medium angustiore, fauce cylindricâ, latere exteriore profundiùs fissi: *nervis* 5 primariis ad laciniarum sinus divisis: *dentibus* linearibus, obtusis. *Antheræ* appendiculâ lineari-lanceolatâ, acutiusculâ, coriaceâ coronatæ, basi setis 2, longis, tenuissimis, simplicibus munitæ. *Stigma* hermaphroditis inclusum, emarginatum, obtusum; fœmineis exsertum, magnum, indivisum, clavatum, pruinosum. *Achenia* cuneato-oblonga, pilosiuscula. *Pappi radiis* persistentibus, triplici ordine digestis, copiosis; *interioribus* compressis, rigidis, serrulatis; *extimis* brevissimis, pilosis.

Herba

Herba *annua, niveo-lanata, facie* Cryptostemmatis calendulacei. Radix *longissima, descendens, fulvella, fibris plurimis, capillaceis munita.* Caules *plures, procumbentes, simplices v. divisi, palmares aut spithamæi.* Folia *alterna, petiolata, ovata, mucronata, sinuato-dentata, nunc sublyrata, dentibus inæqualibus, mucronatis, distantibus, membranacea, maximè fragilia, triplinervia, subtùs densiùs lanata, mollissima, pollicaria v. sesquipollicaria, semunciam v. unciam latitudine æquantia;* radicalia *longiùs petiolata.* Flores *solitarii, longè pedunculati, pulcherrimi, odorati; diametro sesqui-unciales.* Pedunculi *filiformes, uniflori, assurgentes, nunc ex ipsâ radice ortum ducentes, stricti, palmares v. spithamæi, lanuginosi, squamulâ unicâ setaceâ muniti.* Radius *atropurpureus, vix semuncialis.* Discus *pallidior.* Pappus *cinereo-fulvellus.*

Nomen a *χαιτη seta*, et *χλαινα involucrum.*

1. C. *odorata.*

Leysera odorata. *Herb. R. et P.*

In Guayaquilâ Peruvianorum. *Tafalla.* ⊙.

Chætachlæna is intimately allied to the preceding genus; the structure of the florets and pappus proves this most satisfactorily; and the elongated almost cirrhose points of the scales of the involucrum compared with the tendrils of the leaves of *Mutisia*, as well as the woolly habit of the plant, and the general resemblance of the flower, appear to me to indicate considerable affinity to that genus. The leaves of this genus and of *Mutisia lanata* are extremely fragile in the dried state.

Euthrixia.

Receptaculum scrobiculatum. *Flosculi disci* hermaphroditi, tubulosi, 5-dentati; *radii* fœminei, bilabiati.

Involucrum campanulatum, polyphyllum, basi attenuatum: *squa-*

mis quadruplici circiter ordine imbricatis, obtusis, membranaceis, margine scariosis. *Receptaculum* depressum, scrobiculatum. *Flosculi disci* numerosi, hermaphroditi, tubulosi, basi angustati: *limbo* obtusè 5-dentato, subæquali; *dentibus* 2 *exterioribus* majoribus, profundiùsque sejunctis: *nervis primariis* ad sinum laciniarum bifidis, ramis marginalibus: *radii* plures, fœminei, bilabiati, staminibus sterilibus; *labio exteriore* ligulato, elliptico-oblongo, 4-nervio (nervis extimis longè intramarginalibus) apice obtusè tridentato; *interiore* lineari-angustissimo, recto, acutè bidentato. *Antheræ* appendiculâ lineari-lanceolatâ acutâ, cartilagineo-membranaceâ coronatæ, basi setis 2, longis tenuissimis, puberulis ipsâ antherâ longioribus munitæ. *Stigma* clavatum, bilobum: *lobis* obtusis, conniventibus, minutè papillosis. *Achenia* lineari-oblonga, compressa, punctis elevatis, crystallinis copiosè ornata: *disco epigyno* parùm dilatato, concavo. *Pappus* pilosus, persistens: *radiis* simplici ordine contiguis, æqualibus, tenuissimè denticulatis.

Herba *erecta, ramosa, tenella, fragilis, palmaris v. spithamæa, omninò glaberrima, radice fibrosâ, annuâ.* Rami *elongati, erecto-patentes, filiformes, purpurascentes, nitiduli, virgati, rigidiusculi, foliosi.* Folia *alterna, sessilia, lineari-subulata, mucronulata, subcarnosa, glabra, subtùs convexa, suprà concava, margine glandulosa, basi adpressâ remanenti, semuncialia v. parùm ultra;* superiora *sensim breviora, et in foliolis involucri abeuntia, nunc rarò semipollicem longa.* Flores *terminales, pro ratione plantæ magni, solitarii, v. pauci laxè corymbosi, sessiles.* Involucrum *semipollicare, omninò læve:* squamis *scarioso-membranaceis, nitidis, nunc purpurascentibus.* Flosculi *aurei.* Pappus *niveus.*

Nomen ab ευ *benè*, et θριξ *capillus* (i. e. benè comatus), et ad pappum refert.

1. E. *sal-*

1. E. *salsoloides.*
   In Chili. *Ruiz et Pavon.* ⊙.

The naked receptacle, the rays of the pappus disposed in a simple series, and the habit of the plant itself, readily distinguish this genus from the rest of this group.

Trib. 7. MUTISEÆ. *Receptaculum* nudum. *Flosculi* difformes: *disci* tripartito-bilabiati. *Antherarum aristis* subplumosis. *Stigmata* obtusa, pruinosa, partim connata. *Frutices sæpè scandentes, foliis apice cirrhosis!*

MUTISIA, *L.*

Involucrum polyphyllum, multiplici serie imbricatum: *squamis* latis, integerrimis. *Receptaculum* nudum. *Flosculi radii* fœminei, ligulati: *ligula* ampla, multinervia (nervis 10 v. 15 parallelis, nunc supernè dichotomis, extimis longè intramarginalibus), apice tridentata, fauce sæpè ad interiùs dentibus (labello interiore) accessoriis lineari-setaceis munita; *disci* masculi: *tubo* 10-nervio: *limbo* altè tripartito-bilabiato; *labio interiore* bipartito, revoluto, segmentis binerviis; *exteriore* multò majore, ligulato, 8-nervio (nervis alternis secundariis prope apicem omninò obliteratis) obtusè tridenticulato. *Antheræ* omninò exsertæ, in tubum connatæ, appendiculâ longissimâ, lineari-ligulatâ, obtusâ, coriaceâ terminatæ, basi biaristatæ: *aristis* prælongis, pubescentibus, subplumosis. *Stylus* basi callosus. *Stigma* bilobum: *lobis* obtusis, pruinosis. *Achenia* linearia, compresso-quadrangula, glabra: *disco epigyno* parùm dilatato. *Pappus* deciduus: *radiis* validis, compressiusculis, filamentoso-plumosis, simplici ordine copiosis, contiguis: *villis* mollissimis, caducis.

Frutices

Frutices (Amer. Austr.) *scandentes*, Vicias *facie æmulantes.* Folia *alterna, pinnata v. simplicia, apice cirrho (foliolis abortivis aut costæ elongatione) pinnatè partito v. simplici, spirali instructa!* Flores *solitarii, magni, speciosi, purpurei v. lutei.*

The presence or absence of the labellum in the rays is evidently a character of no importance in this genus. Its mutability even in species otherwise intimately allied, shows that it cannot be employed with advantage as a sectional distinction; and in those species where it is less developed, I hardly think it of specific importance. The younger Linnæus in his description of *Mutisia Clematis* appears to have mistaken the two lobes of the labellum for the rudiments of stamina. Humboldt and Bonpland have represented and described their *Mutisia grandiflora* (*Pl. Eq.* i. *t.* 50.) as having the florets of the disk tubular, and equally five-toothed. This is clearly an error, for the origin of which it is difficult to account, as we know of no species with a similar structure; and indeed this character, if really present, would alone be sufficient to justify its removal from *Mutisia:* but its evident affinity to *M. Clematis*, which would also have led us to expect the presence of an interior labellum in the rays, induces us to reject this opinion, and to regard the description and figure in the *Plantes Equinoxiales* as erroneous in these respects. I am not satisfied that this is really distinct from *M. Clematis* of the *Supplementum Plantarum*, as the sample of the latter preserved in the Linnæan herbarium appears to approach very near to it, even as regards the size of the flower, which is erroneously compared by the younger Linnæus to the *Dianthus caryophyllus.* They both agree in having the leaflets on distinct footstalks, which the plant of Cavanilles appears to want entirely. This last being from Peru, may prove to be a distinct species. The most remarkable character in *Mutisia* is the number of vessels in in the corolla, which are from 10 to 15 in the florets of the circumference, and 10 in those of the disk. These vessels are generally of the same thickness, and all originate from the base; but in the exterior lip of the centre florets, where they are eight in number, the alternate ones are more slender, and disappear before they reach the apex of the laciniæ. The number of vessels is uniform in the nine species here enumerated, and there is every probability of its being general throughout the rest of the genus. This character and the pubescent setæ of the antheræ show an intimate affinity between *Mutisia* and *Bichenia*, before described.

* *Foliis pinnatis.*

1. M. *lanata*, niveo-lanata; foliis 7-jugis, involucris subrotundis: squamis appendiculatis cirrhosis, radiis copiosis bilabiatis, caule alato.

   Mutisia lanata. *Ruiz et Pavon Syst. Veg. Fl. Peruv. et Chil. p.* 192. *Gen. Pl. t.* 23.

   In Peruviæ nemoribus prope Muna vicum in Pozuzo viâ. *Ruiz et Pavon.* ♄.

Planta fruticosa, scandens, copiosè niveo-lanata. *Caules* angulati, plerumque 4-anguli, alati: *alis* foliaceis, retrorsùm dentatis, dentibus triangulari-lanceolatis, acutis. *Folia* alterna, sessilia, pinnata, palmaria v. spithamæa: *rachis* subtùs convexa, suprà canaliculata, margine alata, basi dilatata: *pinnis* 6—7-jugis, lanceolatis, obtusiusculis, integerrimis, planis, subtùs densè lanatis, suprà hinc nudiusculis, nunc (præsertim in junioribus) lanatis, basi latâ decurrentibus, 2 v. 2½-pollicaribus, semunciam v. ultra latis; *imis* 2 stipulas mentientibus, caulem amplexantibus. *Cirrhi* (foliola abortiva) pinnatè partiti: *segmentis* (3—5) filiformi-compressis,

compressis, obtusis, spiraliter revolutis. *Flores* terminales, solitarii, magni, omnium formosissimi, pedunculati, diametro ferè 3 pollices adæquantes. *Pedunculi* spithamæi, cylindrici, pennâ corvinâ parùm crassiores, apicem versus foliolis simplicibus cirrhosis muniti. *Involucrum* amplum, subrotundum, truncatum, longitudine et latitudine 2 uncias adæquans: *squamis* ellipticis, adpressis, latissimis, membranaceis, appendice (præsertim in exterioribus) sæpè pollicari, lanceolatâ, longissimè subulato-acuminatâ, apice obtusâ, cirrhosâ, revolutâ auctis! hinc squamæ involucri, ut omnibus appareant, tantùm folia sunt mutata. *Receptaculum* planum, nudum. *Flosculi radii* plurimi (18—20) atrosanguinei, fœminei, staminum rudimentis, bilabiati; *labio exteriore* ligulam amplam, bipollicarem, 3 lineas latam, subtùs lanatam, obtusè tridentatam, dependenti-patulam constituente; *interiore* profundè bipartito: *laciniis* setaceis, apice bidentatis! revolutis; *disci* creberrimi, hermaphroditi, tubulati, tripartito-bilabiati: *labiis* revolutis; *exteriore* lineari-ligulato, obtusè tridentato; *interiore* bipartito: *laciniis* linearibus, obtusis: *nervis primariis* validis. *Filamenta* angustè linearia, complanata, glabra, libera. *Antheræ* in tubum connatæ, nervo manifestissimo instructæ, basi biaristatæ: *aristis* unguicularibus, infernè attenuatis, basi ramulosis, subplumosis: *appendiculâ* lineari-ligulatâ, obtusâ, cartilagineâ, ipsâ antherâ dimidio longiori. *Stylus* filiformis, lævis, basi incrassato-clavatus. *Stigma* bilobum: *lobis* brevibus, crassis, obtusissimis, pruinosis. *Achenia* radiis tetragona; *disco* oblongo-compressa, glabra. *Pappus* fuliginoso-cinereus, sesquipollicaris, mollissimus: *radiis* valdè plumosis, imâ basi connatis, ramulis demùm deciduis, tunc simplicibus.

2. M. *vi-*

2. M. *viciæfolia*, glabriuscula; foliolis 12-jugis, involucro cylindrico: squamis inappendiculatis, radiis paucis unilabiatis, caule tereti.

Mutisia viciæfolia. *Cav. Ic.* 5. *p.* 62. *t.* 490. *Willd. Sp. Pl.* 3. *p.* 2069. *Lam. Illustr.* 6. *t.* 690. *f.* 2.

In Chili prope Valparaiso. *Ludovicus Née, Ruiz et Pavon.* ♄.

Planta fruticosa, scandens, Viciis quibusdam facie ferè similis. *Caules* teretes, rubri, striati, tenuissimè pubescentes. *Folia* alterna, sessilia, pinnata, 3—4-uncialia: *rachi* teretiusculâ, pubescenti, margine superiore angustè alatâ: *foliolis* plurimis (10—13-jugis) ellipticis lanceolatisve, acuminatis, inæquilateris, glabris, semunciam v. nunc ferè pollicem longis. *Cirrhi* pinnatè partiti: *laciniis* 3—5, subulatis, obtusiusculis, revolutis, semuncialibus. *Flores* in dichotomiis solitarii, longè pedunculati. *Pedunculi* cylindrici, striati, minutè pubescentes, 3—5-unciales, apice incrassati. *Involucrum* tubulato-cylindricum, læve, bipollicare: *squamis* latissimis, integerrimis, lævissimis, adpressis, nudis, nec appendiculatis; *extimis* brevissimis, ovatis, acutis; *interioribus* oblongis, mucronulatis; nunc in juventute lanigeris. *Receptaculum* nudum. *Flosculi radii* pauci (6—8), fœminei, atropurpurei, unilabiati, ligulâ oblongâ, patenti, obtusè tridenticulatâ, subtùs glabrâ, involucro duplò breviore, rudimentis staminum nullis; *disci* hermaphroditi, pallidiores, plures (16—17), tubulosi, tripartito-bilabiati: *labiis* erectis; *exteriore* trifido, lobis lineari-lanceolatis, obtusis; *interiore* bipartito, laciniis linearibus, obtusiusculis: *nervis primariis* validis. *Antheræ* biunciales, appendiculâ lineari, acuminatâ, unguiculari coronatæ, basi longè biaristatæ: *aristis* complanatis, infernè capillaceo-attenuatis. *Stigma* radiis bifidum, segmentis linearibus, acutis, pruinosis; disco bilobum,

lobum, lobis obtusiusculis, minutè papillosis. *Achenia* radiis quadrangula, glabra; disco compressa, lævia. *Pappus* fulvellus, mollissimus, plumosus.

3. M. *acuminata*, glabra; foliolis multijugis, involucro pyramidali lanuginoso; squamis exterioribus ovatis reflexis, caule teretiusculo.

Mutisia acuminata. *Ruiz et Pavon Syst. Veg. Fl. Peruv. et Chil.* i. *p.* 192.

In præruptis, collibus et sepibus Tarmæ et Haurocheri ubique. *Ruiz.* ♄.

Planta frutescens, 6-pedalis. *Caulis* scandens, ramosissimus, glaber, fragilis, tereti-angulatus. *Folia* alterna, pinnata, cirrho furcato terminata: *foliola* lanceolata, acuminata, integerrima, glabra, sessilia: *extima* minora, subacinaciformia, leviter decurrentia. *Pedunculi* terminàles, foliosi, uniflori, folio oppositi. *Calyx* pyramidalis, ovato-oblongus, imbricatus, lanuginosus, extùs coloratus: *squamis* 24, concavis; *exterioribus* ovatis, reflexis; *interioribus* lanceolato-cuneiformibus. *Corollulæ* plures in disco hermaphroditæ, flammeæ; *fœmineæ* septem in radio, aureæ v. flavæ. *Pappus* plumosus. *Ruiz Mss.*

OBS. Vulgò *Chinchinculma* nuncupàtur. Floret Maio et Julio. *Ruiz Mss.*

There being no specimen of this species in the Herbarium of Ruiz and Pavon, and as the plant has been only known by the short specific character contained in the work above-quoted, I have thought that the above description, derived from the manuscripts of Ruiz, might not prove unacceptable to my botanical readers.

4. M. *arachnoidea*, lanigera; foliolis subseptemjugis, involucri squamis

squamis ovato-lanceolatis acuminatis, radiis copiosis bilabiatis: ligulis linearibus revolutis.

Mutisia arachnoidea. *Mart. Mss.*

M. speciosa. *Bot. Mag. t.* 2705.

In Brasiliâ ad Rio de Janeiro. *Martius.* ♄.

Planta suffruticosa, ramosissima, scandens, lanâ cinereâ, copiosâ, fugaci, arachnoideâ vestita, quandoque omninò læviuscula evadit. *Caulis* 5-gonus. *Folia* alterna, sessilia, pinnata, palmaria, patentissima: *pinnæ* alternæ, 12—14, elliptico-oblongæ, obsoletè mucronulatæ, integerrimæ, membranaceæ, basi angustatâ substipitatæ, posticibus sæpiùs rotundatis, nec attenuatis, pollicem v. sesquipollicem longæ, 6—8 lineas latæ: *rachis* simplicissima, purpurascens, suprà planiuscula, canaliculata, subtùs carinata, apice in cirrhum pinnatè partitum, cujus laciniæ filiformes spiraliter contortæ, prodeunte. *Flores* terminales, solitarii, pedunculati. *Pedunculi* erecti, teretiusculi, inde planiusculi, spithamæi. *Involucrum* oblongum, cylindricum, imbricatum, apice paululùm coarctatum: *squamis* ovato-lanceolatis, acuminatis, membranaceis, extùs præsertim ad oram lanuginosis, nunc omninò glabris; *exterioribus* patentibus, basi tantùm adpressis; *intimis* oblongis, conniventibus, apice rotundatis, mucronulatis, margine lanuginosis. *Receptaculum* nudum. *Flosculi radii* bilabiati, rubri, plurimi (15—20) fœminei, staminibus sterilibus, tubo compressiusculo longitudine involucri: *ligulâ* lineari, tridentatâ, revolutâ, involucro triplò breviore, quandoque bipartitâ; *labio interiore* paulò breviore, pallido, bipartito, laciniis lineari-angustissimis, spiraliter revolutis, primùm margine conglutinatis; *disci* hermaphroditi, albi, tubulosi, bilabiati: *labiis* revolutis; *exteriore* ligulato, tridentato, 4-nervio; *interiore* bipartito, laciniis linearibus obtusis, binerviis. *Filamenta* linearia, compressa, minutissimè glandulosa.

dulosa. *Antheræ* in tubum pentagonum coalitæ, appendiculâ lineari, obtusâ terminatæ, basi bisetosæ: *setis* longis, basi ramulosis. *Stylus* filiformis, glaber, basi incrassatus. *Stigma* bilobum: *lobis* brevissimis, obtusis, papillosis, partim connatis. *Achenia* compressiuscula, disco parùm concava, non dilatata, glabra. *Pappi radiis* copiosis, contiguis, plumosis, cinereo-fulvellis, mollissimis.

The appellation of *speciosa* being so truly inapplicable to this species, I have preferred the unpublished one given to it by Dr. Martius. The plant was imported into this country from some continental nursery, where the name of *speciosa* no doubt originated.

** *Foliis pinnatifidis, basi decurrentibus.*

5. M. *retrorsa*, niveo-lanata; foliis runcinatis, caule tereti.
Mutisia retrorsa. *Cav. Ic.* 5. *p.* 65. *t.* 498.
M. runcinata. *Willd. Sp. Pl.* 3. *p.* 2069. *Hook. Bot. Misc.* 1. *p.* 8. *t.* 5.
In Chili (*Ruiz et Pavon*); ad Fretum Magellanicum. *Ludovicus Née et P. P. King.* ♄.

Planta suffruticosa, sesqui- v. bipedalis. *Caulis* scandens, cylindricus, flexuosus, undique lanâ fugaci niveâ copiosè obrutus, demùm nudus. *Folia* alterna, basi decurrenti edentulâ, lanceolata, acuminata, runcinata, coriacea, margine revoluta, subtùs densè niveo-lanata, costâ prominenti, suprà minùs copiosè lanata, et tandem denudata, perlucida, uncialia v. sesquiuncialia, 10 lineas v. paulò ultra lata: *lobis* triangulari-ovatis, spinoso-mucronatis. *Cirrhi* simplicissimi, nunc bipartiti, compresso-filiformes, obtusiusculi, revoluti, glabri, vix unciales. *Flores* terminales, solitarii, subsessiles. *Involucrum* unciale, cylindricum: *squamis* subrotundo-ovalibus, adpressis; *exterioribus* appendice lanceolatâ, spinoso-mucronatâ,

mucronatâ, ipsâ squamâ breviore, patulâ; *intimis* mucronulatis, margine lanuginosis. *Receptaculum* nudum. *Flosculi* lutei! *radii* plures (8—14) fœminei, bilabiati, staminibus sterilibus; *labio exteriore* amplo, ligulato, obtusè tridenticulato, patulo; *interiore* bipartito, laciniis linearibus, revolutis; *disci* tubulato-bilabiati; *labio exteriore* trifido; *interiore* angustiore, bipartito; utroque revoluto. *Antheræ* basi setis 2, attenuatis, simplicibus, longis aristatæ, appendiculâ lineari, apice inflexâ, cartilagineâ, interiùs carinatâ coronatæ. *Stylus* teres, validus. *Stigma* bilobum: *lobis* brevissimis, crassis, obtusis, conniventibus, pruinosis. *Pappus* plumosus, cinereus, mollissimus.

6. M. *sinuata*, nudiuscula; foliis pinnatifidis basi attenuatis, caule alato.

Mutisia sinuata. *Cav. Ic.* 5. *p.* 66. *t.* 499. *Willd. Sp. Pl.* 3. *p.* 2070.

In Chili. *Ruiz et Pavon.* ♄.

Caulis suffruticosus, scandens, flexuosus, alatus: *alis* dentatis, interruptis, quòd basin versus attenuatis, ibique obliteratis, nec continuatis. *Folia* alterna, linearia, pinnatifida, dentata v. grossè serrata, margine revoluta, basi attenuata, decurrentia, subcoriacea, utrinque nunc leviter lanuginosa, tunc (præcipuè in *adultioribus*) glabriuscula, pollicaria v. paulò ultra: *lobis* ovatis, mucronatis, retrorsis v. sæpiùs porrecto-patulis. *Cirrhi* simplices, subulati, corneo-mucronati, folio dimidio breviores, recurvati, vix revoluti. *Flores* terminales, solitarii, sessiles. *Involucrum* cylindricum, vix longitudine unciale: *squamis* subrotundis, adpressis, lævissimis, margine tantùm lanuginosis; *exterioribus* appendice lanceolatâ, acuminatâ, strictâ, glabrâ auctis. *Flosculi* purpurei? *radii* 8, fœminei, ligulati, unilabiati, staminum rudimentis; *disci* plures

plures (15) tubulato-bilabiati, hermaphroditi; *labio exteriore* ligulato, tridentato; *interiore* bipartito, revoluto. *Antheræ* basi longè bisetæ, appendiculâ lineari cartilagineâ coronatæ. *Stigma* bilobum, pruinosum. *Pappus* cinereus, valdè plumosus, mollissimus.

*** *Foliis amplexicaulibus, tantùm dentatis.*

7. M. *ilicifolia*, foliis cordato-oblongis spinuloso-serratis venosissimis, caule teretiusculo.

Mutisia ilicifolia. *Cav. Ic.* 5. *p.* 63. *t.* 493. *Willd. Sp. Pl.* 3. *p.* 2069. *Hook. Bot. Misc.* 1. *p.* 7. *t.* 4.

M. spinosa. *Ruiz et Pavon Syst. Veg. Fl. Peruv. et Chil.* i. *p.* 193.

In Chili copiosè ad Arauco arcem supra Colocolo montem intra fossas (*Ruiz et Pavon*); in summis montibus Chilensibus Cordillera del Planchon dictis, et ad Cucha-Cucha. *Ludovicus Née. Caldcleugh.* ♄.

Planta suffruticosa, scandens, nunc lanâ fugacissimâ leviter ornata, tunc glaberrima, glauca. *Caulis* tripedalis v. ultra, teretiusculus, foliosus. *Rami* angulati, in plantis adhuc teneris alati. *Folia* alterna, amplexicaulia, conferta, subimbricata, cordato-oblonga, argutè æqualiterque dentato-serrata (dentibus spinulâ rigidâ brevissimâ terminatis) undulata, coriacea, reticulatim venosissima, apice truncata, costâ validâ basi dilatatâ, apice in cirrho simplici, filiformi, mucronulato, spiraliter revoluto productâ, pollicem v. sesquipollicem longa, 8—10 lineas lata. *Flos* terminalis, solitarius, brevissimè pedunculatus. *Pedunculus* squamis aliquot cordatis, coriaceis, denticulatis, apice recurvis munitus. *Involucrum* oblongum, unciale: *squamis exterioribus* appendice ovato-lanceolatâ, acuminatâ, reflexo-patenti, coriaceâ auctis; *interioribus* latissimis, adpressis, subrotundis, coriaceis, mu-

cronulo

cronulo recurvo, lanuginoso. *Flosculi radii* fœminei, plures (8—10) bilabiati, intùs albi, extùs purpurei; *labio exteriore* elliptico-oblongo, apice tridenticulato, subtùs bicarinato; *interiore* brevissimo, bidentato, nunc simplici v. obsoleto; staminibus sterilibus; *disci* plurimi (20—30) hermaphroditi, tubuloso-bilabiati: *labiis* revolutis. *Antheræ* basi longè bisetæ, appendiculâ lineari obtusiusculâ coronatæ. *Stigma* bifidum: *lobis* recurvatis, apice paulò incrassatis, minutè papillosis. *Pappus* albus, mollissimus, plumosus.

8. M. *truncata*, foliis cordato-oblongis truncatis basi apiceque spinoso-dentatis undulatis subaveniis, caule angulato.

In Chili. *Caldcleugh.* ♄.

Planta suffruticosa, scandens, ramosissima, glabra. *Caulis* angulatus. *Folia* remotè alterna, sessilia, amplexicaulia, e basi cordatâ oblonga, lobis posticis truncatis, spinoso-dentatis, conniventibus, apice truncata, emarginata, dentibusque 2, spinosis, subremotis utrinque ornata, marginibus strictis, integerrimis; subcoriacea, rigida, utrinque glabra, glauco-viridia, sesqui- v. bipollicaria, vix unciam lata, venis vix manifestis, costâ utrinque prominulâ lævi, in cirrhum longissimum (3—4-uncialem) filiformem, lævissimum, apice complanatum, spiraliter revolutum prodeunte. *Flores* terminales et alares solitarii, pedunculati. *Pedunculi* filiformes, unciales, glabri. *Involucrum* cylindricum, pedunculi longitudine: *squamis* subrotundis ovalibusve, adpressis, margine membranaceis; *extimis* appendice lanceolatâ, acutâ, coriaceâ, patentissimâ auctis; *interioribus* apice obsoletè mucronulatis et lanugine parcissimâ barbatis. *Receptaculum* nudum. *Flosculi radii* 8 circiter, purpurei, ligulati, fœminei, involucro longitudine æquales, obtusè tridentati, labello interiore obsoleto v. bidenticulato; *disci* hermaphroditi, tubulatolato-bilabiati; *labio exteriore* tridentato; *interiore* bipartito: *laciniis* linearibus, acutis, revolutis. *Antheræ* basi bisetæ (setis longis basi ramosis) appendiculâ lineari, antherâ ipsâ paulò longiori, apice conniventi, obtusiusculâ terminatæ. *Stigma* bilobum: *lobis* lingulatis, obtusis, pruinosis, sæpè facie interiore applicatis. *Pappus* valdè plumosus, mollissimus, cinereus.

For the opportunity of adding this truly distinct species to the genus *Mutisia* I am indebted to Mr. Caldcleugh, by whom specimens of it as well as of the preceding were transmitted to Mr. Lambert.

9. M. *latifolia*, foliis basi decurrentibus cordato-ovalibus spinoso-dentatis integerrimisve subtùs lanatis, radiis copiosis, caule alato.

In Chili ad Valparaiso. *D. Bridges.* ♄.

Caulis fruticosus, ramosus, scandens, alatus. *Rami* alati, foliosi: *alis* 3, latis, foliaceis, dentatis. *Folia* conferta, amplexicaulia, cordato-ovalia, coriacea, apice rotundata et emarginata, aut omninò truncata, margine dentato-serrata, undulata, dentibus spinoso-mucronatis, utrinque lanâ fugaci vestita, suprà demùm nuda, viridia, venis siccitate conspicuis, reticulatis, costâ basi latiore, apice in cirrhum longum (3-uncialem) compressum, obtusum, spiraliter convolutum prodeunte; sesqui- v. bipollicaria, pollicem v. sesquipollicem lata: *lobis posticis* productis, rotundatis, sinu baseos decurrentibus. *Flos* terminalis, solitarius, subsessilis. *Involucrum* magnum, cylindricum, unciale, densè arachnoideo-lanatum; *squamis intimis* simplici ordine dispositis, limbo dilatato, rotundato, membranaceo, margine lanuginoso; *exterioribus* appendice ovato-lanceolatâ spinoso-mucronatâ, patenti auctis. *Flosculi radii* plures (14) rosei, ligulati, spathulato-

spathulato-oblongi, obtusè tridentato, multinervio, labello interiore aucti, hujus laciniæ lineares, erectæ, brevissimæ, staminibus sterilibus; *disci* circiter 30, tubulato-bilabiati: *tubo* 5-angulo: *labiis* revolutis; *exteriore* ligulato, obtusè tridentato; *interiore* bipartito: *segmentis* linearibus, obtusis, revolutis, binerviis. *Stamina* tubo inserta: *filamenta* compressa, pubescentia, apice articulata. *Antheræ* exsertæ, in tubum coalitæ, appendiculâ ligulatâ obtusâ callosâ coronatæ, basi bisetosæ: *setis* longis, compressis, canaliculatis, basi ramosis, nunc rariùs bipartitis. *Stylus* 5-angulus, basi clavatus, glaber. *Stigma* bilobum: *lobis* brevissimis, obtusis, minutè papillosis. *Achenia* ancipiti-compressa, leviter quadrangula, glabra: *disco epigyno* dilatato, planiusculo. *Pappus* sordidè cinereus: *radiis* simplici ordine copiosis, contiguis, plumosis, basi dilatatis, apice mucronulatis.

Specimens of this *Mutisia* were collected in the neighbourhood of Valparaiso by Mr. Thomas Bridges, an enterprising young botanist, from whose exertions we may confidently expect many valuable additions to the Chilian Flora. Mr. Bridges informs me that the plant flowers in October, and that the rays are pink.

**** *Foliis simplicibus, integerrimis.*

10. M. *inflexa*, foliis deflexis perangustis cirrhosis, involucri squamis appendiculatis.

Mutisia inflexa. *Cav. Ic.* 5. *p.* 65. *t.* 496. *Willd. Sp. Pl.* 3. *p.* 2070. *Hook. Bot. Misc.* 1. *p.* 9. *t.* 6.

M. subulata. *Ruiz et Pavon Syst. Veg. Fl. Peruv. et Chil.* i. *p.* 193.

M. linearifolia. *Hook. l. c. p.* 11. *t.* 8. non *Cav.*

In Chili in sylvis arenosis prope urbem Conceptionis (*Ruiz et Pavon*); ad Valparaiso et Cucha-Cucha. *Ludovicus Née.* ♄.

Caulis suffruticosus, scandens, teres, flexuosus, ramosissimus, ut et et tota planta lanâ fugacissimâ leviter instructus, cortice cinereo lævi obductus, altitudine maximè varians, nunc altissimus, sæpè 12-pedalis! *Ramuli* foliosi, tortuosi, angulati. *Folia* (laricina) alterna, sessilia, conferta, lineari-angustissima, coriacea, glabra, lætè viridia, nunc leviter lanuginosa, margine revoluta, integerrima, apice cirrho brevi trilineari v. unguiculari subulato, mucronulato, revoluto instructa, basi nunc rariùs longè decurrentia; *inferiora* deflexo-patula; *suprema* erecta, tantùm mucronata; sesqui- v. tripollicaria, quàm lineæ tertiâ latitudine vix ampliora. *Flores* terminales, solitarii, sessiles. *Involucrum* cylindricum, longitudine unciale, demùm lævigatum; *squamis exterioribus* appendice lanceolatâ spinuloso-mucronatâ patulâ auctis; *interioribus* ovalibus, obtusis, nudis, adpressis. *Flosculi radii* sanguinei, plures (8—10), fœminei, staminibus sterilibus, ligulati, subbilabiati; *labello interiore* bidentato, dentibus brevissimis setaceis, nunc rariùs obsoletis v. nullis: *ligulâ* lanceolatâ, obtusè tridentatâ, involucro vix breviore: *tubo* filiformi, unciali; *disci* plurimi (20—25) hermaphroditi, lutei, tubulato-bilabiati: *labiis* revolutis; *interiore* bipartito; *altero* 3-dentato. *Antheræ* appendiculâ lineari, apice obtusâ, inflexâ, ipsâ antherâ ferè dimidio breviori coronatæ, basi biaristatæ: *aristis* subsimplicibus, sesquilineam longis, sursùm latioribus. *Stylus* filiformis. *Stigma* bilobum: *lobis* brevibus, obtusis, pruinosis. *Pappus* cinereus, mollissimus, plumosus.

11. M. *linearifolia*, foliis erectis linearibus subimbricatis, involucri squamis inappendiculatis.

Mutisia linearifolia. *Cav. Ic.* 5. *p.* 66. *t.* 500.

M. linifolia. *Hook. Bot. Misc.* 1. *p.* 12. *t.* 9?

In Chili cum præcedente. *Ludovicus Née.* ♄.

Caulis

Caulis erectus, dodrantalis. *Rami* teretes, cortice cinereo lævi, foliosi. *Folia* duplò latiora, erecta, subimbricata, linearia, glabra, margine revoluta, mucrone recto instructa, uncialia v. sesquiuncialia, lineam v. sesquilineam lata. *Flos* terminalis, solitarius, sessilis. *Involucrum* tubulato-cylindricum, sesquiunciale, tandèm lævissimum: *squamis* ovalibus, obsoletè mucronulatis, dilatatis, margine superiore puberulis. *Flosculi radii* 8, purpurei, involucro breviores. *Pappus* albus, plumosus. Reliqua ut in præcedente, ad quam maximè, ut videtur, affinis sit hæc planta; sed satis discrepat foliis erectis duplò latioribus non cirrhosis, involucro longiore squamis inappendiculatis, atque ligulis brevioribus.

Trib. 8. Barnadeseæ. *Receptaculum* paleaceo-villosum. *Flosculi* difformes v. regulares, 5-partiti. *Filamenta* nunc monadelpha! *Antheræ* basi quandoque muticæ! *Stigmata* crassa, conniventia, papilloso-pruinosa. *Frutices erecti, foliis integerrimis.*

Barnadesia, *L.*

Diacantha. *Lag.*

Bacasiæ sp., *Ruiz et Pavon.*

Flosculi radii bilabiati, hermaphroditi; *disci* masculi, tubulosi. *Pappus* difformis.

Involucrum oblongum, basi ventricosum, multiplici ordine polyphyllum, imbricatum: *squamis* mucronatis, integerrimis, cartilagineis; *intimis* elongatis, radiantibus. *Receptaculum* paleis tenuissimis, capillaceis, longis, membranaceis, acutis, muticis, spiraliter tortuosis copiosissimè vestitum. *Flosculi* dissimiles; *disci* paucissimi (1—3) masculi, tubulati, 5-fidi, basi callosâ, genitalibus omninò inclusis: *nervis primariis* validis,

validis, infrà laciniarum sinus profundè bipartitis; *secundariis* per paria interjectis, tenuioribus, ultra medium corollæ obscurioribus, demùm evanescentibus; *periphæriæ* plurimi (10—20) hermaphroditi, bilabiati, unicâ serie digesti, radiati, tubo longissimo, filiformi; *labio exteriore* amplo, ligulato, patulo, 4—5-fido, 5—6-nervio; *interiore* tenuissimo, subsetaceo, canaliculato, indiviso, uninervio. *Filamenta* in tubum cylindricum connata! membranacea, intùs villosa, nervo manifesto medium cujusque percurrenti; nunc rariùs omninò libera. *Antheræ* coalitæ, appendice lineari-lanceolatâ apice uncinatâ obtusâ cartilagineâ coronatæ, valvulis in filamentis decurrentibus, hinc basi simplices, muticæ. *Stylus* hermaphroditis teres, glaber; masculis subclavatus, pentagonus, stigmate emarginato, imberbi. *Stigma* hermaphroditis clavatum, bilabiatum: *lobis* crassis, brevibus, obtusis, apice subdilatatis, superficie minutè papillosis. *Achenia* turbinata, densè villosa. *Pappus* difformis; *periphæriæ* longus, eleganter plumosus, mollis, erectus: *radiis* simplici ordine copiosis (18—20) imâ basi connatis; *disci* setosus radiis plurimis (15—21) inæqualibus, subulatis, validis, recurvatis, hirsutis, vix plumosis, suprà planiusculis, imâ basi connatis, callosis.

Frutices (Amer. Æquin.) *sæpiùs spinosi.* Folia *petiolata, integerrima, mucronata, sæpè fasciculata.* Spinæ (dum adsint folia esse mutata) *geminæ, subulatæ.* Flores *solitarii sessiles v. plures terminales corymbosi, magni.* Flosculi *purpurei, sericeo-villosissimi.* Pili receptaculi *et* achenii *structurâ simillimâ, fulvi.* Pappus *fulvus.*

* *Flosculis disci nonnullis, tubulosis. Filamentis in tubum connatis.* Propriæ.

1. B. *spinosa*, foliis obovatis mucronatis nervosis, involucris pubescentibus;

bescentibus; squamis exterioribus ovatis acuminatis adpressis.

Barnadesia spinosa. *Linn. Suppl. p.* 348. *Lam. Ill. t.* 660? *Willd. Sp. Pl.* 3. *p.* 1705. *Humb. et Bonpl. Pl. Æqu.* 2. *p.* 176. *t.* 138. *Kunth Syn.* 2. *p.* 360.

In Andibus Novo-Granatensibus. *Mutis.* ♄.

Frutex erectus, ramosus, rigidus, spinosus. *Rami* cylindrici, striati, leviter sulcati, glabriusculi, cortice purpureo induti. *Ramuli* densè villosi. *Folia* fasciculata, petiolata, obovata, abruptè mucronata (mucrone setaceo, reflexo) integerrima, nervosa (nervis pluribus, arcuatis), parùm undulata, utrinque subvillosa, suprà viridia, demùm nudiuscula, subtùs pallidiora, basi attenuata, sesquipollicem longa, ferè pollicem lata. *Spinæ* patentes, aciculares, rigidæ, brunneæ, unciæ dimidium et ultra longæ, basi sejunctæ. *Capitula* subpaniculata. *Involucrum* oblongum, basi ventricosum, obtusum, copiosè fulvescenti-pubescens, pollicare; *squamis exterioribus* ovatis, acuminatis (acumine subulato, spinescenti), adpressis, callosis, integerrimis; *intimis* lineari-lanceolatis, mucronatis, elongatis, erectis, radiantibus. *Receptaculum* paleis capillaceis fulvis densè obsitum. *Flosculi periphæriæ* numerosi, duplici ordine digesti, hermaphroditi, bilabiati: *tubo* cylindrico, lævi; *labio exteriore* ligulato, quadrifido (laciniis lanceolato-linearibus, acutis), 5-nervio, subtùs densè fulvescenti-villoso, sericeo; *interiore* minimo, simplici, setaceo, canaliculato; *disci* 3, masculi, tubulosi, 5-fidi, coriacei, extùs villosissimi, imâ basi callosâ, genitalibus longè inclusis. *Filamenta* in tubum membranaceum connata. *Antheræ* coalitæ, basi simplices, muticæ, appendiculâ ligulatâ obtusâ callosâ apice incurvatâ coronatæ. *Stigma* bilobum: *lobis* crassis, obtusissimis, brevibus, dilatatis,

tatis, suprà concaviusculis, pruinosis. *Achenia* turbinata, fulvescenti-villosissima. *Pappus* fulvus, dissimilis; hermaphroditis plumosus, mollissimus, radiis copiosis (20—25) basi connatis; masculis setosus, radiis 20, subulato-setaceis, recurvatis, hirsutis, basi callosis, connatis.

The above description is taken from the original sample preserved in the Linnæan herbarium, and which had been communicated to Linnæus by Mutis. The figure in the *Plantes Equinoxiales* is a good representation of this species; but I am in doubt respecting that of Lamarck, which appears to approach nearer to the following. It is most probable that *B. spinosa* is peculiar to New Granada, and that the Peruvian plant said to be the same, is really distinct, and that it belongs to one of the other species I have enumerated.

2. B. *media*, foliis obovatis mucronatis subaveniis, floribus corymboso-paniculatis, involucris lanatis; squamis exterioribus lanceolatis mucronatis.

In Peruviâ. *Ruiz et Pavon.* ♄.

Frutex erectus, ramosus, spinosus. *Rami* undique cinereo-pubescentes. *Spinæ* subulatæ, graciles, semunciales, rectæ, divaricato-patentes. *Folia* fasciculata, brevissimè petiolata, obovata, mucronata, integerrima, plana, basi attenuata, utrinque subsericea, subtùs leviter canescentia, exsiccatione obsoletè venosa, pollicaria. *Flores* duplò minores, in ramulorum apice plures (8—10) corymboso-paniculati. *Pedunculi* uniflori, filiformes, tomentosi, unciales v. sesquiunciales. *Involucra* campanulata, longitudine vix uncialia, basi paululùm attenuata, folio unico sæpiùs bracteata: *squamis* fulvo-lanatis; *exterioribus* lanceolatis, pungenti-acuminatis, demùm reflexis, squarrosis; *intimis* elongatis, linearibus, mucronatis, radiatis, revolutis! *Flosculi radii* 15, ligulâ

ligulâ semipollicari, laciniis linearibus obtusis: *pappo* plumoso, mollissimo, radiis 18—20 erectis; *disci* 3, infundibuliformes, limbo 5-fidi: *pappo* subulato, rigido, radiis 15, recurvatis, hirsutis, dimidio brevioribus. Cætera omninò ut in genere.

3. B. *reticulata*, foliis elliptico-oblongis abruptè mucronulatis reticulato-venosis subtùs sericeis, involucri squamis adpressis nudiusculis nitidis.

In segetibus Tarmæ Peruvianorum. *Ruiz et Pavon*. ♄.

Frutex biorgyalis, erectus, ramosissimus, spinosus, cortice fusco. *Rami* dependentes, teretes, glabriusculi, apicem versus levissimè puberuli. *Ramuli* nutantes. *Spinæ* semunciales, horizontaliter patentes, nec divaricatæ, fulvæ, nitidæ. *Folia* in fasciculis paucissima (3—6) rarò subsolitaria, elliptico-oblonga, abruptè mucronulata, integerrima, plana, substantiâ tenuiora, ferè membranacea, suprà, nisi ad venas primarias, nudiuscula, subtùs sericea, nervis plurimis obliquè parallelis, venisque ramosissimis connexis reticulata. *Capitula* multò majora, 8—10 subcorymbosa, terminalia, breviter pedunculata. *Involucra* oblonga, basi ventricosa, rotundata, longitudine sesquipollicaria, v. pauld ultra: *squamis* siccitate fulvo-coloratis, nitidis; *exterioribus* ellipticis, subsericeis, abruptè mucronulatis, adpressis; *intimis* elongatis, erectis! acuminatis, radiantibus. *Flosculi* villosissimi. Cætera ut in præcedente.

4. B. *lanceolata*, foliis obovato-lanceolatis mucronatis aveniis utrinque sericeo-pubescentibus, floribus subsolitariis sessilibus, involucris lanatis.

Bacasia lanceolata. *Ruiz et Pavon Mss.*

In Andibus Peruviæ. *Ruiz et Pavon*. ♄.

Species

Species distinctissima. *Frutex* ramosissimus, rigidus, armatus. *Rami* teretes, flexuosi, glabriusculi. *Ramuli foliiferi* tomentoso-pubentes, nunc pollicares, infernè de lapsu foliorum tuberculati. *Spinæ* ligneæ, validæ, subulatæ, divaricato-patentes, rectæ, rigidissimæ, ad basin ramulorum geminatim oppositæ, vicem stipularum fungendæ, unciales v. sesquiunciales. *Folia* alterna, conferta, quasi fasciculata, obovato-lanceolata, mucronata, integerrima, plana, coriacea, utrinque avenia, pube ferrugineâ atomisque resinosis numerosissimis vestita, basi attenuata, petiolo ramis adnato suffulta, costâ mediâ conspicuâ; *adultiora* suprà nudiuscula. *Capitula* subsolitaria, sessilia. *Involucra* sesquipollicaria: *squamis* extùs, sed præsertim in junioribus, copiosè fulvo-lanuginosis, mollissimis; *intimis* elongatis, strictis, radiantibus; *exterioribus* ovatis, acuminatis, demùm revolutis, squarrosis. *Flosculi radii* magis copiosi (20) longiores, ligulâ ferè pollicari, 6-nerviâ, tubo involucri vix longitudine, filiformi; *disci* 3, infundibuliformes, masculi, limbo 5-fidi. *Pappus periphæriæ* radiis (20) eleganter plumosis, erectis, mollissimis, validioribus; *disci* 18, validis, rigidis, recurvatis, subulatis, hirsutis, infernè crassioribus, imâ basi connatis. Cætera ut in genere.

** *Flosculo disci solitario, tubuloso. Filamentis in tubum connatis.*

5. B. *corymbosa*, inermis; foliis sparsis ovato-lanceolatis acuminatis nervosis, floribus corymbosis, involucris pubescentibus.

Bacasia corymbosa. *Ruiz et Pavon Syst. Veg. Fl. Peruv.* 1. *p.* 189. *Gen. t.* 22.

In Andium nemoribus prope Muna vicum Peruviæ. *Ruiz et Pavon.* ♄.

Frutex

Frutex inermis, erectus, 2-orgyalis. *Rami* angulati, leviter sulcati, calamum scriptorium crassitie adæquantes, cortice fusco-cinereo obducti, apicem versus fulvo-tomentosi. *Folia* sparsa, petiolata, ovato-lanceolata, acuminata, coriacea, rigida, margine callosa, integerrima, suprà glabra, lucida, subtùs villosa, basi attenuata, costâ mediâ subtùs prominenti, nervis plurimis incurvatis, reticulatim connexis, venosissima, sesqui- v. quadri-uncialia, tunc pollicem v. sesquipollicem lata. *Petioli* semiteretes, tomentosi, suprà canaliculati, semunciales. *Flores* terminales, numerosi (7—14) corymbosi, *Serratulæ coronatæ* magnitudine et facie similes. *Pedunculi* teretes, copiosè fulvo-tomentosi, semi- v. pollicares. *Involucrum* ovatum, multiplici ordine polyphyllum, imbricatum, basi ventricosum; *squamis exterioribus* ovatis, acuminatis, integerrimis, adpressis, cartilagineis, extùs pubescentibus; *intimis* elongatis, linearibus, mucronulatis, recurvato-patulis, radium efformantibus. *Receptaculum* paleis capillaceis fulvis tectum. *Flosculi periphæriæ* plures (8—10) hermaphroditi, bilabiati, purpurei, ferè sesquipollicares; *labio exteriore* maximo, ligulato, patente, obtusè 4—5-dentato, subtùs tuboque sericeo-villosissimo, nervis tantùm primariis 5 v. 6, rectis, parallelis; *interiore* subsetaceo, canaliculato, indiviso; *disci* unicus, tubulosus, limbo 5-fidus, genitalibus longè inclusis (an sterilibus?) basi callosâ, extùs villosissimus: *lobis* ovato-oblongis, obtusis: *nervis primariis* validis, infra loborum sinus altè bipartitis; *secundariis* 2 interstinctis, parallelis, tantùm a basi ad medium et ultra manifestis, supernè obscurioribus, demùm evanescentibus, hinc reverà non recurrentibus. *Filamenta* in tubum membranaceum connata, intùs villosa, exserta, infernè tubo flosculi adhærentia. *Antheræ* connatæ, costâ dilatatâ, appendice lanceolatoceolato-lineari, coriaceâ, rigidâ, apice uncinatâ, obtusâ, ipsâ antherâ quater breviori coronatæ, basi simplices, muticæ, ob valvulas basi in filamentis decurrentes. *Stylus* hermaphroditis filiformis, lævis. *Stigma* bilabiatum: *lobis* crassis, obtusis, brevibus, suprà concaviusculis, pruinosis. *Achenia* turbinata, fulvescenti-villosissima. *Pappus* fulvus, dissimilis; flosculo centrali setosus, radiis 21 inæqualibus subulatis, validis, recurvatis, hirsutis, vix plumosis, basi connatis; cæteris duplò longior, eleganter plumosus, mollis, radiis 20 circiter, tenuioribus, imâ basi conferruminatis.

*** *Flosculo disci solitario, tubuloso. Filamentis omninò liberis.*

Penthea.

6. B. *laxa*, spinosa; foliis . . . . floribus subsolitariis sessilibus, involucri squamis intimis erectis radiatis.

In Brasiliâ. *Sello.* ♄.

Caulis fruticosus, spinosus, diffusè ramosissimus, laxus, cortice fusco obductus. *Rami* teretes, glabri, atrofusci. *Folia* nondùm vidi. *Spinæ* geminæ, aciculares, læves, æquales, rigidæ, patulæ, basi distinctæ, semipollicares et ultra. *Flores* copiosi, in apice ramulorum subsolitarii, sessiles, in paniculam laxam dispositi. *Involucra* campanulata, sesqui v. bi-pollicaria: *squamis* ovatis, mucronulatis, adpressis, coriaceis, sericeis, demùm læviusculis; *interioribus* gradatim longioribus, lanceolatis; *intimis* elongatis, linearibus, acuminatis, rectis, radiatis. *Receptaculum* copiosè villosum. *Flosculi* plurimi, hermaphroditi, bilabiati; *labio exteriore* maximo, ligulato, obtusè tridentato, 5-nervio, subtùs sericeo-villosissimo; *interiore* lineari-setaceo, binervio, breviore; *disci* solitarii, masculi, tubulosi, 5-dentati. *Filamenta* libera,

libera, complanata, glabra; *articulo superiore* longo, substantiâ crassiore. *Antheræ* in tubum coalitæ, appendiculâ ligulatâ obtusâ callosâ rigidâ coronatæ, basi bidentatæ: *dentibus* brevissimis, setaceis. *Stigma* bilobum: *lobis* obtusis, minutè papillosis. *Achenia* undique sericeo-villosissima. *Pappus* difformis; hermaphroditis plumosus, mollissimus; flosculo disci setosus, radiis subulato-setaceis, recurvatis, rigidis, basi connatis.

The character of *Bacasia* appears to have been constructed entirely from *B. corymbosa*, whose only point of distinction would consist in the reduced number of male florets, these being solitary in each capitulum, while in *Barnadesia* there are several; but this must be admitted to be a character too unimportant to be regarded as sufficient to constitute a generic distinction. Ruiz and Pavon in their *Systema Vegetabilium Floræ Peruvianæ et Chilensis* added a second species to *Bacasia*, namely *B. spinosa*, but without altering the generic character previously given in their *Genera Plantarum*. It is evident they had not examined this plant with due attention, otherwise it would have been impossible for them to have determined in referring to *Bacasia* a plant which accords in so few particulars with their generic description, and which proves to be really a species of *Chuquiraga*. The *Diacantha* of Lagasca is apparently identical with *Barnadesia spinosa*, but by no means with the *Bacasia spinosa* of Ruiz and Pavon, which he has inadvertently regarded as the same plant. The central florets of *Barnadesia* have been hitherto described as sterile, but as the anthers evidently contain grains of perfect pollen, I have considered them as male.

Chuquiraga. *Juss.*

Johannia. *Willd.*

Bacasiæ sp., *Ruiz et Pavon.*

Flosculi regulares, 5-partiti, hermaphroditi. *Pappus* uniformis.

Involucrum turbinato-campanulatum, multiplici ordine polyphyllum, imbricatum: *squamis* adpressis, cartilagineis, exteriùs gradatim minoribus, costâ validâ apice in mucronem rigidum subulatum excurrente; *intimis* elongatis, acuminatis, radium constituentibus. *Receptaculum* densè villoso-lanatum. *Flosculi* indefiniti, hermaphroditi, tubulosi, altè 5-partiti, villosi: *fauce* intùs densè barbatâ! *segmentis* linearibus, strictis, apice penicillatis! nervis marginalibus prominulis. *Stamina* disco epigyno inserta: *filamenta* complanata, libera, basi tubi corollæ adhærentia: *antheræ* in tubum connatæ, appendice lineari-ligulatâ cartilagineâ coronatæ, basi bisetæ v. bidentatæ. *Stigmata* lineari-lingulata, conniventia, papilloso-pruinosa. *Achenia* turbinata, undique villosissima. *Pappi radiis* copiosis, valdè plumosis, infernè crassioribus, simplici ordine digestis, imâ basi connatis, apice simplici.

Frutices *sempervirentes, erecti, rigidi, ramosissimi, inermes v. spinosi.* Folia *alterna, margine integerrima, callosa, pungenti-mucronata, coriacea, nitida; aut omninò subulata, spinosa.* Capitula *terminalia, solituria, sessilia, erecta, magna,* v. *plura paniculata.* Involucra *extùs fulvescenti-villosissima, nunc glabriuscula:* squamis *luteo-coloratis.* Flosculi *aurei.*

Obs.—Folia sapore amarissimo gaudent.

* *Capitulis*

* *Capitulis solitariis, sessilibus. Antheris basi bisetosis.* Propriæ.

1. C. *insignis*, inermis; foliis imbricatis, setis antherarum æqualibus.

Chuquiraga insignis. *Humb. et Bonpl. Pl. Æqu.* 1. *p.* 153. *Lam. Ill. t.* 691. *Kunth in H. et B. Nov. Gen. et Sp. Pl.* 4. *p.* 18. *Syn.* 2. *p.* 361.

C. microphylla. *Humb. et Bonpl. l. c. p.* 151. *t.* 43. *Kunth in H. et B. Nov. Gen. et Sp. Pl.* 4. *p.* 19. *Syn.* 2. *p.* 361.

C. lancifolia. *Humb. et Bonpl. l. c. p.* 153. *Kunth in H. et B. Nov. Gen. et Sp. Pl.* 4. *p.* 19. *Syn.* 2. *p.* 361.

In Antisanâ Quitensium, et alpibus Peruvianis. *Jos. Jussieu, Humboldt et Bonpland.* ♄.

Frutex erectus, ramosus, rigidus, 5-pedalis. *Rami* teretes, a casu foliorum cortice scabro cicatricoso obducti. *Ramuli* adpressè copiosèque pilosi, demùm glabriusculi. *Folia* alterna, sessilia, confertissima, undique imbricata, ovata, integerrima, margine calloso, incrassato, mucrone brevi, recto, subulato, rigido, pungentia, avenia, substantiâ crassa, coriacea, suprà concava, subtùs costâ validâ carinata, utrinque viridia, perlucida, juventute villosiuscula, demùm nuda, et exsiccatione præsertim punctis minutissimis quasi resinosis notata, basi angustiora, 4—5 lineas longa, 2 lata. *Capitula* in ramulorum summitate solitaria, sessilia. *Involucra* turbinato-campanulata, multiplici ordine polyphylla, imbricata: *squamis* adpressis, cartilagineis, rigidis, fulvescenti-villosissimis, nervo percurrente apice exserto prominulo, subinde mucronatis; *exterioribus* ovatis; *interioribus* gradatim longioribus; *intimis* lanceolato-linearibus, elongatis, acuminatis, erectis, radium constituentibus. *Receptaculum* densè villoso-lanatum, villis fulvescentibus. *Flosculi* numerosissimi (45—50), regulares, hermaphroditi, pollicares, profundè 5-partiti:

5-partiti: *tubo* pentagono, 5-nervio, substantiâ crassiore, extùs et intùs densè fulvo-villoso, limbo ter breviore: *segmentis* linearibus, villoso-plumosis, apice penicillatis, strictis, basi latiore planis, nervis marginalibus prominulis, margine supernè involutis: *villis* fulvis. *Stamina* disco epigyno cum corollâ inserta: *filamenta* linearia, angustissima, complanata, ferè membranacea, nervo manifestissimo, basi parùm latiore, imo tubo corollæ adhærentia: *antheræ* in tubum angustum coalitæ, longitudine 8-lineares, appendiculâ lineari-ligulatâ obtusâ antherâ ipsâ dimidio breviori cartilagineâ coronatæ, basi bisetæ: *setis* æqualibus, compressis, validis, sulco exaratis, 2 lineas longis, extremitate filamentosâ, spirali, retroflexâ. *Stylus* glaber, 5-angulus, basi incrassatâ. *Stigmata* lineari-lingulata, obtusa, facie interiori canaliculata, cum superiore parte styli atomis resinosis copiosissimis ornata, conniventi-applicata. *Achenia* turbinata, undique fulvo-villosissima, hinc convexa, inde biangulata. *Pappi radiis* pluribus (20—24) valdè plumosis, inæqualibus, infernè crassioribus, simplici ordine digestis, imâ basi connatis, apice simplici setaceo, brevi: *ramulis* persistentibus.

Obs.—Tabula Lamarckiana, errore pictoris, tubum antherarum pro corollâ exhibet.

I have, without hesitation, united the *Chuquiraga insignis* and *microphylla*, being fully persuaded that the characters relied on, as marks of distinction, are of too transitory a nature to justify the separation of two plants otherwise so much alike. In the Lambertian herbarium are two specimens of *C. insignis* from M. Bonpland himself, with the branches thickly clothed with short hairs, and the young leaves slightly villous, which circumstances are regarded by him as constituting the specific distinction of his *C. microphylla;* but, as the epidermis is deciduous,

ciduous, and the older branches consequently devoid of hairs, I have no doubt that these two presumed species, as well as the *C. lancifolia*, will be found to possess the same characters, and that they will prove to be only different states of the same plant, as M. Kunth has already suspected.

2. C. *spinosa*, armata; foliis patulis, setis antherarum inæqualibus.

Bacasia spinosa. *Ruiz et Pavon Syst. Veg. Fl. Per. et Chil.* i. *p.* 188.

In Peruviæ subalpinis et præruptis frigidis ad Huarocheri, Tarmæ et Cantæ provincias. *Ruiz et Pavon.* ♄. Fl. Maio et Junio. *Vulgò* Clavelon de Serranias.

Frutex bipedalis, erectus, ramosissimus, spinosus, cortice fusco scabro obductus. *Ramuli* copiosè adpressèque pilosi. *Folia* alterna, sessilia, patentia, ovato-lanceolata, coriacea, plana, avenia, margine calloso integerrima, basi angustiori, spinâ subulatâ rectâ terminata, subtùs convexiuscula, costâ validâ carinata, juventute utrinque hirsutissima, sed denique omninò denudata, perlucida, atomis resinosis conspersa, semipollicaria, 2—3 lineas lata. *Spinæ propriæ* (folia mutata) axillares, plerumque geminæ, subulatæ, divaricato-patentes, sæpè foliorum longitudine. *Flores* in apice ramulorum solitarii, sessiles, minores quàm in præcedente. *Involucrum* turbinato-campanulatum, multiplici ordine polyphyllum, imbricatum, nunc pedunculo brevissimo undique squamoso suffultum: *squamis* adpressis, lanceolatis, spinuloso-mucronatis, pungentibus, sericeo-villosissimis (villis fulvescentibus); *interioribus* gradatim longioribus; *intimis* elongatis, erectis, subscariosis, radiatis. *Receptaculum* densè villoso-lanatum. *Flosculi* pauciores (15—20), regulares, hermaphroditi, minùs profundè 5-partiti: *segmentis*

segmentis lineari-ensatis, strictis, margine conniventibus, cartilagineis, apice acutis, intùs canaliculatis, densè sericeo-villosissimis, penicillatis, denique glabratis: *tubo* cylindraceo, vix fauce dilatatâ, extùs et intùs copiosè sericeo-villoso, substantiâ crassiore, limbo ferè duplò breviore: *nervis* 5, in tubo simplicibus, ad laciniarum sinus divisis in ramis 2 strictis marginalibus, summo apice confluentibus; *secundariis* nullis. *Stamina* disco epigyno cum corollâ inserta: *filamenta* libera, complanata, glabra, infernè ferè membranacea, nervo manifestissimo, canaliculata, basi dilatata, corollæ imo tubo adhærentia; *articulo superiore* duplò angustiore, 5-plò breviore: *antheræ* in tubum connatæ, 5 lineas longæ, appendiculâ lineari-ligulatâ obtusâ membranaceâ, ipsâ antherâ dimidio longiori coronatæ, basi bisetosæ: *setis* callosis, strictis, inæqualibus, interiori latere leviter canaliculatis, extremitate filamentosâ, spirali, nunc retrofractâ v. revolutâ, deciduâ! *Stylus* filiformis, uncialis, v. ferè sesquiuncialis. *Stigma* bilobum: *lobis* lingulatis, obtusis, pruinosis, compressis. *Achenia* turbinata, undique adpressè villosissima. *Pappus* fulvus, deciduus: *radiis* 20 circiter, valdè plumosis, inæqualibus, imâ basi in annulum connatis: *rachibus* setaceis, infernè gradatim crassioribus, apice tenuissimo, simplici.

Such is the description of authentic specimens of *Bacasia spinosa* contained in the herbarium of Ruiz and Pavon, which will be found to correspond in every essential point of structure with the genus *Chuquiraga*. It is evident, as I have before observed, that this plant had been referred to *Bacasia* by the above-mentioned botanists from habit alone, without any regard to the structure of the flower, as the slightest examination would have convinced them of the incorrectness of that arrangement. Cavanilles seems

seems also to have been deceived with regard to the affinity of this plant, as appears by specimens from him in the Lambertian herbarium, marked "*Barnadesia ex Peruviâ.*"

** *Capitulis paniculatis. Antheris basi bidentatis: appendiculâ terminali, bilobâ.* Erinesa.

3. C. *hispida*, foliis elliptico-oblongis acuminatis subtùs ramulisque setosis, spinis basi coadunatis, pedunculis armatis.

In Brasiliâ. *Sello.* ♄.

Frutex diffusus, spinosus. *Caulis* teres, cortice cinereo-fusco, demùm læviusculo. *Ramuli* pilis setaceis persistentibus fuscis copiosè vestiti. *Spinæ* geminæ, in ramulorum foliorumque axillis præcipuè positæ; caulis erectæ, rigidæ, subulatæ, durissimæ, basi coadunatæ, sæpè setis ornatæ, semunciam et ultra longæ; ramulorum brevissimæ, recurvatæ. *Folia* alterna, brevissimè petiolata, elliptico-oblonga, acuminata, integerrima, obsoletè triplinervia, reticulato-venosa, coriacea, suprà glabra, subtùs hispidè pilosa, basi parùm attenuata, 3-pollicaria, unciam v. sesquiunciam lata. *Petioli* semicylindrici, hispidi, suprà canaliculati, vix 2 lineas longi. *Flores* terminales, plures, subpaniculati. *Pedunculi* breves, uniflori, undique copiosè fulvo-pilosi, spinis solitariis geminisve reflexis, rectis, subulatis armati. *Involucra* semipollicaria, cylindrica: *squamis* ovatis, spinuloso-mucronatis, coriaceis, adpressis, margine ciliatis; *intimis* conniventibus. *Receptaculum* parvum, densè pilosum: *pilis* fulvis, brevibus. *Flosculi* 8—10, hermaphroditi, æqualiter tubulosi, coriacei: *tubo* intùs villosissimo: *limbo* regulari, 5-partito: *segmentis* angustè linearibus, acutis, canaliculatis, binerviis, erectis, margine conniventibus, pube adpressâ fulvâ sericeis. *Filamenta* gracillima, glabra, infernè corollæ tubo adhærentia. *Antheræ* in tubum coalitæ, basi bidentatæ: *dentibus* æqualibus,

libus, obtusis: *appendicula terminalis* brevis, ligulata, cartilaginea, emarginata! *Stigma* bilamelloso-partitum, cum stylo apice minutè papillosum, scabriusculum: *lobis* planis, mucronulatis. *Achenia* undique villosissima, fulva. *Pappus* fulvus, mollissimus: *radiis* plumosis, apice mucronulatis, imâ basi crassioribus, nudis et connatis, simplici ordine digestis.

4. C. *latifolia*, foliis ovatis acutis trinerviis, spinis inæqualibus, floribus racemoso-corymbosis, involucri squamis intimis revolutis.

In Brasiliâ. *Sello.* ♄.

Frutex ramosus, spinosus. *Rami* cylindrici, leviter sulcati, cortice fusco-cinereo obducti. *Folia* alterna, petiolata, ovata, v. ovato-oblonga, acuta, integerrima, trinervia, reticulatim venosa, submembranacea, basi latâ rotundatâ, rarò parùm in petiolum decurrentia; palmaria, ferè bipollicem lata, utrinque demùm glabrata; *juniora* tamen cum ramulis novellis villis adpressis fulvescentibus subsericea. *Spinæ* axillares, geminæ, inæquales, subulatæ, rigidæ, divaricatæ, sæpiùsque deflexæ, basi coadunatæ, trilineares; *altero* breviore. *Petioli* brevissimi, semicylindrici, pubescentes, basi parùm dilatatâ ramis articulati. *Flores* in apice ramulorum copiosi, racemoso-corymbosi. *Pedunculi* uniflori, inermes, vix pollicares. *Involucra* semipollicaria, campanulata: *squamis* ovatis, mucronulatis, ciliatis, subcarinatis, coriaceis, adpressè imbricatis; *intimis* elongatis, radium efformantibus, revolutis. *Receptaculum* magis dilatatum, copiosè pilosum. *Flosculi* indefiniti, omnes regulares, hermaphroditi, tubulosi, 5-partiti, coriacei, infernè vix attenuati: *segmentis* linearibus, acutis, æqualibus, canaliculatis, binerviis, apice barbatis: *fauce* intùs villosâ. *Stamina* brevissima, sub fauce inclusa: *filamenta*

filamenta capillaria, libera, glabra: *antheræ* appendiculâ lineari, membranaceâ, bifidâ! coronatæ, basi obtusè bidentatæ. *Stigma* bilamelloso-partitum: *lobis* ovalibus, obtusis, revolutis, cum apice styli minutissimè papillosis, scabriusculis. *Achenia* turbinata, undique fulvo-villosissima. *Pappus* plumosus, fulvus: *radiis* simplici ordine digestis, imâ basi crassiore connatis.

5. C. *paniculata*, inermis; foliis elliptico-oblongis triplinerviis subtùs pubescentibus, floribus thyrsoideis, involucri squamis intimis revolutis.

In Brasiliâ ad ripas fluminis La Plata. *Sello.* ♄.

Caulis fruticosus, diffusè ramosissimus, inermis. *Rami* angulati, pubescentes. *Folia* alterna, petiolata, elliptico-oblonga, acuta, triplinervia, integerrima, plana, suprà glabra, subtùs copiosè pubescentia, denique denudata, basi paululùm attenuata, 3—5-pollicaria, sesquipollicem lata. *Petioli* pubescentes, suprà planiusculi, semunciales. *Capitula* terminalia, copiosissima, thyrsoideo-paniculata. *Pedunculi* angulati, fulvescenti-tomentosi. *Involucrum* tubulato-campanulatum, longitudine semipollicare: *squamis* coriaceis, tomentosis; *exterioribus* ovatis, acutis, adpressis; *intimis* linearibus, mucronulatis, elongatis, revolutis. *Receptaculum* densè villosum. *Flosculi* 12 circiter, tubulosi, hermaphroditi, limbo profundè 5-partiti: *segmentis* linearibus, acutis, apice barbatis, recurvis: *nervis* marginalibus: *tubo* pentagono, substantiâ crassiore, basi attenuato, intùs villosissimo. *Stamina* tubo inclusa, brevia: *filamenta* angustè linearia, complanata, glabra: *antheræ* basi obtusè bidentatæ, appendiculâ membranaceâ, ligulatâ, bilobâ! coronatæ. *Stigma* exsertum, bilobum: *lobis* crassis, obtusis, pruinosis. *Achenia* turbinata, undique densè adpressèque

2 P 2 pilosissima.

pilosissima. *Pappi radiis* 18, eleganter plumosis, simplici ordine digestis, imâ basi connatis, apice truncatis: *rachibus* fulvis, infernè crassioribus: *ramulis* persistentibus, argenteis.

6. C. *vepreculata*, foliis ovato-lanceolatis acuminatis trinerviis, spinis falcatis basi coadunatis, floribus thyrsoideis, antherarum appendiculâ bicuspidatâ.

Ad Caracas. *D. Fanning.* ♄.

Frutex more *Rubi* capreolatus, sæpè scandens, ramosissimus, spinosus. *Rami* teretes, sulcati, pubescentes. *Folia* alterna, petiolata, ovato-lanceolata, acuminata, trinervia, integerrima, utrinque (præsertim in junioribus) villosa, demùm glabrata, suprà lucidula, basi subacuta, pollicaria v. bipollicaria. *Petioli* semicylindrici, densè villosi, basi ramis articulati, sesqui v. bilineam longi. *Spinæ* interpetiolares, brevissimæ, subulatæ, coadunatæ, divaricatæ, arcuatæ, rigidæ, fulvescentes, sesquilineares. *Flores* terminales, thyrsoidei. *Thyrsi* compositi, multiflori. *Pedunculi* brevissimi, teretes, validi, tomentosi, uniflori. *Involucra* oblonga, cylindrica, semuncialia: *squamis* ovato-lanceolatis, adpressis, coriaceis, tomentosis, spinâ rectâ brevi terminatis; *intimis* linearibus, elongatis, radiantibus, nunc rariùs revolutis. *Receptaculum* pilis cinereis densè vestitum. *Flosculi* plures (18—20) uniformes, tubulosi, 5-fidi, hermaphroditi, albi: *tubo* attenuato, extùs et intùs villoso, 5-angulo, substantiâ coriaceo, fauci longitudine subæquali: *laciniis* lineari-lanceolatis, obtusiusculis, erectis, villosis, nervis primariis marginalibus. *Stamina* basi tubi inserta: *filamenta* capillaria, glabra; *articulo superiore* brevi: *antheræ* in tubum pentagonum coalitæ, basi acutè bidentatæ, appendiculâ membranaceâ bicuspidatâ coronatæ. *Stylus* capillaris, 5-angulus.

angulus. *Stigma* clavatum, bilobum, pruinosum. *Achenia* turbinata, copiosè sericeo-villosa. *Pappus* cinereus: *radiis* 16 circiter, simplici ordine digestis, eleganter plumosis.

Specimens of this curious species of *Chuquiraga* formed part of a small but interesting collection of dried plants made in Caracas by Mr. Fanning, and which is now in the possession of Mr. Lambert. Mr. Fanning discovered it in the vicinity of Caracas, extending its feeble branches, like a bramble, for support over the other shrubs and trees in its neighbourhood, and frequently spreading to fifteen or even to thirty feet. Mr. Fanning has also brought to this country a valuable collection of seeds and living plants, among which is the famous Cow-tree, *Palo de Vaca.*

This section, which has entirely the habit of *Barnadesia*, constitutes a very remarkable osculant group connecting *Chuquiraga* with that genus. The species are evidently intimately allied, and although I have not ventured to separate them entirely from *Chuquiraga*, yet I am satisfied that they are sufficiently characteristic to merit being regarded as a distinct genus.

Trib. 9. STIFFTIEÆ. *Receptaculum* nudum. *Flosculi* tubulosi, 5-partiti, regulares, hermaphroditi. *Stamina* fauci inserta! *Antheræ* basi bisetæ. *Stigmata* plerumque soluta, papillosa, recurva. *Frutices foliis simplicibus.*

STIFFTIA. *Mikan.*

AUGUSTA. *Leand.*

PLAZIÆ SP., *Spreng.*

Stamina limbi sinubus inserta. *Pappi radiis* multiplici ordine digestis, cylindricis, undique scabris, apice incrassatis.

Involucrum subglobosum, polyphyllum, imbricatum: *squamis* obtusis,

obtusis, integerrimis, planis, coriaceis, adpressis. *Receptaculum* nudum, scrobiculatum. *Flosculi* infundibuliformes, regulares, hermaphroditi, infernè substantiâ coriacei, limbo altè 5-partiti: *segmentis* linearibus, obtusis, spiraliter revolutis, nervis primariis prominulis marginatis; nunc primùm 2 v. 3 marginibus leviter connexis, tunc flosculum bilabiatum æmulantibus. *Stamina* inter corollæ lacinias inserta: *filamenta* e sinubus supernè libera, gracilia, glabra: *antheræ* coalitæ, basi longissimè biaristatæ, appendice lineari-subulatâ compressâ callosâ rigidâ coronatæ. *Stylus* filiformis, lævis. *Stigmata* soluta, linearia, recurva, papilloso-pruinosa, acuta v. truncata. *Achenia* elongata, hinc convexa, inde angulata. *Pappus* longus, coloratus, persistens: *radiis* multiplici ordine digestis, cylindricis, undique denticulato-scabris, apice incrassato, hinc penicillatis.

Frutices *frondosi, sempervirentes, speciosi.* Folia *alterna, simplicia, integerrima, uninervia, reticulato-venosa, glabra.* Flores *terminales solitarii v. paniculati.* Pedunculi *squamis obtusis ornati.* Flosculi *aurei v. rosei.*

1. S. *chrysantha*, foliis lanceolatis acuminatis, floribus solitariis, flosculis indefinitis.

Stifftia chrysantha. *Mik. Bras.*
Augusta grandiflora. *Leand. in Act. Mon.* 7. *t.* 14.
Plazia brasiliensis. *Spreng. Syst.* 4. *pars* 2. *p.* 301.

Frutex biorgyalis, erectus, ramosissimus, frondosus, cortice lævissimo cinereo obducta. *Folia* (Lecythidis) alterna, petiolata, lanceolata, obtusè acuminata, integerrima, basi acutâ membranacea, nervo medio subtùs prominente, reticulato-venosissima, utrinque glaberrima, nitida, viridia, 4—6 uncias longa, sesqui v. biunciam lata. *Petioli* brevissimi, teretiusculi, suprà leviter canaliculati, subtùs convexi, unguiculares.

guiculares. *Flos* speciosus, terminalis, solitarius, pedunculatus. *Pedunculus* teres, supernè incrassatus, undique squamis plurimis, ovalibus oblongisve, coriaceis, concavis, glabris munitus, uncialis. *Involucrum* globosum, sextuplici circiter serie imbricatum, ut et *pedunculus*, læve, magnitudine atque structurâ *Centaureæ majori* simillimum: *squamis* obtusissimis, integerrimis, coriaceis, adpressis, lævibus, exteriùs gradatim minoribus; *intimis* elongatis, ligulatis. *Receptaculum* depressum, nudum. *Flosculi* numerosissimi, hermaphroditi, infundibuliformes, longissimi, (biunciales): *tubo* basi coriaceo: *fauce* dilatatâ: *limbo* profundè 5-partito: *segmentis* linearibus, obtusis, spiraliter revolutis, nervis primariis validis marginatis, 10 lineas longis; nunc primùm 2 v. 3 margine inter se connexis, tunc flosculum bilabiatum æmulantibus. *Stamina* inter limbi lacinias inserta: *filamenta* tubo corollæ omninò arctè adhærentia, e sinubus supernè tantùm libera, gracilia, glabra: *antheræ* pollicares, in tubum coalitæ, appendice lineari-lanceolatâ, acuminatâ, coriaceâ, rigidâ terminatæ, basi aristis 2 simplicibus, setaceo-attenuatis, longissimis (semipollicaribus) instructæ. *Stylus* longitudine staminum, filiformis, glaber. *Stigma* bilobum, exsertum: *lobis* semicylindricis, acutis, pruinosis, recurvis. *Achenia* angusta, pentagona, hinc convexiuscula, undique rugulosa, pubescentia, semuncialia. *Pappus* longissimus (sesquiuncialis) persistens, croceus: *radiis* triplici v. quadruplici ordine digestis, setaceo-capillaribus, teretibus, rigidiusculis, undique puberulis, scabris, apice penicillato, mucronulato; *intimis* compressis.

Obs.—Hujus stirpis pulcherrimæ exempla quatuor a Langsdorffio et Sellovio communicata vidi.

2. S. *parviflora*,

2. S. *parviflora*, foliis cuneato-lanceolatis, floribus paniculatis, flosculis definitis.

Augusta parviflora. *Leand. l. c.*

Plazia parviflora. *Spreng. Syst.* 4. *pars* 2. *p.* 301.

In Brasiliâ ad Campos Novos et ad Rio das Contas. *Martius.* ♄.

Frutex erectus, frondosus. *Rami* cylindrici, cortice cinereo lævi obducti. *Folia* alterna, brevissimè petiolata, spathulato-oblonga, nunc raró lanceolata, integerrima, coriacea, uninervia, venis obscurioribus, utrinque glabra, viridia, basin versus attenuata, 5-pollicaria, unciam v. sesquiunciam latitudine æquantia. *Petioli* semicylindrici, glabri, suprà plani, 3 lineas longi. *Flores* parvi, copiosissimi, paniculati. *Panicula* terminalis, diffusa. *Pedunculi* teretes, glabri, apicem versus crassiores, squamis nonnullis ovalibus obtusis concavis muniti. *Involucra* globosa: *squamis* ovalibus, obtusissimis, concavis, membranaceis, lævibus, triplici ordine imbricatis, adpressis; *intimis* oblongis. *Receptaculum* nudum. *Flosculi* definiti (12) hermaphroditi, infundibuliformes, basi coriaceâ, limbo 5-partiti: *segmentis* linearibus, acutis, glabris, revolutis. *Stamina* sinubus limbi inserta: *filamenta* e limbo supernè libera, capillaria, glabra, infernè nervis primariis longitudinaliter adnata! *antheræ* in tubum coalitæ, exsertæ, basi calcaribus 2 linearibus, acutis, complanatis, ipsâ antherâ 4-plo brevioribus ornatæ, appendice lanceolatâ mucronatâ coriaceâ rigidâ terminatæ. *Stylus* filiformis, glaber. *Stigma* bilobum: *lobis* lingulatis, truncatis, pruinosis, revolutis. *Achenia* angusta, hinc convexa, inde angulata, glabra, 3—4 lineas longa. *Pappus* capillaris, persistens, flavicans: *radiis* triplici circiter serie dispositis, inæqualibus, undique puberulis, apice penicillatis, semipollicem longis.

ANASTRAPHIA.

Anastraphia.

Stamina fauci corollæ inserta. *Pappi radiis* singulo ordine contiguis, complanatis, margine denticulatis, apice simplici.

Involucrum polyphyllum, campanulatum, basi ventricosum, multiplici serie imbricatum: *squamis* ovato-lanceolatis, acuminatis, adpressis, cartilagineis; *intimis* lineari-lanceolatis, tantùm acutis. *Receptaculum* nudum. *Flosculi* numerosissimi, hermaphroditi, tubulosi: *tubo* æquali, angulato, coriaceo: *limbo* profundè 5-partito: *segmentis* linearibus, obtusis, revolutis, glabris. *Stamina* fauci infra laciniarum sinum inserta: *filamenta* supernè libera, capillaria, glabra: *antheræ* in tubum coalitæ, basi aristis 2, simplicibus, lævibus, ipsius antheræ longitudine munitæ, appendice lineari-subulatâ apice inflexâ terminatæ. *Stylus* filiformis, glaber. *Stigma* exsertum, clavatum, emarginatum, pruinosum. *Achenia* linearia, ancipiti-compressa, sericeo-villosa. *Pappus* capillaris, persistens: *radiis* singulo ordine contiguis, basi solutis, apice simplici setaceo complanatis, margine denticulatis.

Frutex *ramosus, rigidus, sempervirens, cortice cinereo.* Rami *teretes, pube brevissimâ cinereâ obruti, de lapsu foliorum tuberculati.* Folia *omninò* Querci Ilicis, *alterna, petiolata, elliptica, margine spinoso-dentata, subreflexa, ac undulata, coriacea, basi truncatâ v. acutâ, suprà nuda, viridia, lucida, subtùs tomento brevissimo albo flocculoso densè vestita, exsiccatione venosissima, costâ venisque prominentibus, 2-pollicaria, vix ultra pollicem lata.* Involucrum *campanulatum, extùs tomento flocculoso, brevissimo, cinereo vestitum, bipollicare, diametro unciale.* Flosculi *purpurei, involucro longiores.* Antheræ *semiexsertæ, albæ.* Pappus *vix uncialis, sordidè cinereus.*

Nomen ab *αναστραφεις revolutus*, atque ad limbum flosculi revolutum refert.

 1. A. *ilicifolia*,

1. A. *ilicifolia.*

In Americâ Meridionali. *Joannes Fraser.* ♄.

From the preceding, *Anastraphia* is readily distinguished by the insertion of its stamina and by the structure of its pappus, the rays of which are disposed in a single series. The specimen in the Lambertian herbarium was received from the late Mr. Fraser, but in what part of South America it was collected is not known.

Pentaphorus.

Stamina limbi sinubus inserta. *Pappi radiis* setaceo-complanatis, serrulatis, multiplici ordine collocatis. *Involucrum* 5-florum, cylindricum, connivens.

Involucrum oblongum, cylindraceum, polyphyllum, imbricatum: *squamis* lanceolatis, acuminatis, coriaceis, adpressis, lanuginosis; *interioribus* conniventibus. *Receptaculum* nudum. *Flosculi* 5, tubulosi, hermaphroditi, basin versus sensim angustati, limbo 5-partiti: *segmentis* linearibus, apice crassiore obtusis, revolutis. *Stamina* intra limbi lacinias inserta: *filamenta* tantùm è sinubus supernè libera, capillaria, glabra: *antheræ* in tubum coalitæ, basi bicalcaratæ (calcaribus linearibus, complanatis, acutis), appendice lanceolatâ, mucronatâ (mucrone tenui, elongato), coriaceâ, rigidâ coronatæ. *Stylus* filiformis, glaber. *Stigma* bilobum: *lobis* lingulatis, pruinosis, recurvis. *Achenia* trigona, densè villosa. *Pappus* persistens: *radiis* setaceis, complanatis, tenuissimè serrulatis, mucronulatis, inæqualibus, multiplici ordine collocatis; *intimis* latioribus.

Frutex *procumbens? ramosissimus, diffusus.* Rami *teretes, cortice lævi, fusco vestiti.* Ramuli floriferi *conferti, brevissimi, foliosi, pubescentes, semunciales.* Folia *alterna, sessilia, vix illa* Buxi *magnitudine adæquantia, obovata, mucronulata, integerrima,*

tegerrima, coriacea, basi attenuata, utrinque punctis parùm elevatis, resinosis, et pube brevissimâ cinereâ copiosè instructa, subtùs obsoletè trinervia. Flores *in apice ramulorum sæpiùs 5, rariùs 3 v. 7, brevissimè pedicellati.* Involucrum *semipollicis longitudine.* Flosculi *purpurei.* Pappus *cinereus.*

Nomen e vocibus græcis *πεντε quinque*, et *φερω porto*, compositum.

Genus a præcedente distinctissimum pappi radiis multiplici ordine dispositis, atque involucro connivente, 5-floro, undè nomen.

1. P. *foliolosus.*
In Chili. *Caldcleugh.* ♄.

ADDITIONS AND CORRECTIONS.

After Trixis *corymbosa*, p. 188, insert the three following Species.

T. *glabra*, foliis petiolatis ovato-oblongis mucronulatis integerrimis glabris, paniculâ foliosâ.
In Mexico prope Laguna Verde. *Schiede et Deppe.* ♄. Floret Martio.

Caulis fruticosus, ramosissimus, lævis. *Rami* diffusi, cylindrici, glabri. *Folia* alterna, petiolata, ovato-oblonga, mucronulata, integerrima, membranacea, utrinque glaberrima, subtùs reticulata, basi rotundata, sesquiuncialia. *Panicula* foliosa, multiflora. *Bracteolæ* subsolitariæ, lineares, acutæ, involucro duplò breviores. *Involucrum* 8-phyllum : *foliolis* linearibus, acutis, pubescentibus, erectis, simplici serie digestis.

gestis. *Receptaculum* densè pilosum. *Flosculi* 8, hermaphroditi, bilabiati, lutei; *labio exteriore* ligulato, tridentato; *interiore* bipartito, revoluto. *Antheræ* appendiculâ lineari obtusiusculâ elongatâ cartilagineâ terminatæ, basi bisetosæ: *setis* longis, simplicibus, attenuatis. *Stigmata* soluta, truncata, apice minutè papillosa. *Achenia* angusta, angulata, papilloso-scabra: *disco epigyno* dilatato. *Pappus* capillaris, denticulato-scaber, cinereo-fulvellus.

T. *salicifolia*, foliis elongato-lanceolatis acuminatis denticulatis subtùs tomentosis basi auriculatis, involucris multibracteolatis pedunculisque glanduloso-pubescentibus.

In Brasiliâ. *Sello.* ♄.

Caulis fruticosus, diffusè ramosissimus, teres, striatus. *Rami* hirsuti. *Folia* alterna, sessilia, elongato-lanceolata, acuminata, membranacea, margine denticulis plurimis subsetaceis ornata, suprà hirsuta, subtùs cinereo-tomentosa, basi attenuatâ et auriculatâ, 4—5 pollices longa, 10 lineas lata. *Panicula* ramosissima, divaricata. *Pedunculi* teretes, densè glanduloso-pubescentes. *Involucrum* 8—10-phyllum, basi bracteolis 5 v. 7, lineari-lanceolatis, acuminatis, patulis munitum: *squamis* lineari-lanceolatis, acuminatis, membranaceis, leviter carinatis, pube copiosâ glandulisque intermixtâ vestitis. *Receptaculum* densè pilosum. *Flosculi* plures (10—12) hermaphroditi, bilabiati, æquales: *fauce* tubo angusto 5-angulo longiore, dilatatâ, intùs villosâ: *labiis* brevioribus; *exteriore* ligulato, acutè tridentato; *interiore* bipartito, revoluto: *segmentis* lanceolato-linearibus, obtusiusculis. *Filamenta* membranacea, canaliculata, glabra. *Antheræ* appendiculâ lineari-lanceolatâ obtusâ subfalcatâ coronatæ, basi setis 2 simplicibus longis instructæ. *Stigmata* recurvata, apice truncata, minutè papillosa. *Achenia* undique

undique papilloso-scabra: *disco epigyno* dilatato, concaviusculo. *Pappus* capillaris, flavicans.

T. *mollissima*, foliis petiolatis ovato-lanceolatis acuminatis serratis basi attenuatis utrinque sericeo-villosissimis.

In Brasiliâ. *Sello*. ♄.

Frutex erectus, ramosissimus. *Rami* teretes, undique tomentosi. *Folia* alterna, petiolata, ovato-lanceolata, acuminata, serrata, basi acuta, penninervia, utrinque sericeo-villosissima, suprà demùm viridia, 4-pollicaria. *Flores* diffusè corymboso-paniculati. *Bracteæ* lanceolatæ, acutæ, integerrimæ. *Involucrum* duplici ordine polyphyllum: *foliolis* lanceolatis, acuminatis, sericeo-villosissimis; *interioribus* angustioribus. *Receptaculum* densè pilosum. *Flosculi* plures, hermaphroditi, bilabiati; *labio exteriore* ligulato, tridenticulato, 4-nervio; *interiore* bipartito, revoluto: *segmentis* lanceolatis, acuminatis, binerviis. *Antheræ* appendiculâ lineari, obtusâ breviore cartilagineâ coronatæ, basi bisetosæ: *setis* compressis, vix attenuatis. *Achenia* subpentagona, undique copiosè papilloso-glandulosa: *disco epigyno* dilatato, concavo. *Pappus* capillaris, denticulato-scaber, cinereo-fulvellus.

TRIXIS *divaricata*, p. 190.

The flowers of this species are most probably entirely white, although in the dried state they have assumed a yellow colour. This species, as well as *cacaloides*, have been already referred to *Trixis* by Sprengel.

After JUNGIA *spectabilis*, p. 227, insert

3. J. *pyramidalis*, foliorum lobis obtusis pubescentibus, stipulis maximis,

maximis, paniculâ amplâ terminali, corollæ labio exteriore tridenticulato.

In Brasiliâ ad ripas fluminis La Plata. *Sello.* ♄.

Planta pube brevissimâ densè vestita, rubiginosa. *Caulis* leviter angulatus, crassitie digiti minoris. *Folia* alterna petiolata, subrotundo-cordata, 7-loba, 5-nervia, suprà planiuscula, punctis minutissimis granulosa, subtùs reticulato-venosissima, varicosa, latitudine 2—3-uncialia: *lobis* obtusis, brevibus, grossè inæqualiterque dentatis, margine paululùm revolutis. *Petioli* teretes, 2—3-pollicares, basi dilatatâ, concavâ. *Stipulæ* 2, maximæ, foliaceæ, lobato-dentatæ, sessiles, basi parùm angustatæ, 5-nerviæ, reticulato-venosissimæ, pollicares v. sesquipollicares. *Panicula* terminalis, ampla, laxa, tripedalis: *ramis* elongatis, multifloris. *Pedicelli* filiformes, densè pubescentes. *Bracteolæ* lanceolatæ, acuminatæ, dentatæ; *ultimis* integerrimis. *Involucra* simplici ordine polyphylla: *foliolis* lanceolatis, acuminatis, membranaceis, striatis, pubescentibus. *Paleæ* foliolis involucri conformes, lanceolatæ, acuminatæ, membranaceæ, concavæ, striatæ, margine scariosæ. *Flosculi* 10 circiter, albi, bilabiati, hermaphroditi; *labio exteriore* ligulato, revoluto, 4-nervio, obtusè tridenticulato, tubo breviore; *interiore* bipartito, spiraliter revoluto: *segmentis* linearibus, obtusis, binerviis, adprimùm margine conglutinatis. *Filamenta* capillaria, glabra. *Antheræ* coalitæ, appendiculâ lineari, falcatâ acutiusculâ cartilagineâ coronatæ, basi bidentatæ: *dentibus* lineari-lanceolatis, acutis. *Stylus* capillaris. *Stigmata* soluta, semicylindrica, recurvata, apice dilatato, truncato, minutè papilloso. *Achenia* angustè fusiformia, sulcata, minutè papillosa: *disco epigyno* dilatato, planiusculo. *Pappus* cinereus: *radiis* plurimis (28) eleganter

ganter plumosis, simplici ordine digestis, imâ basi connatis, patentibus, æqualibus.

PROSELIA, p. 234.

Two new species of this genus have been discovered by Dr. Gillies, of which he has had the kindness to favour me with specimens. The rays of the pappus in these are disposed in a double series.

TYLLOMA, p. 238.

The flowers in the specimen of *Tylloma limbatum* which I had to examine being hardly sufficiently advanced to admit of my ascertaining their structure with perfect accuracy, I beg to subjoin the following amendments of the character and description from an inspection of more complete specimens, for which I am indebted to the liberality of Dr. Gillies.

Flosculi radii fœminei, bilabiati; *labio interiore* brevissimo, erecto, bifido. *Pappus* capillaris: *radiis* simplici ordine digestis.

Flosculi radii numerosi (18—20) bilabiati, fœminei, staminibus sterilibus; *labio exteriore* amplo, ligulato, obtusè tridenticulato, patulo, 4-nervio, subtùs sericeo-villosissimo, nervis lateralibus longè intramarginalibus simplicibus, intermediis supernè bifurcatis, ramis apice confluentibus; *interiore* lanceolato, acuminato, erecto, bifido, brevissimo; *disci* hermaphroditi, tubulosi, bilabiati: *labiis* ereetis, abbreviatis; *exteriore* obtusè tridentato; *interiore* bilobo.

Obs.—Hujus flosculi aurei, nec rosei, radio semipollicari. In alterâ specie ab amicissimo D. Gillies lectâ flosculi albi; *radii* 10, fœminei, absque sterilium rudimentis; *labio exteriore* ligulato, acutè tridentato; *interiore* brevissimo, bipartito, laciniis linearibus, acutis, erectis, inæqualibus.

DIAZEUXIS?

Diazeuxis? *serrata*, p. 254.

In a collection of dried plants, which Mr. Lambert lately received from Messrs. Schiede and Deppe, is a specimen in flower of this plant, which proves to be a genus akin to *Serratula;* and it is therefore to be expunged from *Diazeuxis*, to which it had been referred from habit alone, and the following inserted in its place.

2. D. *latifolia*, foliis lanceolatis acuminatis triplinerviis basi attenuatis, involucri squamis ovato-lanceolatis, pappi fœminei radiis fasciculatis.

Ad Caracas. *D. Fanning.* ♄.

Præcedenti proxima. *Rami* angulati, sulcati, undique lanâ fugaci vestiti. *Folia* brevissimè petiolata, latè lanceolata v. elliptico-oblonga, acuminata, triplinervia, coriacea, basi attenuata, margine angustissimo, reflexo, denticulato, suprà nuda, polita, viridia, subtùs lanâ implexâ copiosissimâ niveâ tecta, spithamæa, 2 pollices lata. *Involucra fœminea* sphæroidea: *squamis* ovato-lanceolatis, mucronatis, coriaceis, adpressè imbricatis, extùs lanuginosis, obsoletè striatis. *Flosculi fœminei* filiformes, limbo 5-fidi: *laciniis* linearibus, obtusiusculis. *Stigmata* lingulata, lævia. *Pappi radiis* copiosissimis, fasciculatis, apice penicillatis, cinereis.

Mutisia, p. 260.

I ought to have added to my remarks on this genus, that the presence or absence of appendages to the scales of the involucrum is a character of specific importance only, as may be seen by a comparison of species intimately allied, such as *Mutisia Clematis* and *lanata*, and *M. inflexa* and *linearifolia*. I have now satisfied myself as to the identity of *Mutisia grandiflora* of Humboldt and Bonpland with the *M. Clematis* of Linnæus, from the

the examination of another and very perfect specimen of the latter species in the herbarium of the younger Linnæus, now incorporated with that of Sir James Edward Smith.

MUTISIA *viciæfolia*, p. 363.

The specimens of this species from Cavanilles, as well as from Ruiz and Pavon, are marked on the tickets as being from Peru; but it is stated by Cavanilles in his *Icones Plantarum* as being a native of Valparaiso in Chile. Should this information be incorrect, and the plant really proves to be a native of Peru, the *M. acuminata* may ultimately be found to be identically the same.

MUTISIA *sinuata*, p. 267.

From a specimen I have received from Dr. Gillies, the rays appear to be of a pale pink, almost approaching to white. The broad base of the leaves, and the continuous wings of the stalks, sufficiently distinguish the *M. subspinosa* from this species, although Dr. Hooker has proposed to unite them. I have also a specimen of this from Dr. Gillies. The rays of *M. subspinosa* are bright yellow.

MUTISIA *linearifolia*, p. 272.

I have specimens of this from Dr. Gillies marked *M. rigida, nov. sp.?* The exterior scales of the involucrum are furnished with a short abrupt point. I have referred to this species, with a mark of doubt, the *M. linifolia* of Dr. Hooker, which, however, turns out to be a very distinct plant, as I find from examining a specimen with which Dr. Gillies has favoured me. It differs in having perfectly flat leaves, and the exterior scales of the involucrum ovate and acuminate.

[The continuation of this Paper will be given in a future Part of the Transactions.]

 XVII. *On*

XVII. *On the Organs of Voice in Birds. By William Yarrell, Esq. F.L.S.*

Read June 2 and 16, 1829.

THE very liberal manner in which the Linnean Society did me the honour to illustrate a former paper on the Tracheæ of Birds, has been an additional inducement with me to render this subject as complete as my means of observation would allow: I therefore now submit descriptions and figures of the numerous muscles attached to the different parts of the windpipes of birds, by the action of which their varied and extraordinary powers of voice are produced, with representations of the tracheæ of four birds, which, though not all entirely unknown, are each of them illustrative of a portion of this subject, and have not been hitherto so represented as to afford a correct idea of their local situation or peculiarities.

The organ of voice in birds may be considered as consisting of four parts; the glottis or superior larynx, the tube of the trachea, the inferior larynx with its muscles, and the bronchiæ; and the variety of modulation birds are known to possess has its corresponding variety of forms. The glottis or superior larynx opens into the mouth at the root of the tongue. The orifice is long and narrow, encircled by two pair of muscles which govern the size of the aperture, and constitute one of the accessory means by which the sound of the voice is regulated. Birds have no epiglottis or covering over this aperture to prevent any

 particles

particles of food passing into the windpipe; but the surface near the opening is furnished with numerous papillæ, pointing backwards, which assist in directing and conveying food towards and into the œsophagus.

Tab. XVII. Fig. 1. is a representation of the glottis with its surrounding membranes. Fig. 2. is a representation of the cartilages forming the superior larynx. The letters, *a*, *a* refer to the principal cartilage, which, when in its natural situation, lies upon the pharyngeal portion, and between the cornua, of the *os hyoïdes* or bone of the tongue. This cartilage appears to perform the double office of the thyroid and cricoid cartilages in the higher animals. In substance it is uniformly thin, its shape nearly triangular, one angle placed forwards, the lateral angles curving upwards to support the base of the arytenoid cartilages on its own side. The letters *b*, *b* refer to the arytenoid cartilages, supported at their base by the lateral angles of the cricoid cartilage before mentioned, and projecting forwards in two narrow and thin parallel processes over two-thirds of the orifice formed by the curved lateral portions of the cartilage underneath: each parallel process forming a slight groove on its superior surface by the edges curving upwards.

The glottis is closed by a pair of muscles, (Tab. XVII. Fig. 4, *a*, *a*) extending from the upper portion of the cricoid cartilage along the crura of the arytenoid cartilages, upon each outer edge of which they are inserted; and it is opened by a pair of muscles arising from the lateral and posterior portions of the cricoid cartilage, the fibres of which passing over the pair of smaller muscles just described, are inserted upon the inner edge of each arytenoid cartilage (Fig. 3, *b*, *b*). The obvious use of these two pair of muscles is to govern the size of the aperture. Baron Cuvier in his *Leçons d'Anatomie Comparée*, vol. iv. p. 490, says, "Birds have no arytenoid cartilages;" but the

uses

uses to which the two processes already described are subservient, and the action and effect of the muscles attached to them, render it difficult for me to speak of them under any better designation.

The tube of the windpipe is composed of two membranes, inclosing between them numerous cartilaginous or bony rings, forming a cylinder more or less perfect from end to end. Ossification appears to commence in these rings at the front of the trachea, from which point the bone gradually extends equally on both sides towards the œsophagus as the bird increases in age: in particular parts, however, of the tracheæ of some birds the rings are not entirely complete at any age. Various inequalities of size occur in different parts of the same tube in some species, producing, as might be expected, a particular effect on the voice, to be hereafter explained; and the length of the tube deserves consideration. Thus, shrill notes are produced by short tubes, and *vice versâ;* the first are possessed by the Singing Birds, and the reverse by the Waders and Swimmers; but the diameter of the tube has also its influence, large tubes producing notes low in the scale, and *vice versâ.* The substance of the tube itself has also to be considered, though some anomalies present themselves. Those birds possessing strong and broad cartilages or bony rings have monotonous and loud voices, while the more slender rings with enlarged spaces between them allow a freedom of motion producing a corresponding variety in the scale of tone.

The inferior larynx, the true situation of the organ of voice in birds,—as the experiments of Baron Cuvier have sufficiently proved,—is situated at the bottom of the tube, and is formed sometimes by the approximation of several of the lower rings of the trachea more or less firmly ossified together, and occasionally of solid bones; varying in form, being compressed, conical,

cal, or triangular at its lower surface, (Tab. XVII. Fig. 7, 11, & 12) having a central cross-bone extending from behind to the front, dividing the orifice in two equal parts (Fig. 11 & 12, *a,a*); to the outer side of which cross-bone the inner membrane of each bronchial tube is attached. This cross-bone thus dividing the lower orifice, forms the point of divarication from which the bronchiæ arise separate, and go off to the lungs. But a more minute description of this important part will be given, when considering the various muscles connecting the bone of divarication with the bronchiæ.

The bronchiæ are formed on the outer sides by membrane interposed between and connecting a variable number of cartilages which describe only parts of circles, diminishing in size as they approach the lungs, the circle being completed on the inner side by a delicate membrane stretching from the opposite points of the semicircular cartilages, and forming a tube from the orifice of the inferior larynx to the substance of the lungs (Tab. XVII. Fig. 9 & 10, *c, c*). This membrane is called by Cuvier the *membrana tympaniformis*, and upon its dilatation and contraction, as well as the power afforded of altering the form and length of the bronchiæ, some of the varieties of intonation depend. The bronchiæ are also slightly attached to each other and to the œsophagus.

The muscles of the glottis or superior larynx are uniformly two pair in all the birds I have examined: but the muscles of the inferior or true larynx, all largely supplied with nerves, vary from one pair to five pair, according to the genus or species, affording a corresponding increase in the various qualities of the voice. Some few birds have no true muscles of voice at the inferior portion of their tracheæ. Cuvier describes the King of the Vultures as being without any; and this is also the case with the Condor. Tab. XVII. Fig. 5. is a representation

of

of the lower portion of the trachea of a Condor Vulture without muscles or any true bone of divarication, the bronchial rings almost completing the circle, with little flexibility, and the voice of the bird monotonous. The want of muscles of voice will be more immediately apparent by comparing this representation with those of TAB. XVIII. all of which exhibit various muscles attached. The Spoonbill is another instance of a bird without any true muscles of voice. TAB. XIX. is a representation of part of the inside of this bird with the convolutions of its singular trachea *in situ:* the insertion of the bronchiæ into the lobes of the lungs is shown, but no ossification at their junction with the tube of the trachea will be observed, nor any muscles by which variations in the length of the trachea or bronchiæ can be effected. The convolutions of the trachea of the Spoonbill have been described, but I am not aware that they have been figured.

The next division, or those birds possessing one pair of muscles of voice, is by far the most numerous, including as it does the genera *Falco* and *Strix*, some of the *Insessores*, all the *Rasores*, *Grallatores*, and *Natatores*, with a few exceptions only, which will be pointed out. I refer particularly to the British species of these different orders, as it is with them I am best acquainted.

The single pair of muscles with which these birds are provided, arise from the whole outer surface of the cricoid cartilage; descending, they form a sheath round the upper part of the tube, afterwards dividing and passing downwards in two equal portions, one on each side, uniformly attached to the tube, and not quitting it till arrived at or near the bone of divarication; when, separating from the tube, they pass outwards and downwards in distinct slips on each side to be inserted upon each inner lateral edge of the sternum. This pair of muscles support

support the trachea, and serve to accommodate the tube to all the varied inflexions of the neck: they influence the length of the trachea as well as that of the bronchiæ, and on account of their place of insertion have been named sterno-tracheal.

Tab. XVIII. Fig. 1. & 2. are a front and side view of a trachea furnished with one pair of muscles, in which the letters *d, d* mark the portion of each muscle going off to be inserted upon the sternum. Tab. XX. Fig. 1. represents the trachea of the Curassow (*Crax Alector*) with its singular convolution lodged between the shafts of the *os furcatorium*. Fig. 2. represents the posterior aspect of the same trachea removed from its natural situation to show its single pair of muscles (*d, d*).

Some of the birds possessing two pair of true muscles of voice may be considered as exceptions to a general rule, rather than otherwise, since they belong to those orders which usually possess but one pair.

The Indian Crowned Pigeon, the largest example of the family, exhibits this second pair of muscles (Tab. XVIII. Fig. 3, *e*). They are formed of a portion of the sterno-tracheal muscles, but taking a different direction. They proceed by a narrow slip, from that point upon the tube where the first pair of muscles go off to be inserted upon the sternum, down the side of the trachea, to be attached externally to the membrane between the lowest ring of the tube and the first ring of the bronchia, as shown in the side view before referred to. By their contraction they shorten the flexible portion of the tube between their points of attachment, and produce tension upon the *membrana tympaniformis*. Our British Pigeons exhibit a few fibres in the same relative situation.

The Wood Grouse is remarkable for its variation in the organ of voice from other Gallinaceous birds. The tube of the trachea is one fourth longer than the neck of the bird, and this excess forms

forms a free and loose curve or fold within the skin (TAB. XXI. Fig. 1, *a*). The first pair of muscles of large size are not attached to the tube throughout any part of its length as in other birds (Fig. 1, *d*), but pass separately downwards, becoming connected together below the convolution of the trachea, and inserted upon the *os furcatorium* or merrythought, at the angle formed by the junction of the two shafts of that bone. About the commencement of the lower third portion of these muscles, each of them sends off a narrow slip downwards, which becomes attached on its own side to a strong membranous sheath that invests and strengthens the lower portion of the trachea (Fig. 1, *e*), ultimately quitting the tube above the point of divarication in the ordinary way, to be inserted upon the sternum, becoming the true sterno-tracheal muscles; the first pair, from their place of insertion, being called furculo-tracheal, of which we shall hereafter find further examples. TAB. XXI. Fig. 1, is a representation of the trachea and its muscles in this bird, in which another peculiarity will be observed. By the contraction of the first pair of muscles, marked *d*, the glottis may be drawn downwards two inches below its ordinary or true situation upon the pharyngeal portion of the *os hyoides*: the length and flexibility of the tube of the trachea itself, and the power of withdrawing the glottis just noticed, forming a considerable cavity by the elongation of the pharynx, are principally instrumental in producing the very powerful voice this bird is known to possess. The muscles for elevating and directing the glottis to its ordinary situation are also shown.

Among the *Natatores*, which I have stated generally as possessing but one pair of muscles of voice, there are four exceptions known; the Velvet Duck, the Golden-eye, the Red-breasted Merganser, and the Gannet; these birds possess a second pair of muscles of voice.

 The

The Velvet Duck is remarkable for a hollow bony enlargement in its trachea, situated about two-thirds down the tube, made up of expanded tracheal rings firmly ossified together. Upon each side of this enlargement a small muscle, marked *e*, arises, which, passing downwards, is inserted upon the inner side of the shaft of the *os furcatorium*, and the voice is probably influenced by the action of these muscles altering the relative situation of this hollow bulb upon the tube.

There is also another peculiarity, which, as far as I am aware, has not been noticed. On making a longitudinal section of the trachea of this rare British bird, (representations of the inner surfaces of both halves of which are shown at Tab. XXI. Fig. 2, & 3,) it will be seen, that the inner tube of the trachea at its upper part has an aperture on each side, by which it communicates freely with the cavity within the bony enlargement situated immediately below the superior larynx, and brings to mind the laryngeal cavities found in some of the higher animals. A slip of paper is represented as passing through both apertures. Letters *d*, *d*, represent the ordinary sterno-tracheal muscles.

In the Golden-eye, the second pair of muscles is of large size, and inserted also upon the shafts of the *os furcatorium*. They arise in part below, and upon a portion of the surface of the enlarged rings, which form the bulb on the tube of that bird. When the voice is not exercised, these enlarged rings lie folded flat upon each other, but by the contraction of these muscles, the rings are set up at right angles to the axis of the tube, and the air, forced through and vibrating in an enlarged hollow cavity, acquires a degree of power which has obtained for this bird the specific name *Clangula*.

The trachea of the Red-breasted Merganser has also a permanent enlargement of a portion of the rings, forming a bulb on the tube. It has also a second pair of muscles (furculo-tracheal), which

which go off about half-way between this bulb and the inferior larynx, to be inserted upon the *os furcatorium*. These muscles are called ypsilo-tracheal by Baron Cuvier, from the form of the bone upon which they are inserted. They seem peculiar to those birds having enlargements of the tube, and figures of the two last-mentioned tracheæ will be found attached to Dr. Latham's Paper in the 4th volume of the Transactions of the Linnean Society.

I have mentioned the Gannet as differing from the *Natatores* generally in being provided with a second pair of true muscles of voice; but the second pair in this bird differ materially from the furculo-tracheal muscles already described as existing in the three species of palmated birds having enlargements of the tube. The trachea in the Gannet is uniform in size throughout, and furnished with one strong pair of muscles, which, passing down the side of the tube nearly the whole of its length, go off to be inserted upon the sternum as usual. Underneath and below these there is another pair given off from the inner surface of the first, which pass directly downwards, and are inserted upon the upper surface of a spherical glandular protuberance fixed to the upper or first half-circular bronchial cartilage. The membranous division between the point or bone of divarication and this first ring is considerable; and the contraction of this second pair of muscles shortens the bronchiæ the whole depth of this division, producing at the same time corresponding tension of the *membrana tympaniformis*. The protuberances upon the bronchiæ here noticed are solid, unctuous in appearance, and probably perform the office of bronchial glands. Tab. XVIII. Fig. 4, & 5, represent the lower portion of this trachea in two points of view.

Tracheæ possessing three pairs of true muscles of voice are confined entirely, as far as my observations have extended, to one very large family only, the *Psittacidæ;* and these muscles

 will

will be found uniform in situation and shape throughout the whole of the Parrot tribe. The upper orifice is governed by two pair of muscles as in other birds; and when mentioning the true muscles of voice, I refer only to those situated near the inferior larynx. As the organ of voice is more complex in these birds than in any of those hitherto noticed, it will be necessary to enter somewhat more into detail. The bony rings forming the tube of the trachea are strong, and of large size at the upper part, diminishing gradually as they approach the point of divarication, which is formed by the lower rings becoming elongated from before backwards, and terminating both before and behind in a small triangular-shaped bone (Tab. XVII. Fig. 8, *b*) having its apex pointing downwards. To each side of the bottom of the tube there is attached by intervening membrane a thin crescent-shaped bone (Tab. XVII. Fig. 6, *b*), the horns of which, directed also downward, pass below the points of the triangular interposed bones; the connecting membrane permitting a certain degree of lateral motion in the inferior edges of both these crescent-shaped portions of bone. Tab. XVII. Fig. 6. 7. & 8, represent these parts as they appear when divested of their muscles in the great blue and yellow Macaw. None of the Parrot tribe possess the cross-bone which usually divides the opening at the bottom of the tube in other birds. The bronchiæ are triangular in shape and very short, extremely flexible, being made up principally of membrane with slender semicircular cartilages placed at considerable distances from each other, having a broad surface of membrane only between the lower edge of the moveable bones of the tube, and the first bronchial cartilage, to facilitate the requisite alteration in the length of the bronchial tubes. The inner membranes of the bronchiæ unite at their upper broad edges to form their own division between the bronchiæ in the absence of the cross-bone.

The

The first pair of muscles after passing down the sides of the tube in the ordinary way do not quit it to be attached to the sternum, but have their tendons inserted upon the outside of the second pair of muscles, their use being to influence the length of the tube, and assist the second pair in their action upon the bronchiæ (TAB. XVIII. Fig. 7, *d*). The second pair of muscles have their origin one on each side a little above the bones of divarication. Somewhat broad at first, they become narrower as they pass downwards, and are inserted upon the outer and central portion of the bronchiæ at the fourth semi-circular cartilage (Fig. 7, *e*). The third pair of muscles arise broad and thick from the sides of the last ring of the tube, and are inserted over the whole surface of the moveable crescent-shaped bones below (Fig. 7 & 8, *f*), their obvious use being that of separating the inferior edges of these bones, thereby enlarging the aperture. Fig. 8. represents a side view of the lower portion of the trachea in the Macaw, the three muscles detached from each other to render them more distinct. It may be necessary here to remark that the two sides of a trachea and their attendant muscles are invariably alike, except in some of the *Anatidæ*. Fig. 6. & 7. are two views of the same portion of the trachea with the three pair of muscles *in situ*. Their different powers will be obvious on inspection; the second pair, marked *e*, performing by their contraction the double office of altering the length of the bronchiæ, and, pressing upon the projecting surface of the third pair of muscles, which they pass over, diminish the aperture formed by the edges of the moveable semi-lunar-shaped side bones. It is to this power of diminishing the aperture these birds are indebted for the notes they are able to produce so high in the scale of tone.

I have never yet been fortunate enough to meet with a bird possessing four pair of true muscles of voice. I proceed therefore to to the consideration of the most complex organ, that furnished with five pair.

The birds included in this division are all the *Corvi*, Starling, Thrush tribe, Larks, Buntings, Finches, Warblers, Swallows, &c., the organs of voice in which vary only in size. The tube of the trachea is generally uniform in shape throughout, the bronchiæ long in proportion, and both parts perfectly flexible. Tab. XVIII. Fig. 9. 10. & 11. are an anterior, posterior, and side view of a portion of the trachea and its muscles in the Raven, which may be considered as the type of this form, and from its size admits of clear explanation. Tab. XVII. Fig. 9. is a side view of the same part divested of its muscles, to show by the prevalence and interposition of membrane the degree of alteration the various muscles are able to effect.

Tab. XVII. Fig. 10. represents part of the same trachea, one bronchia having been removed to show the *membrana tympaniformis*, letter *c*, on the inner side of the other. Tab. XVII. Fig. 11. is a view of the under surface of the bone of divarication. Letter *a* with a cross is the wider posterior part to admit the passage of the œsophagus from behind forwards, between the bronchiæ, when both are in their natural situation. Letters *a*, in Fig. 11. & 12. mark the situation of the cross-bone.

Referring again to Tab. XVIII. Fig. 11. the pair of muscles which descend on the outside of the trachea, divide at a short distance above the end of the tube, and send one portion in continuation downwards and backwards, to be inserted upon the extreme posterior end of the first bone of the bronchia, and is marked *f*. Its counterpart (*e*) passes from the place of separation downwards and forwards, to be inserted below the extreme point of the last bone of the tube. Within the angle formed by the separation of these two muscles, a third slender and

and cord-like muscle (*d*) arises, which goes off to be inserted upon the sternum. The fourth muscle (*h*) is the shortest of the five, and partly hid by the muscle just described marked *f*. It arises near the centre of the bottom of the tube, and its fibres, directed obliquely backwards and downwards, are inserted by tendon upon the extremity of the first half-circular bone. The fifth muscle, marked *g*, arises also from the centre of the tube similar to the last, but is something longer, oval in shape, and much more fleshy. It has the appearance of being made up of several small muscles in close contact. Its direction is obliquely downwards and forwards, its substance in part hid by the muscle already described, marked *e*, and it is attached by a broad base to the last bony ring of the tube, to the cartilaginous projection immediately below, and sends one portion to be inserted upon the extreme end of the first bronchial bone. Fig. 12. represents these five muscles, three of them being partly detached for distinction. Should names for these four muscles be considered necessary, they may be called the long and short anterior and posterior tensors: the muscle, marked *d*, from its insertion upon the sternum, may still retain the name of sterno-tracheal. Thus, it will be seen, the lungs govern the volume of air as well as the force with which it is expelled, while these muscles influence the diameter and length of the bronchial tubes.

The advantageous size of the organ of voice in the Raven, and its perfect similarity to those of all the song-birds, was my reason for selecting it in illustration of a subject to which, in quality of tone, there is no resemblance; but it must not be forgotten that this bird possesses the power of imitating that most difficult of all sounds, the human voice.

It will appear anomalous that the Parrots, with their three pair of muscles of voice, should possess a greater range of sound, or or compass of voice, than those provided with five pair; but it will be seen by a reference that the insertion of the principal muscle shortening the bronchial tube, in the Parrots is much lower down than in any other birds; nor do any of the song-birds possess the power of altering the size of the aperture at the bottom of the tube of the trachea. Considerable advantage is supposed to be afforded the Parrots by their soft, fleshy, human-like tongue; yet it cannot be denied that the Raven, Magpie, Jay and Starling produce a close imitation of the human voice with tongues long, slender and horny. The celebrated Mocking-bird of America, which I have once had an opportunity of examining, has an organ of voice and tongue precisely similar to our own Song-thrush.

The organs of voice in the Mammalia, possessing *chordæ vocales*, have been considered to bear some relation to musical instruments with strings; and those of birds, to wind instruments. Among the latter, (with most of which there are some points of similarity,) they appear to me to have a closer resemblance to the French horn than any other; the bronchiæ performing the same office as the lips of the musician, and the muscles of the glottis, like the hand, governing the extent of the other aperture. The voices of the Stanley Crane and Demoiselle, with their single convolution in the trachea, are lower in the scale of tone than those of the other species of the same family having no such convolution; and the Common Crane with his elongated double convolution possesses a voice still deeper than the Stanley Crane or Demoiselle. In this circumstance they also particularly resemble the French horn, the performers upon which fix additional circles of tube upon their instrument when required to take a part in any concerted piece of music that is set in a low key.

It will perhaps be objected, that the utmost extent of motion which

which birds appear to possess the power of exercising over the various parts of their organ of voice, seems insufficient to account for the effects produced ; but it may in answer be urged, that the closest examination or most scientific demonstration of the chordæ vocales and muscles in man, with all the auxiliary appendages, afford but an imperfect illustration of the varied and extraordinary powers of the human voice.

EXPLANATION OF THE PLATES.

Tab. XVII.

Fig. 1. The glottis in situ. *a, a, a.* Part of the pharynx. *b.* The rima glottidis.

2. Cartilages of the superior larynx. *a, a, a.* Cricoid cartilage. *b, b.* Arytenoid cartilages. *c.* Upper rings of the trachea.

3. *b, b.* The muscles opening the arytenoid cartilages. *a.* Part of the muscle closing the arytenoid cartilages.

4. Shows at *a, a,* the muscles closing the arytenoid cartilages.

5. Part of the trachea of a Condor Vulture (*Vultur Gryphus*). *a.* Part of the tube. *b.* Point of divarication. *c, c.* The bronchiæ.

6. Side view of the lower portion of the trachea of the Great Blue and Yellow Macaw (*Psittacus Araruna*). *a.* Part of the tube. *b.* Semilunar bone. *c.* The bronchia.

7. Bottom of the tube seen from below.

Fig. 8. Front view of the same trachea. *a.* Part of the tube. *b.* The triangular bone between the crescent-shaped bones.

9. Side view of the trachea of the Raven (*Corvus Corax*). *a.* Part of the tube. *b.* Point of divarication. *c.* Bronchia outside.

10. Another view of the same, one bronchia being removed to show the inner portion (membrana tympaniformis) of the other, letter *c.*

11. Bone of divarication in the Raven (*Corvus Corax*), seen from below. *a**. Posterior part. *a, a.* Cross-bone. *b, b.* The sides.

12. Lower part of the trachea of the Great Black-backed Gull (*Larus marinus*). *b.* The triangular bone of divarication; and *a, a.* The triangular cross-bone.

Tab. XVIII.

Fig. 1 & 2. Front and side views of a trachea having one pair of muscles of voice. *a, b, & c.* Refer as before. *d, d.* The first pair of muscles.

3. Side view of a trachea with two pair of muscles of voice. *d.* Sterno-tracheal or first pair. *e.* The second pair.

4 & 5. Front and side views of part of the trachea of the Gannet (*Pelicanus bassanus*), having two pair of muscles of voice. *d, d.* The first pair, sterno-tracheal. *e, e.* The second pair.

6 & 7. Front and side views of part of the trachea of the Great Blue and Yellow Macaw (*Psittacus Ararauna*), having three pair of muscles of voice. *d, d.* The first pair. *e, e.* The second pair. *f, f.* The third pair.

8. Side view of the same, the muscles partly detached for distinction. Letters of reference the same.

Fig.

Fig. 9. 10 & 11. Front, back and side views of part of the trachea of the Raven (*Corvus Corax*). *d.* The sterno-tracheal muscle. *e.* The long anterior tensor. *f.* The long posterior tensor. *g.* The short anterior tensor. *h.* The short posterior tensor.

12. Side view of the same trachea, the muscles partly detached for distinction. Letters of reference the same.

Tab. XIX.

Trachea of the Spoonbill (*Platalea leucorodia*) in situ.

Tab. XX.

Fig. 1. Trachea of the Curassow (*Crax Alector*) in situ, seen from before.

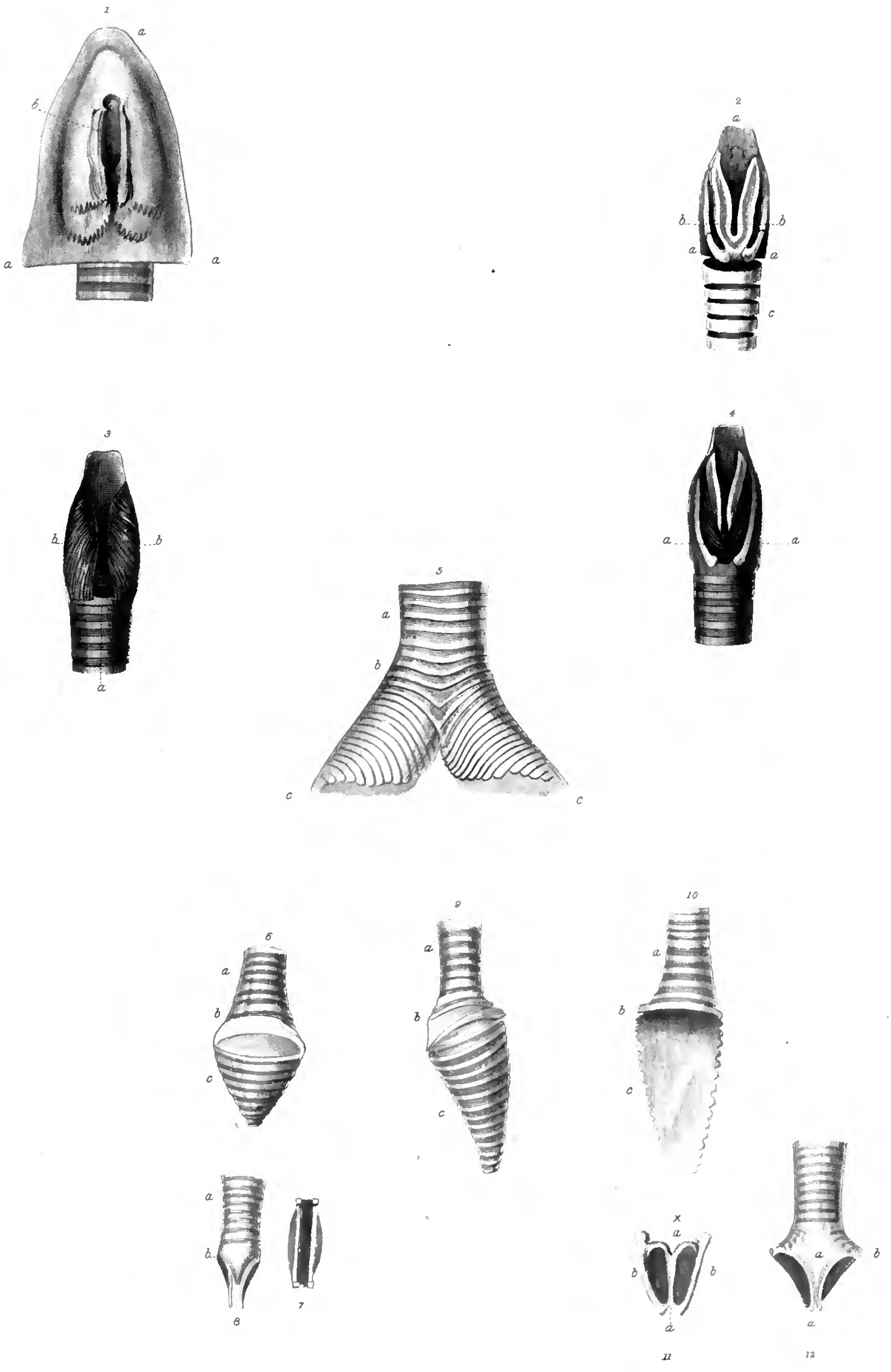
2. The same trachea seen from behind. *a, a.* The convolutions of the tube. *b.* Point of divarication. *c, c.* The bronchiæ. *d, d.* The single pair of muscles of voice.

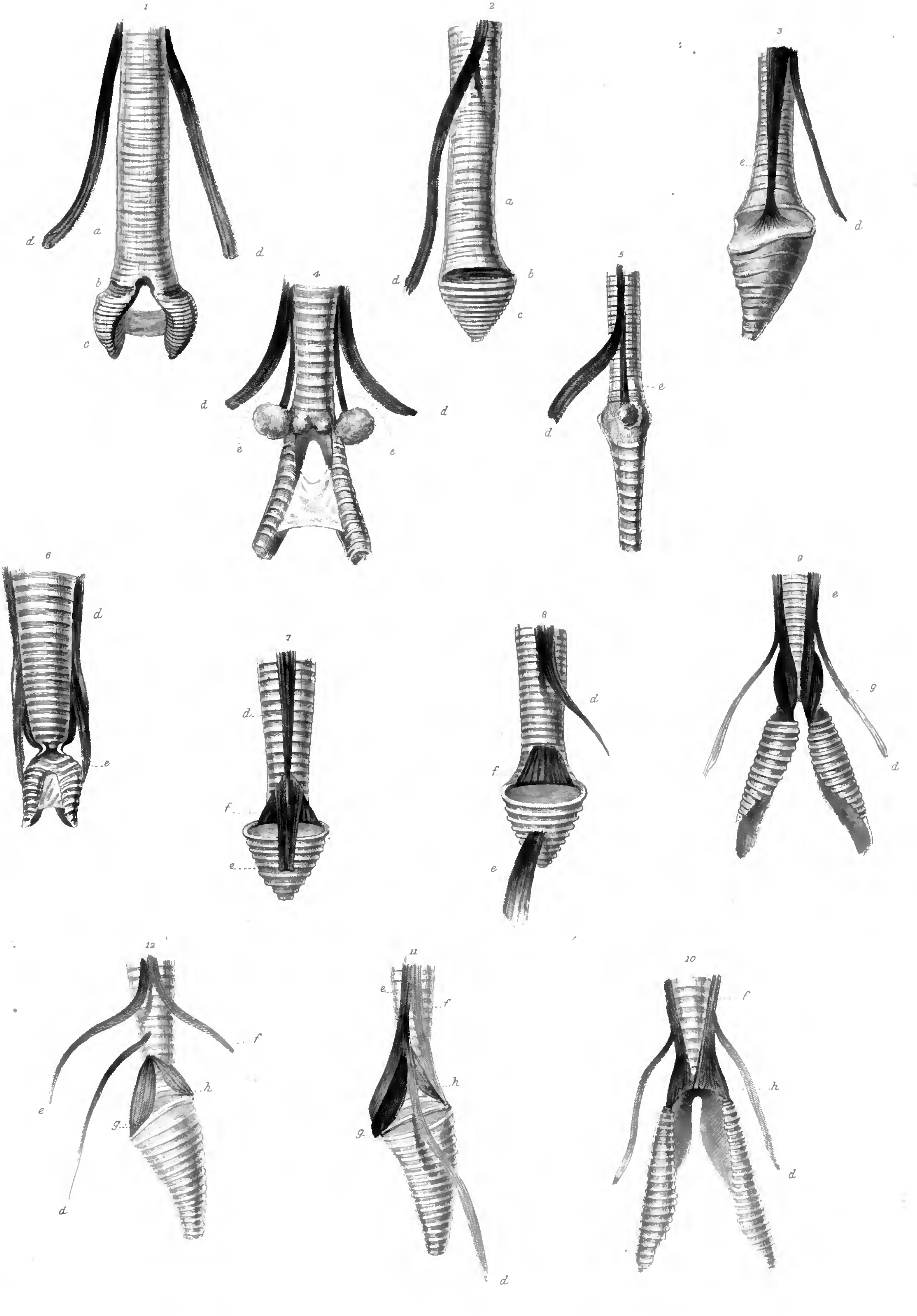
Tab. XXI.

Fig. 1. Trachea of the Wood Grouse (*Tetrao Urogallus*), half the natural size. *a.* The loose portion. *c, c.* The bronchiæ. *d.* The furculo-tracheal muscles. *e, e.* The sterno-tracheal muscles.

2 & 3. Inside views of both halves of the trachea of the Velvet Duck (*Anas fusca*). *d, d.* Sterno-tracheal muscles. *e, e.* The furculo-tracheal muscles. *a, a.* The laryngeal cavity.

 XVIII. *A Syn-*

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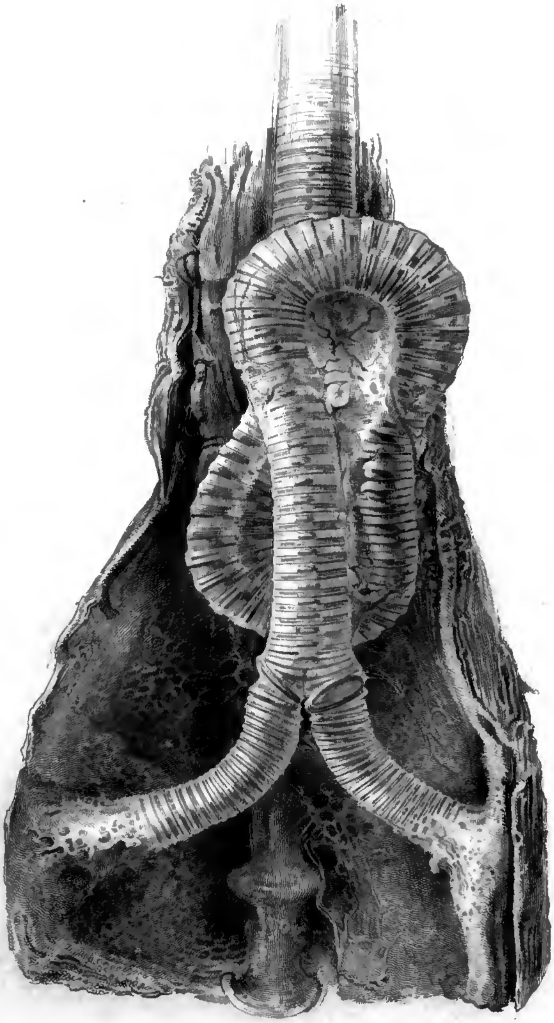

Trachea of the Spoonbill.

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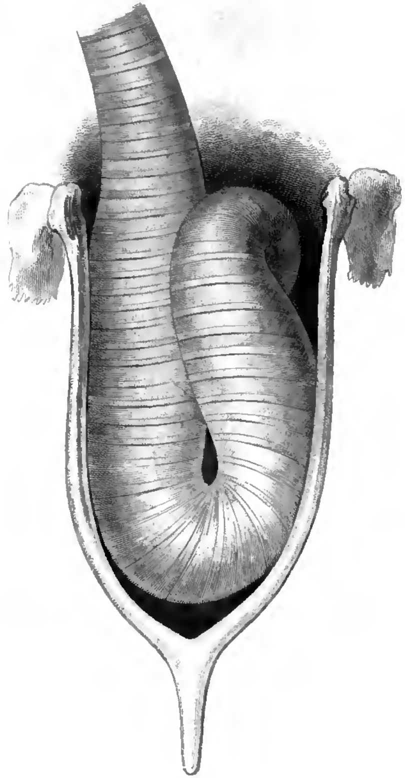

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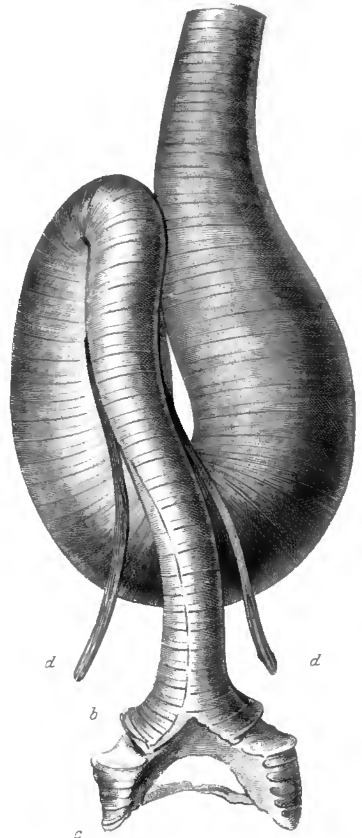

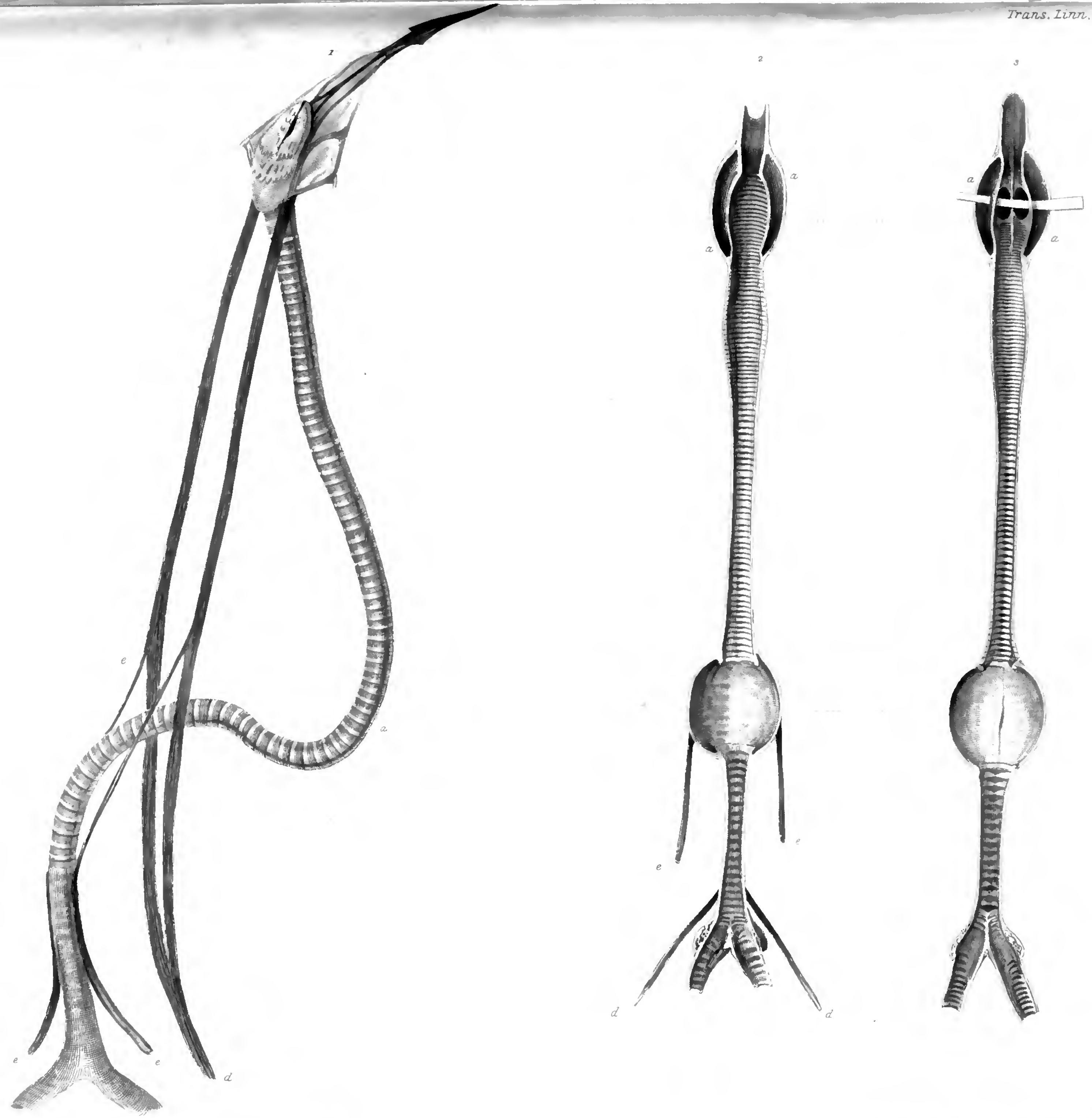

J. B Newton. del.

XVIII. *A Synopsis of the Testaceous Pneumonobranchous Mollusca of Great Britain. By J. G. Jeffreys, Esq. In a Letter addressed to L. W. Dillwyn, Esq. F.R. and L.S.*

Read November 18, *and December* 16, 1828.

Dear Sir,

If you think that the following account of an interesting branch of our native Testacea, compiled from my own observations and a careful investigation of those authors who have written on the subject, will be found worthy the notice of the Linnean Society, I shall be glad to avail myself, with permission, of your medium in submitting it to that learned body. The few changes in system and nomenclature which I have ventured to propose are very partial, and I am sure that you will think with me that they are justifiable in an attempt to ascertain uncertain characters, or determine new ones. I do not lay much stress upon the distinctive marks furnished by the animals of this order specifically considered, though I am fully aware of their importance in forming the leading features of the higher divisions. The accompanying catalogue will I believe be found to comprise all the species hitherto known as British, with some not inconsiderable additions. They are, with a single exception, in my Cabinet.

I am, Dear Sir,

Yours truly,

J. G. Jeffreys.

Swansea, September 1st, 1828.

Class. GASTEROPODA. *Auct.*

Ordo. *PNEUMONOBRANCHIA.* Pulmonés. *Fér.*

Stirps 1.—Animal; pallio interrupto; testâ plerumque spirali obtectum.

Familiarum et Generum Synopsis.

Familia I. HELICIDÆ.—Tentaculis quatuor cylindricis, retractilibus; quorum superiora ad apicem oculigera.

II. CARYCHIADÆ.—Tentaculis duobus cylindricis, contractilibus, ad basin internam oculatis.

III. LIMNÆADÆ.—Tentaculis duobus compressis, contractilibus; quorum ad basin externam pedunculi oculigeri.

Familia I. HELICIDÆ. *Leach.*

Tentacula superiora longiora.

§ Testâ transverso-ovatâ, absque umbilico.

1. Succinea.
2. Vitrina.

§§ Testâ conoideâ seu depressâ, umbilico subcentrali.

3. Helix.

§§§ Testâ turritâ, umbilico transverso, seu nullo.

4. Bulimus.
5. Cianella.
6. Clausilia.
7. Pupa.

Tentacula inferiora indistincta, seu nulla.

8. Alæa.
9. Vertigo.

Genus

Genus I. SUCCINEA. *Drap.*

Animal redundans, gelatinosum: *tentaculis* brevibus, inflatis: *sustentaculo* crasso.

Testa ovato-conica: *spirâ* exsertâ; *anfractu ultimo* majore: *aperturâ* amplâ.

1. PUTRIS.

Animal griseo-maculatum. *Tentacula* concentricè rugosa. *Testa* ampullacea, fragilis, nitida, glabra, subflava. *Anfractus* 3. *Apertura* ovata, marginibus dispunctis.

Long. 0.6.—Diam. 0.35.

Succinea amphibia. *Drap. Hist. des Moll. p.* 58. *t.* 3. *f.* 22. *Lam. Hist. des Anim. sans Vert.* 6. *p.* 135.

Helix putris. *Linn. Syst. Nat.* 1. *p.* 1249.

——— succinea. *Müll. Verm.* 2. *p.* 97.

——— limosa. *Dillw. Cat.* 2. *p.* 966.

α. Minor, oblonga; apertura effusiore.

Common, in marshy places, on the water-flag; but not, as the name given to it by Draparnaud imports, amphibious.

2. OBLONGA.

Animal nigro-griseum. *Tentacula* ferè conica.

Testa ovata, subventricosa, nitida, substriata, rufescenti-cornea. *Anfractus* 3 vix 4, producti: *suturâ* distinctâ. *Apertura* ovalis, peristomio subcontinuo.

Long 0.3.—Diam. 0.15.

Succinea oblonga. *Drap. Hist. des Moll. p.* 59. *t.* 3. *f.* 24.

In great abundance in a ditch at Britonferry near Swansea.

Genus

Genus II. VITRINA. *Drap.*

Animal redundans: *pallii processu* spiræ partem obtegente.

Testa depresso-conica, fragilissima: *spirâ* obliquâ; *anfractu ultimo* valdè maximo: *aperturâ* obliquè lunatâ, marginibus dispunctis.

1. Mülleri.

Animal albo-cinereum. *Sustentaculum* perangustum crassum. *Pallii processus* albus.

Testa orbiculata, utrinque convexa, hyalina, politissima, subvirescenti-alba. *Anfractus* 3. *Apertura* subrotundo-lunata.

Long. 0.125.—Diam. 0.175.

Helix pellucida. *Müll. Verm. p.* 16.

La Transparente. *Geoff. p.* 38. *t.* 2?

α. Globosa; spirâ prominulâ.

In moist woods, in autumn, on the *Jungermannia platyphylla* (on which the animal feeds); and under decaying leaves. The shell differs from the following in the spire being more central and produced, and in the form of the aperture, which is slightly angular near the insertion of the columellar border. The size of the animal is also not so disproportionately large.

2. Draparnaldi.

Animal griseum, testam valdè superans. *Sustentaculum* permagnum.

Testa depressior, spirâ parùm exsertâ laterali, perlucida, subviridis. *Anfractus* 3. *Apertura* ampla, elliptico-lunata.

Long. 0.135.—Diam. 0.25.

Vitrina pellucida. *Drap. Hist. des Moll. p.* 119. *t.* 8. *f.* 38.

Plentifully

Plentifully towards the end of autumn at the roots of the *Rosa spinosissima*, on the Swansea Burrows.

3. DEPRESSA.

Animal ———

Testa depressa, lentissimè et irregulariter rugosa, albida. *Anfractus* 2, vix 3. *Apertura* lunata.

Long. 0.065.—Diam. 0.145.

As yet I have only found two dead specimens from Britonferry wood near Swansea. In its general contour this more nearly resembles the true *Helices* than any of the preceding ones. It is whitish, and has not much of the pellucidity and glossiness characteristic of its genus. The last volution is not so proportionally large and swollen, and the spire is in consequence more central.

4. ELONGATA.

Animal elongatum, peramplum. *Tentacula* brevia, ferè conica.

Testa globosa, spirâ prominulâ, alba. *Anfractus* vix 2. *Apertura* ovato-lunata.

Long. 0.085.—Diam. 0.15.

Vitrina elongata. *Drap. Hist. des Moll. p.* 102. *t.* 8. *f.* 40.

From Britonferry wood, near Swansea; very rare. Except in the fewer volutions and less orbicular form, (characters which do not alter with the growth of the shell,) I should have been inclined to consider this as the young of the *V. Mülleri*.

Draparnaud's representation of this shell is very incorrect, and by no means agrees with his description. Nor has he better succeeded in his figures of the *V. diaphana*,

 judging

judging from the appearance of French specimens of that shell in the cabinet of Mr. Dillwyn.

Genus III. HELIX. *Auct.*

Animal mediocre: *sustentaculo* lato, testam æquiparante vel parùm superante.

Testa conoidea seu depressa: *umbilico* subcentrali.

* *Subglobosæ, inæquilaterales; umbilico indistincto, in junioribus perforato.*

1. Aspersa.

Animal supernè verrucosum, luteo-griseum, fasciâ dorsali pallidiore.

Testa subrotundo-ovata, globosa, solidior, lutea, fasciis quatuor subrufis. *Anfractus* 4. *Apertura* subrotundo-lunata: *peristomio* albo, reflexo.

Long. 1.5.—Diam. 1.

Helix grisea. *Linn. Syst. Nat.* 1. *p.* 1247? *Dillw. Cat.* 2. *p.* 943.

—— aspersa. *Müll. Verm.* 2. *p.* 59.

—— hortensis. *Penn. Zool.* 4. *p.* 136. *t.* 84. *f.* 129.

α. fasciis quinque fuscis angustis.

β. fasciâ unicâ alba, strigisque transversis.

γ. ventricosa, anfractibus ferè disjunctis.

Common in old walls, gardens, &c. The var. α is from the neighbourhood of Leith; and the last is found on the dry short grass which covers the limestone rocks at Oystermouth near Swansea.

Although this probably is the *Helix grisea* of Linnæus, from the great uncertainty which prevails in his descriptions of the banded species, I do not think that name ought to be retained to the exclusion of the more apt and now

now generally adopted one of *aspersa*, given to it by Müller.

2. Pomatia.

Animal supernè verrucosum, pallidè fuscum, subtùs griseum. *Tentacula* longiora.

Testa subrotundo-ovata, ventricosa, solidior, fasciis variis rufo-brunneis depicta. *Anfractus* 4—5. *Apertura* subrotundo-lunata : *peristomio* crasso, subreflexo.

Long. 2.—Diam. 1.5.

Helix pomatia. *Linn. Syst. Nat.* 1. *p.* 1244.

Not uncommon in woods of the midland and southern counties of England. Many distortions of the shell occur, but they may be all referred to the same principle, and cannot rank as varieties, which are chiefly influenced by food and situation.

3. Arbustorum.

Animal verrucosum, nigro-viridescens. *Tentacula* perbrevia.

Testa globosa, solidior, fasciâ unicâ fuscâ maculisque flavis insignita. *Anfractus* 5. *Apertura* subrotundo-lunata : *peristomio* reflexo, in junioribus intùs submarginato.

Long. 0.75.—Diam. 0.65.

Helix arbustorum. *Linn. Syst. Nat.* 1. *p.* 1245.

a. efasciata, pellucida.

Not uncommon in moist woods.

4. Nemoralis.

Animal colore varians, plerumque viridescenti-griseum. *Sustentaculum* latum.

Testa rotundata, depressiuscula, solidior, nunc fasciis diversè picta interdùm unicolor. *Anfractus* 5—6. *Apertura* subrotundo-lunata, compressa. *Umbilicus* perangustus.

Long. 1.15.—Diam. 0.85.

Helix nemoralis. *Linn. Syst. Nat.* 1. *p.* 1247.

Common in hedges, woods, &c., particularly after showers of rain.

Among the numerous varieties of this species I cannot help remarking one, which in its markings and consistency seems closely allied to the *H. sylvatica* of Continental authors, and from which it only differs in being of a rather more globular form, and in having the umbilicus a little impressed.

5. HORTENSIS.

Animal colore varians, plerumque rubicundo-griseum. *Tentacula* grisea.

Testa rotundata, depressior, nunc variè fasciata, interdùm unicolor. *Anfractus* 5. *Apertura* subrotundo-lunata, costâ interiore albâ marginata: *peristomio* albo.

Long. 0.85.—Diam. 0.7.

Helix hortensis. *Müll. Verm.* 2. *p.* 52.

——— nemoralis var. *Maton & Rackett in Linn. Trans.* 8. *p.* 206. *Dillw. Cat.* 2. *p.* 942.

Found with the last, though less commonly.

Linnæus's variety of his *Helix nemoralis*, which has been referred by Müller and others to this shell, is probably the *H. vermiculata*, a Continental species.

** *Conoideæ, æquilaterales; umbilico angustato.*

6. FUSCA.

Animal ———

Testa

Testa subglobosa, subdiaphana, fragilissima, luteo-fusca. *Anfractus* vix 5. *Apertura* lunata: *peristomio* simplici.

Long. 0.225.—Diam. 0.3.

Helix fusca. *Mont. Test. Brit. p.* 424. *t.* 13. *f.* 1.

From woods in the neighbourhood of Swansea and Cardiff. Mr. J. S. Miller of Bristol, who has described this shell in the *Annals of Philosophy* as a new species (*H. subrufescens*), says he has not unfrequently found it in Somersetshire; but it is at least a local species.

7. Trochiformis.

Animal fusco-griseum, nitidissimum. *Sustentaculum* perangustum tenue. *Tentacula* perlonga, valdè flexilia.

Testa supernè conica, globosa; subtùs planiuscula; nitidissima, glabra, corneo-fulva. *Anfractus* 6. *Apertura* lunata, compressa.

Long. 0.1 ferè.—Diam. 0.1.

Helix trochiformis. *Mont. Test. Brit. p.* 427. *t.* 11. *f.* 9.

——— fulva. *Drap. Hist. des Moll. p.* 81. *t.* 7. *f.* 12.

α. subfusca, diaphana.

Not uncommon under stones at the bank of an old canal on Crymlin Burrows; and on the waterflag, and under decaying wood, in marshy ground, at Marino near Swansea. The var. *α.* is from Somersetshire.

To this species may perhaps be referred the *Trochus terrestris* of Pennant, said to have been found by Mr. Hudson on the mountains of Cumberland; though the figure of that author (which hardly agrees with the description) represents quite a different shell. The *Helix fulva* of Müller is quite distinct, and is probably the *H. edentula* of Draparnaud.

8. Mortoni.

8. Mortoni.

Animal pallidum. *Tentacula* nigra, respectu corpusculi longa. (*Müll.*)

Testa suprà depressior, nitidissima, glabra; subtùs planata, substriata; lateribus utrinque acutis; pallidè fulva. *Anfractus* 5. *Apertura* compressa, subrhomboidea.

Long. 0.085.—Diam. 0.11.

Helix Trochulus. *Müll. Verm.* 2. *p.* 79?

From the rejectamenta of the Avon river, near Bristol.

I have scarcely any doubt of this species being the *Trochus terrestris* β. of Da Costa, which is stated by that author to have been found by Mr. Morton in the clefts of a sallow near a pond in Thorpe Mandeville, Northamptonshire, and which, as well as the *Trochus terrestris* of Pennant, has been referred by Montagu and succeeding authors to the *Helix elegans*, a species inhabiting the plains of the South of France.

9. Aculeata.

Animal grisescens, testâ erectâ incedit. *Tentacula* perlonga, cylindrica.

Testa globosa, lamellis mucronatis transversis aspera, fusca. *Anfractus* vix 4. *Apertura* elliptico-rotundata.

Long. 0.085.—Diam. 0.1 ferè.

Helix aculeata. *Müll. Verm.* 2. *p.* 81.

——— spinulosa. *Lightf. in Phil. Trans.* 76. *p.* 166. *Mont. Test. Brit. p.* 429. *t* 11. *f.* 10. *Maton & Rackett in Linn. Trans.* 8. *p.* 201.

Not uncommon in a coppice at Newton near Swansea. The animal feeds on the *Jungermannia platyphylla*.

10. Lamellata.

10. Lamellata.

Animal ———

Testa pyramidalis, subglobosa, lamellis muticis numerosis, subfusca. *Anfractus* 6, parùm decrescentes, subturritæ. *Apertura* lunata.

Long. 0.1.—Diam. 0.1.

From the neighbourhood of Scarborough, Yorkshire. Favoured me by Mr. J. S. Miller of Bristol (as well known for his elaborate work on the *Crinoidea* as for his successful attention to other intricate departments of natural history) under the specific name of *holosericea;* but Gmelin's and Ferussac's shell of that name is very different, being nearly allied to the *Helix obvoluta*, and is five times the size of this.

11. Sericea.

Animal ———

Testa subglobosa, nitidula, diaphana, setis obsita confertis, cereo-lutescens aut strigata. *Anfractus* 5—6. *Apertura* subrotundo-lunata, intùs subincrassata: *peristomio* posticè reflexo.

Long. 0.35.—Diam. 0.4.

Helix sericea. *Müll. Verm.* 2. *p.* 62. *Drap. Hist. des Moll. p.* 103. *t.* 7. *f.* 16, 17. *Fér. Tabl. p.* 44.

——— hispida. *Mont. Test. Brit. p.* 423. *t.* 23. *f.* 3. *Maton & Rackett in Linn. Trans.* 8. *p.* 198.

——— velutina. *Lam. Hist. des Anim. sans Vert.* 6. *p.* 86?

Not uncommon in hedge-banks and moist woods in Somersetshire.

*** *Depresso-conicæ; umbilico in aperto, spiram detegente.*

12. Cingenda.

Animal albido-lutescens; collo purpurascente. *Tentacula* clavata, longiora.

Testa

Testa globosa, suprà depressior, glabra, zonis rufo-brunneis sæpè interruptis depicta. *Anfractus* 5. *Apertura* subrotundo-lunata: *fauce* roseâ, internè marginatâ: *peristomio* posticè reflexo.

Long. 0.55.—Diam. 0.75.

Helix cingenda. *Mont. Test. Brit. p.* 418. *t.* 24. *f.* 4. *Maton & Rackett in Linn. Trans.* 8. *p.* 195. *t.* 5. *f.* 6.
—— rhodostoma. *Drap. Hist. des Moll. p.* 86. *t.* 5. *f.* 13, 15.
—— strigata. *Dillw. Cat.* 2. *p.* 911.
—— pisana. *Lam. Hist. des Anim. sans Vert.* 6. *p.* 82.

This species, which is rather local, covers the sandy plains near Tenby in vast profusion, probably affording nourishment to a great number of small birds of the Finch tribe, as I have frequently observed the dead shells collected in heaps, with the apex broken and the animal picked out. The beautiful pink gloss observable on the mouths of this and the following species, is entirely owing to the action of, and their exposure to, the sun. In the specimens found in more sheltered situations, the colours and markings are much fainter, and sometimes altogether wanting.

I suspect that Müller confounded this with the next, under the name of *Pisana*.

13. VIRGATA.

Animal purpurascente-cinereum. *Sustentaculum* crassum, subflavum.

Testa subconica, globosa, glabra, fasciâ mediâ rufescenti-brunneâ aliisque angustioribus sæpè confluentibus circumscripta. *Anfractus* 6. *Apertura* suborbiculata, internè marginata: *peristomio* subreflexo.

Long. 0.4.—Diam. 0.6.

Helix

Helix virgata. *Mont. Test. Brit.* 415. *t.* 24. *f.* 1. *Maton & Rackett in Linn. Trans.* 8. *p.* 195.

—— variabilis. *Drap. Hist. des Moll. p.* 84. *t.* 5. *f.* 11, 12.

—— pisana. *Dillw. Cat.* 2. *p.* 911.

a. minor, conica, obscurè rubra, fasciata, fauce purpurascenti.

Helix maritima. *Drap. Hist. des Moll. p.* 85. *t.* 9, 10.

Very plentiful on all sandy heaths. The variety is common on the sandy plains near Swansea.

14. Caperata.

Animal flavescenti-cinereum, supernè verrucosum. *Sustentaculum* crassiusculum.

Testa subdepressa, subcarinata, striis argutissimis exarata, fasciâ rufescenti-brunneâ spiram circumornante aliisque variis inferioribus. *Anfractus* vix 6. *Apertura* subrotundo-lunata, intùs marginata.

Long. 0.25.—Diam. 0.35.

Helix caperata. *Mont. Test. Brit. p.* 430. *t.* 11. *f.* 11. *Maton & Rackett in Linn. Trans.* 8. *p.* 196.

—— crenulata. *Müll. Verm.* 2. *p.* 68? *Dillw. Cat.* 2. *p.* 895.

—— striata. *Drap. Hist. des Moll. p.* 106. *t.* 6. *f.* 18—21.

Common in the same situations as the last.

15. Pallida.

Animal griseum; supernè fusco-verrucosum. *Sustentaculum* exile.

Testa subdepressa, globosa, fragilis, roseo-pallescens. *Anfractus* 6. *Apertura* subrotundo-lunata, intùs marginata.

Long. 0.5.—Diam. 0.7.

Helix pallida. *Don. British Shells, t.* 157. *f.* 2.
—— cantiana. *Mont. Test. Brit. p.* 422. *t.* 23. *f.* 1.
Maton & Rackett in Linn. Trans. 8. *p.* 197.

α. paulò minor, albida.
Helix carthusiana. *Drap. Hist. des Moll. p.* 101. *t.* 7. *f.* 3, 4.

Not uncommon in parts of Somersetshire and the neighbourhood of Swansea: to be seen in hedges after showers of rain. The variety, which exactly resembles some French specimens of Draparnaud's *carthusiana* in my possession, was presented to me by Mrs. Smith of Bristol, and was, I believe, found by that lady in Gloucestershire. The inhabitants of this and many of its congeners have a dorsal line or band, of a lighter colour than the rest of the body. It corresponds with the circular lines sometimes observable on the last volution of their shells.

Local names should at all times be avoided; but where, as in the present instance, two such happen to be applied to the same species, there can be no doubt of the propriety of changing them.

16. Concinna.

Animal rufescens, politissimum. *Tentacula* longiora.
Testa subdepressa, subcarinata, nitidula, setis albidis valdè caducis sparsa, rufo-brunnea. *Anfractus* 5—6. *Apertura* subrotundo-lunata, intùs marginata. *Umbilicus* patulus.

Long. 0.2.—Diam. 0.3.

α. minor, candidior; aperturâ vix marginatâ.
Helix polita. *Müll. Verm.* 2. *p.* 33?
—— hispida, γ. *Drap. Hist. des Moll. p.* 104. *t.* 7. *f.* 22?

Under

Under stones &c. in dry places in the neighbourhood of Swansea, mixed with the following; and very plentifully among the rejectamenta of the Avon river, near Bristol. The variety is of a smaller size, more pellucid, and of a paler colour, and was presented to me by Mr. Dillwyn as Irish. Müller's specimens (if this shell be the long-sought-for *H. polita* of that author) may have been bleached, and conveyed to the habitat mentioned by him (on the banks of torrents in Lombardy) by the waters of a flood.

17. RUFESCENS.

Animal nigro-griseum. *Tentacula superiora* crassiora, valdè divergentia.

Testa depressior, glabra, striata, subcarinata, rufescenti-cornea. *Anfractus* 6. *Apertura* subrotundo-lunata, intùs marginata: *peristomio* subreflexo. *Umbilicus* patulus.

Long. 0.25.—Diam. 0.5.

Helix rufescens. *Penn. Brit. Zool.* 4. *p.* 134. *Mont. Test. Brit. p.* 420. *t.* 23. *f.* 2. *Maton & Rackett in Linn. Trans.* 8. *p.* 196. *Dillw. Cat.* 2. *p.* 895.

——— hispida, *juniores*, et *var.* helvetica. *Müll. Verm.* 2. *p.* 74.

Common in hedges, gardens, &c. In every stage of growth, from half a line upwards, it is smooth, and not in the least hispid; and it is surprising that Montagu, who has been followed in this respect by succeeding British authors, should have confounded this with the following well-known Continental species.

It is either the *glabella* or *hispida*, var. β. of Draparnaud, but I am rather inclined to think the former.

 18. HISPIDA.

18. Hispida.

Animal griseum. *Sustentaculum* album, crassum.

Testa subdepressa, globosa, substriata, setis obsita confertis. *Anfractus* vix 5. *Apertura* subrotundo-lunata, plerumque emarginata. *Umbilicus* subangustatus, sinu profundo.

Long. 0.225.—Diam. 0.325.

Helix hispida. *Linn. Syst. Nat.* 1. *p.* 1244? *Müll. Verm.* 2. *p.* 73.

—— rufescens, var. *Mont. Test. Brit. p.* 421.

—— conspurcata. *Drap. Hist. des Moll. p.* 105. *t.* 7. *f.* 23—25.

α. minor, albida, striata, subcarinata.

β. minor, tenuior; spirâ productiore.

γ. paulò major, solidior; aperturâ intùs denticulato-marginatâ.

Common under stones &c. in shady places. The var. α. is found in moist willow grounds, and may be a distinct species. β. is not uncommon on the Swansea Burrows, at the roots of the *Rosa spinosissima*.

I do not think that Draparnaud's *hispida* has ever been found in this country: ours, which is that of Müller, Da Costa, and Donovan, and probably also of Linnæus, is the *Helix conspurcata* of Continental writers, and constitutes a variety only remarkable for its more depressed form, and the dark irregular blotches or spots which are often observable on the surface. The spots are noticed by Müller, and originate in the mantle of the animal.

19. Ericetorum.

Animal albido-griseum. *Sustentaculum* tenue, pellucidum.

Testa

Testa utrinque depressior, fragilis, albida, fasciâ superiore rufescenti-brunneâ aliisque sæpè divisis inferioribus. *Anfractus* 5—6. *Apertura* orbiculata, intùs marginata: *peristomio* subreflexo. *Umbilicus* valdè patens, sinu profundo.

Long. 0.35.—Diam. 0.65.

Helix ericetorum, β. *Müll. Verm.* 2. *p.* 34.

Common on heaths, sandy plains, &c. It does not exactly agree with any of the varieties of Draparnaud's *ericetorum* or *cespitum*.

20. Nitida.

Animal cærulescenti-nigrum, politissimum. *Tentacula* brevia, crassiuscula.

Testa subdepressa, nitidissima, substriata, fulvo-cornea. *Anfractus* vix 5. *Apertura* suborbiculato-ovata: *peristomio* simplici. *Umbilicus* patulus, sinu profundo.

Long. 0.15.—Diam. 0.275.

Helix nitida. *Müll. Verm.* 2. *p.* 39. *Lam. Hist. des Anim. sans Vert.* 6. *p.* 91.

—— nitens. *Gmel. Syst. Nat.* 1. *p.* 3633.

—— lucida. *Drap. Hist. des Moll. p.* 103. *t.* 8. *f.* 11, 12. (var.) *Mont. Test. Brit. p.* 425?

α. paulò minor, striata; anfractibus 6, sensim decrescentibus, convexis.

β. hyalina, albido-virescens.

Not uncommon under stones, at the roots of rushes &c., in marshy places near Swansea. Some specimens nearly equal the largest size noted by Müller, $3\frac{1}{3}$ lines of our measure. The var. β. I received from Mr. Dillwyn as Irish.

Gmelin, by changing the name given to this species by Müller, has created no little confusion.

21. Nitidula.

21. Nitidula.

Animal griseo-maculatum, pellucidum. *Sustentaculum* albescens.

Testa depressior, nitida, glabra, cereo-lutescens, subtùs albida. *Anfractus* vix 5, convexiusculi. *Apertura* magna, subovata: *peristomio* simplici. *Umbilicus* plusquàm patens.

Long. 0.2.—Diam. 0.4.

Helix cellaria. *Müll. Verm.* 2. *p.* 28? *Gmel. Syst. Nat.* 1. *p.* 3634. *Dillw. Cat.* 2. *p.* 193.

——— nitidula. *Drap. Hist. des Moll. p.* 117.

β. minor, albida, diaphana, subcarinata; anfractibus sensim decrescentibus.

Helix nitidula, β. *Drap. Hist. des Moll. p.* 117. *t.* 8. *f.* 21, 22.

——— nitidosa. *Fér. Tabl. des Anim. Moll. p.* 41.

Not uncommon under stones &c. in sheltered places. The variety is a very pretty shell, and approaches in form to the *Helix rufa* (*Helicophanta,* Férussac) of Draparnaud.

22. Lucida.

Animal cærulescenti-griseum. *Sustentaculum* albidum, pellucidum, elongatum. *Tentacula* flexilia.

Testa depressa, pellucida, nitidissima, testacei coloris; subtùs lactea. *Anfractus* 5—6, planiusculi. *Apertura* magna, obliquè lunata, emarginata. *Umbilicus* patulus, sinu profundo.

Long. 0.275.—Diam. 0.55.

Helix lucida. *Mont. Test. Brit. p.* 425. *t.* 23. *f.* 4.

Helix

Helix nitens. *Maton & Rackett in Linn. Trans.* 8. *p.* 198. *t.* 5. *f.* 7.

—— cellaria. *Lam. Hist. des Anim. sans Vert.* 6. *p.* 91.

Common; found with the last.

23. ALLIACEA.

Animal nigrescens. *Tentacula* brevia, cylindrica.

Testa suprà plana, politissima, diaphana, rufescenti-cornea; subtùs lactea. *Anfractus* 4—5, suturâ marginatâ. *Apertura* obliqua, subrotundo-lunata. *Umbilicus* subangustatus, sinu profundo.

Long. 0.1.—Diam. 0.225.

Helix alliaria. *Miller in Ann. of Philos.* 1822, *p.* 379.

Under stones &c. in moist situations; often in company with the *H. nitida*, but by no means so common. The animal has a strong odour of garlic, which is very perceptible on its being plunged into boiling water. It is a very distinct species, and differs from the young of the last in the greater depression of its spire, and greater transparency and contraction of the umbilicus. First described by Mr. J. S. Miller in the *Annals of Philosophy* for 1822.

24. CRYSTALLINA.

Animal lacteum. *Tentacula superiora* obtusè cylindrica.

Testa suprà plana, vitrea, hyalina, politissima. *Anfractus* 5, parùm decrescentes, subtùs convexiusculi, suturâ submarginatâ. *Apertura* lunata. *Umbilicus* angustatus, foramine cylindrico.

Long. 0.075.—Diam. 0.125.

Helix crystallina. *Müll. Verm.* 2. *p.* 23. *Drap. Hist. des Moll. p.* 118. *t.* 8. *f.* 13—17. Non *Dillw. Cat.* 2. *p.* 909.

Under

Under stones in moist sheltered situations, but not very common. The shell varies much in size. Dead ones are of an opaque white colour.

First noticed as British by Mr. J. S. Miller in the *Annals of Philosophy* for 1822.

25. Rotundata.

Animal pallidè griseum, supernè punctatum. *Sustentaculum* perbreve, hyalinum.

Testa depressior, subcarinata, striis argutis divaricatis exarata, rufo-maculata. *Anfractus* 6—7. *Apertura* compressa, suborbiculata, emarginata. *Umbilicus* valdè patens, sinu profundo.

Long. 0.125.—Diam. 0.375.

Helix rotundata. *Müll. Verm.* 2. *p.* 29. *Drap. Hist. des Moll. p.* 114. *t.* 8. *f.* 4—7.

—— radiata. *Da Costa Brit. Conch. p.* 57. *t.* 4. *f.* 15, 16. *Mont. Test. Brit. p.* 432. *t.* 24. *f.* 3. *Maton & Rackett in Linn. Trans.* 8. *p.* 199.

α. viridescenti-albida, immaculata.

Common in shady places, under decayed wood, &c. A single specimen of the variety has occurred to me from the neighbourhood of Swansea.

26. Umbilicata.

Animal nigro-griseum, politum. *Tentacula superiora* cylindrica.

Testa subdepressa, subcarinata (præsertim juniores), divaricatè striata, brunnea. *Anfractus* vix 5, suturâ excavatâ. *Apertura* compressa, suborbiculata. *Umbilicus* valdè patens.

Long. 0.05.—Diam. 0.1.

Helix

Helix umbilicata. *Mont. Test. Brit. p.* 434. *t.* 13. *f.* 2. *Maton & Rackett in Linn. Trans.* 8. *p.* 200. *Dillw. Cat.* 2. *p.* 915.

—— rupestris, β. *Drap. Hist. des Moll. p.* 82. *t.* 7. *f.* 7—9.

Very plentiful in the crevices of limestone-rocks near Swansea, Tenby, and other parts of South Wales; and in the rocks near Bristol. The animal walks with its shell erect, owing to the shortness of its foot.

27. Pygmæa.

Animal nigro-griseum, politum. *Tentacula superiora* filiformia, approximata. *Sustentaculum* longius.

Testa subdepressa, pellucida, subtiliter striata, pallidè brunnea. *Anfractus* 3—4, globosi. *Apertura* compressa, suborbiculata: *peristomio* simplici, marginibus disjunctis. *Umbilicus* patulus, sinu profundo.

Long. 0.025.—Diam. 0.06.

Helix pygmæa. *Drap. Hist. des Moll. p.* 114. *t.* 8. *f.* 8—10.

—— Kirbii. *Shepp. in Linn. Trans.* 14. *p.* 162.

At the roots of rushes in a marshy piece of ground at Marino near Swansea.

**** *Depressæ; peristomio incrassato, reflexo.*

28. Pulchella.

Animal croceo-lactescens, pellucidum. *Tentacula* perbrevia; *superiora* cylindrica.

Testa pellucida, nitida, subtiliter striata, albida. *Anfractus* 3—4, subglobosi. *Umbilicus* patens, sinu profundo. *Apertura* suborbicularis: *peristomio* subcontinuo.

Long. 0.04.—Diam. 0.1.

Helix pulchella. *Müll. Verm.* 2. *p.* 30. *Drap. Hist. des Moll. p.* 112. *t.* 7. *f.* 30—32.

—— paludosa. *Da Costa Brit. Conch. p.* 59. *Mont. Test. Brit. p.* 440. *Maton & Rackett in Linn. Trans.* 8. *p.* 193. *t.* 5. *f.* 5.

α. epidermide laminosâ induta.

Helix costata. *Müll. Verm.* 2. *p.* 31.

—— crenella. *Mont. Test. Brit. p.* 441. *t.* 13. *f.* 3.

Turbo helicinus. *Lightf. in Phil. Trans.* 76. *t.* 3. *f.* 1—4.

Common in moist places under stones, in moss, and at the roots of grass.

29. Acuta.

Animal suprà nigrescenti-rufum, granulatumque; subtùs pallidius. *Tentacula superiora* longiora.

Testa solidior, granulato-scabra, carinata, rufo-maculata. *Anfractus* 5, subtùs convexiusculi. *Apertura* transverso-ovata: *peristomio* continuo. *Umbilicus* patulus.

Long. 0.3.—Diam. 0.65.

Helix lapicida. *Linn. Syst. Nat.* 1. *p.* 1241.

—— acuta. *Da Costa Brit. Conch. p.* 55. *t.* 4. *f.* 9.

Not uncommon in the clefts of rocks, under stones, &c. Somersetshire.

I cannot account for the vulgar error which dictated to Linnæus the name of *lapicida*, or Stone-eroder, for this shell.

Genus IV. BULIMUS. *Bruguière.*

Animal elongatum. *Sustentaculum* angustum, testam non æquiparans.

Testa oblonga, anfractu ultimo majore. *Apertura* inæqualis, ad basin integra. *Umbilicus* semiclausus, perforatus.

* *Ovato-*

* *Ovato-oblongæ ; apice obtuso : peristomio extùs reflexo.*

1. Obscurus.

Animal rosaceo-griseum. *Sustentaculum* crassum. *Tentacula superiora* subulata, tenuiter arcuata.

Testa oblongiuscula, ventricosa, tenuis, epidermide luteo-fusco (præsertim in junioribus) induta. *Anfractus* 6—7. *Apertura* subovata, marginibus subinæqualibus : *peristomio* albo, incrassato. *Umbilicus* angustatus.

Long. 0.35.—Diam. 0.125.

Bulimus obscurus. *Drap. Hist. des Moll. p.* 74. *t.* 4. *f.* 23.

——— hordeaceus. *Brug. Encycl. Meth. n.*62. *Lam. Hist. des Anim. sans Vert.* 6. *p.* 125.

Helix obscura. *Müll. Verm.* 2. *p.* 103.

In woods, hedge-banks, under stones, &c. ; but not very common.

2. Montacuti.

Animal pallidum. *Tentacula* clavata. (*Mont.*)

Testa oblonga, ventricosior, ferrugineo-fusca. *Anfractus* 6—7, reticulato-striati. *Apertura* subovata, marginibus inæqualibus : *peristomio* rosaceo-albo, in columellam parùm reflexo. *Umbilicus* subangustatus.

Long 0.6.—Diam. 0.275.

Bulimus montanus. *Drap. Hist. des Moll. p.* 74. *t.* 4. *f.* 22.

Helix Lackhamensis. *Mont. Test. Brit. p.*394. *t.*11. *f.*3. *Maton & Rackett in Linn. Trans.* 8. *p.* 212. *Dillw. Cat.* 2. *p.* 953.

In moist woods of the midland and southern counties of

England,

England, though by no means common. For specimens I am indebted to my friend Mrs. Smith, who found them in Shortwood, Gloucestershire. Mr. Miller also tells me that he has collected several alive from the bark of *Viburnum Lantana* in woods near Bristol.

** *Elongato-oblongæ; apice acuto: peristomio simplici.*

3. Acutus.

Animal pallidè flavescens. *Tentacula superiora* longa, subulata; *inferiora* brevissima.

Testa clavata, ventricosa, striata, albida, fasciis fulvis strigatis aut obliteratis. *Anfractus* 8—9. *Apertura* subovata, marginibus subinæqualibus. *Peristomium* posticè reflexiusculum.

Long. 0.6.—Diam. 0.2 ferè.

Bulimus acutus. *Brug. Encycl. Meth. n.* 42. *Drap. Hist. des Moll. p.* 77. *t.* 4. *f.* 29.

Helix acuta (var.). *Müll. Verm.* 2. *p.* 100.

——— bifasciata. *Pult. Dorset. p.*49; *ed.*2. *p.*55. *t.*18. *f.* 8—10. *Maton & Rackett in Linn. Trans.* 8. *p.* 210.

Turbo fasciatus. *Penn. Brit. Zool.* 4. *p.* 131. *t.* 82. *f.* 119.

α. testa ventricosior, fasciis 2 nigro-fuscis pulchrè ornata.

Abundantly on sandy banks and high plains on many of the western coasts. The *Bulimus ventricosus* of Draparnaud, which that author refers to the *B. acutus* of Müller, is nothing more than a variety of this species.

The *Helix* (*Cochlicella*) *Clavulus* of Férussac (described by Mr. J. S. Miller in the *Annals of Philosophy* under the name of *Helix Goodallii*), which is found so abundantly in the Pine-

Pine-pits at Miller's nursery near Bristol, can hardly be said to be thoroughly naturalized.

Genus V. CIONELLA.

Animal glutinosum. *Tentacula inferiora* brevissima.

Testa oblonga seu elongata; *anfractu ultimo* majore. *Apex* acutiusculus. *Columella* subinterrupta. *Apertura* canaliculata, ad basin subeffusa, marginibus inæqualissimis. *Umbilicus* nullus.

Baron Férussac remarks, that the animals of his *Styloides*, a group of his subgenus *Cochlicopa*, and which answers to this division, do not agree in their conformation with those of the true *Polyphemi* of Montfort. This remark will, I believe, be found to apply equally well to the genus *Achatina* as established by Lamarck, besides the character which seems essential to that genus, of the truncature of the columella being parallel, or nearly so, with the base of the shell. In the genus I have proposed, the columella is slightly interrupted, and forms a channel or sinus in the aperture; though I have not observed that it is attended on the part of the animal by any corresponding peculiarity.

1. Lubrica.

Animal nitidum, fuscescenti-nigrum; subtùs pallidius. *Tentacula inferiora* vix percipienda.

Testa oblonga, subcylindrica, diaphana, polita, nitidissima, fulvo-flavescens. *Anfractus* 4—6, rotundati. *Apertura* ovato-oblonga, in junioribus ad basin arcuata: *peristomio* sæpè incrassato, luteo, in columellam reflexiusculo.

Long. 0.25.—Diam. 0.085.

Helix

Helix subcylindrica. *Linn. Syst. Nat.* 1. *p.* 1248? *Dillw. Cat.* 2. *p.* 952.
—— lubrica. *Müll. Verm.* 2. *p.* 104.
Bulimus lubricus. *Brug. Encycl. Meth. n.* 23. *Lam. Hist. des Anim. sans Vert.* 6. *p.* 126.
Buccinum obtusulum. *Adams's Microsc. Essays, t.* 25. *f.* 25.

Common in moist places, at the roots of grass, under stones, decaying wood, &c.

2. Acicula.

Animal albidum, pellucidum. *Tentacula superiora* subulata.

Testa elongato-oblonga, diaphana, nitidissima, albida. *Anfractus* 6, turriti. *Apertura* elliptica, convoluta, raró intùs submarginata: *peristomio* simplici.

Long. 0.2.—Diam. 0.05.

Buccinum Acicula. *Müll. Verm.* 2. *p.* 150.
Bulimus Acicula. *Brug. Encycl. Meth. n.* 22. *Drap. Hist. des Moll. p.* 75. *t.* 4. *f.* 25, 26.
Helix octona. *Gmel. Syst. Nat.* 1. *p.* 3653.
Buccinum terrestre. *Mont. Test. Brit. p.* 248. *t.* 8. *f.* 3.

In moss at the roots of grass, &c. in sheltered situations; very plentifully among the rejectamenta of streams. I once found it alive in a coppice at Newton near Swansea.

3. Elongata.

Animal ———

Testa elongato-oblonga, subturrita, striata, nitida, pellucida, lutescenti-alba. *Anfractus* 8—9, teretes, acuminati, suturâ profundâ. *Apertura* ovata: *peristomio* simplici.

Long. 0.6.—Diam. 0.125.

Bulimus

Bulimus octonus. *Brug. Encycl. Meth. n.* 47. *Lam. Hist. des Anim. sans Vert.* 6. *p.* 124.
Helix octona, β. *Gmel. Syst. Nat.* 1. *p.* 3653.

I am happy in being enabled to add the following very respectable authorities for considering this shell as British. I was lately presented with a specimen which I observed in the cabinet of Mr. Henry Collins of Swansea, who assured me that he had found it a few years ago, in company with the *Clausilia nigricans* and *Pupa umbilicata*, in the walls of the old castle at Oystermouth near Swansea. It is a young shell, and has the remains of the animal in it. Mr. Dillwyn also favoured me with a full-grown specimen, which he believes was given him by Miss Hutchins, as collected by that lady in the neighbourhood of Bantry, Ireland. This latter specimen was sent upon the above authority by Mr. Dillwyn to the late Colonel Montagu to be named, who returned it for further information.

The *Helix octona* of Linnæus, and probably also of Dr. Pulteney, is the *Helix octanfracta* of Montagu and other British authors.

Genus VI. CLAUSILIA. *Drap.*

Animal; corpore angusto, attenuato: *tentaculis inferioribus* brevissimis.

Testa fusiformis, elongata, acuminata: *spirâ* sinistrorsâ, intùs juxta aperturam ossiculo testaceo resiliente seu clauso plerumque instructâ. *Apertura* laminis coarctata, extùs compressa: *peristomio* continuo, undique libero, reflexo. *Umbilicus* perangustus.

This and part of the genus *Cyclostoma* of Lamarck (the shells of which latter are uniformly dextral) have been, with

with many others of the land *Turbines* of Linnæus, reunited by Férussac under his subgenus *Cochlodina;* but, as I am inclined to think, without sufficient reason. The validity of a theory first proposed by our older physiological writers, that a peculiarity in the form of the shell, attended by a corresponding formation in its animal inhabitant, is of itself sufficient ground for systematical distinction, has been often questioned, but is I believe at present, with some partial exceptions, pretty well established. But it is most curious that facts, in themselves indicating the closest relation between the animal and its external covering, and which at first seem totally opposed to all the known rules of organization, have at the same time been either disregarded as mere *lusus naturæ*, and therefore unworthy of the attention of the naturalist, or, in the prevailing rage for classification, adopted as generic characters in the fullest and sometimes most absurd extent. The reversed direction of the spire of the shell in the restricted order *Mollusca* is, it is well known, influenced by the position of the circulating and respiratory organs of the animal; and, according to the frequency of its occurrence, and its presumed perpetuation in individuals, furnishes more or less invariable characters in the distribution of that intricate tribe. But I am convinced that the distinction ends here, and that it ought not to be extended to those tribes in which, from the more imperfect organization of the animals, there is not the same connexion between their external and internal structure. Such is the case with the *Nautilidæ* and others of the testaceous *Annelides*, many of the individuals of which have been generically separated upon no other ground than a variation in the form of their shells, without any regard to the characters afforded by the inhabitant. As we descend in the scale of animated nature, instances

instances of this seeming disorganization are still more numerous, while our researches become necessarily more confined; and we are at last forced to confess how very imperfect our greatest diligence has been, and what a large extent of ground yet remains untrodden in the fields of natural history.

* *Incompletæ; umbilico perforato.*

1. Fragilis.

Animal flavo-fuscescens. *Tentacula superiora* breviora, clavata.

Testa clavata, subventricosa, striata, pellucida, nitida, fulva. *Anfractus* 6—7. *Apertura* compressa, subquadrata, interdùm uniplicata: *peristomio* simplici, posticè subreflexo.

Long. 0.25.—Diam. 0.085.

Turbo perversus. *Linn. Syst. Nat.* 1. *p.* 1240.
Pupa fragilis. *Drap. Hist. des Moll. p.* 68. *t.* 4. *f.* 4.
Balea fragilis. *Leach Mss.*

Among moss, under the bark of trees, &c., but not very common. The females have their shells much more ventricose and with fewer volutions.

** *Completæ; umbilico imperforato.*

2. Nigricans.

Animal nitidum, fuscum, supernè corrugatum. *Sustentaculum* tenuius, angustum.

Testa subventricosa, subopaca, subcrenato-striata, nigrescenti-fusca. *Anfractus* 10—12. *Apertura* subtriangularis plicis 2 columellaribus distantibus instructa: *peristomio* producto, albido, incrassato.

Long. 0.5.—Diam. 0.085.

Clausilia rugosa. *Drap. Hist. des Moll. p.* 73. *t.* 4. *f.* 19, 20. *Lam. Hist. des Anim. sans Vert.* 6. *p.* 115.

Helix perversa. *Müll. Verm.* 2. *p.* 118.

Turbo perversus. *Penn. Brit. Zool.* 4. *p.* 130. *t.* 82. *f.* 116. *Don. Brit. Shells,* 2. *t.* 72.

—— bidens. *Mont. Test. Brit. p.* 357. *t.* 11. *f.* 7.

—— nigricans. *Pult. Dorset. p.* 46. *ed.* 2. *p.* 51. *t.* 19. *f.* 10. *Maton & Rackett in Linn. Trans.* 8. *p.* 180.

α. ventricosior; apertura plicis 2 vix 3 mediis columellaribus.

β. minor; anfractibus paucioribus.

Turbo Everetti. *Miller in Ann. of Philos.* 1822. *p.* 377.

Common in the clefts of old walls, under stones, &c. Many curious distortions occur of the shell. In one a prominent medial ridge accompanies the order of the volutions.

3. PARVULA.

Animal ———

Testa gracilis, pellucida, glabriuscula, fulva. *Anfractus* 9, suturâ indistinctâ. *Apertura* uti in præcedente 2-plicata.

Long. 0.425.—Diam. 0.07.

Helix (Cochlodina) parvula. *Fér. Tab. des Moll. p.* 63.

Of this rare and elegant shell I found one specimen which had the remains of the animal in it, among the rejectamenta of the Avon river near Bristol. Férussac restricts the locality of the species to France and Switzerland. It is of a much more slender and tapering form than the last, with the suture less distinct, and is nearly smooth and exceedingly transparent.

4. PLICATULA.

4. Plicatula.

Animal ———

Testa ventricosa, tenuis, pellucida, fuscescens, striis 40—50 ad aperturam confertioribus exarata. *Apertura* dilatata, subquadrata, plicis 2 columellaribus distantibus, mediisque 2 vix 3 minoribus instructa: *peristomio* albo, tenuiore.

Long. 0.4.—Diam. 0.1 ferè.

Clausilia plicatula. *Drap. Hist. des Moll. p.* 72. *t.* 4. *f.* 17, 18.

——— Rolphii. *Leach Mss.*

For this shell I am obliged to Mr. Dillwyn, to whom it had been sent by Dr. Leach. Charlton wood, Kent, is mentioned by him as its locality.

5. Labiata.

Animal ———

Testa subventricosa, subopaca, fuscescenti-cornea, clathratim striata. *Anfractus* 10, suturâ indistinctâ. *Apertura* suborbiculata, dilatata, plicis 2 columellaribus instructa: *peristomio* albo, incrassato.

Long. 0.65.—Diam. 0.125.

Clausilia solida. *Drap. Hist. des Moll. p.* 69. *t.* 4. *f.* 8, 9.

Turbo labiatus. *Mont. Test. Brit. p.* 362. *t.* 11. *f.* 6. *Maton & Rackett in Linn. Trans.* 8. *p.* 180. *Dillw. Cat.* 2. *p.* 875.

I observed a specimen of this shell in the extensive collection of Mr. Lyons of Tenby, who said it came from Hyde Park, near the Serpentine river.

 6. Ventricosa.

6. VENTRICOSA.

Animal ———

Testa ventricosior, tenuis, subpellucida, nigro-fuscescens, striis argutis numerosis exarata. *Anfractus* 12, suturâ obliquiore. *Apertura* subquadrata, dilatata, plicis 2 columellaribus approximatis, mediisque 2 vix 3 minoribus instructa: *peristomio* tenui, ferè disjuncto.

Long. 0.65.—Diam. 0.125.

Clausilia ventricosa. *Drap. Hist. des Moll. p.* 7. *t.* 4. *f.* 14.

Helix perversa (adulta). *Müll. Verm.* 2. *p.* 118.

Turbo biplicatus. *Mont. Test. Brit. p.* 361. *t.* 11. *f.* 5. *Maton & Rackett in Linn. Trans.* 8. *p.* 179. *Dillw. Cat.* 2. *p.* 874.

Helix (Cochlodina) ventriculosa. *Fér. Tab. des Moll. p.* 63.

For this also I am indebted to Mr. Dillwyn, who received it from Colonel Montagu as British. It bears some resemblance to the *C. plicatula*, but is larger, of a thinner texture, and has the striæ much finer and more numerous. The teeth are also differently disposed.

The *C. ventricosa* of Draparnaud constitutes a variety of this species, distinguished by the more oval form of the aperture and more tumid volutions.

7. DERUGATA.

Animal pallidè fulvum. *Tentacula superiora* clavata, longiora.

Testa subarcuata, ventricosior, glabriuscula, nitida, pellucida, fulva. *Anfractus* 10—12. *Apertura* subrhomboidea, biplicata: *peristomio* albo, subincrassato, columellæ insidenti: *clausio* emarginato.

Long. 0.65.—Diam. 0.135.

Clausilia

Clausilia bidens. *Drap. Hist. des Moll. p.* 68. *t.* 4. *f.* 5—7.

Helix bidens. *Müll. Verm.* 2. *p.* 116.

Turbo laminatus. *Pult. Dorset. p.*46. *ed.*2. *p.* 51. *t.* 19. *f.* 9. *Mont. Test. Brit. p.* 359. *t.* 11. *f.* 4.

Helix (Cochlodina) derugata. *Fér. Tab. des Moll. p.* 63.

Not uncommon on the bark of trees in many of the midland and southern counties of England.

Genus VII. PUPA. *Drap.*

Animal corpore attenuato; anteriore parte capitis proboscidali.

Testa pyramidali-cylindracea; *anfractu ultimo* ferè majore: *apertura* dilatata, marginibus disjunctis, intùs lamellis continuis coarctata: *peristomio* extùs reflexo. *Umbilicus* subperforatus.

1. Secale.

Animal nigrescenti-fuscum, nitidum, supernè verrucosum. *Sustentaculum* angustum, crassum.

Testa cylindracea, in apicem attenuata, obliquè striata, pallidè fusca. *Anfractus* 8. *Apertura* subrhomboidea, plicis 7—8 albis, nempè 4 columellaribus et 3—4 labralibus instructa: *peristomio* albo.

Long. 0.3.—Diam. 0.115.

Pupa secale. *Drap. Hist. des Moll. p.* 64. *t.* 3. *f.* 49, 50. *Lam. Hist. des Anim. sans Vert.* 6. *p.* 110.

Turbo Juniperi. *Mont. Test. Brit. p.* 340. *t.* 12. *f.* 12. *Maton & Rackett in Linn. Trans.* 8. *p.* 182. *Dillw. Cat.* 2. *p.* 877.

Plentifully in the crevices of limestone-rocks in some parts of Somersetshire and Gloucestershire. When young the

the shell is clothed with an earthy covering like that of the *Bulimus obscurus*. This seems a provisional defence to the animal until the teeth of the aperture are completely formed, when it divests itself of its coat by rubbing the shell against extraneous substances; and it is one of the many and various contrivances of nature which we cannot sufficiently admire.

This is not the *Grain d'avoine* of Geoffroy, to which as well as the *Pupa avena* of Draparnaud, Férussac has referred it. The *Helix ventricosa* of Müller is without doubt this species in its young state.

2. RINGENS.

Animal ———

Testa ventricosa, nitida, glabra, fulva. *Anfractus* 5, suturâ lineari. *Apertura* elongato-lunata, plicis 5, inæqualibus, nempè 3 columellaribus et 2 labralibus instructa: *peristomio* fulvo, subincrassato. *Umbilicus* foramine cylindrico.

Long. 0.115.—Diam. 0.065.

Vertigo anglica. *Fér. Tab. des Moll. p.* 64.

From the neighbourhood of Scarborough by Mr. J. S. Miller.

3. UMBILICATA.

Animal nigro-griseum, politum. *Tentacula superiora* arcuata.

Testa cylindracea, glabra, nitida, fulvescenti-cornea. *Anfractus* 5—7. *Apertura* elongato-lunata, plicâ unicâ columellari et aliâ interdùm tenuiori in ipso columellæ labio instructa: *peristomio* subincrassato. *Umbilicus* angustatus, foramine cylindrico.

Long.

Long. 0.14.—Diam. 0.075.

Pupa umbilicata. *Drap. Hist. des Moll. p.*62. *t.*3. *f.* 39, 40. *Lam. Hist. des Anim. sans Vert.* 6. *p.* 111.

Turbo muscorum. *Mont. Test. Brit. p.* 335. *t.* 22. *f.* 3. *Maton & Rackett in Linn. Trans.* 8. *p.* 182.

α. major, fulva, ferè edentula.

Common everywhere among moss, in the clefts of old walls, &c.

The character of "apertura edentula" given by Linnæus to his *Turbo muscorum* will hardly suit this species. I rather think that celebrated naturalist has, with Geoffroy, Müller, and others, confounded it with the following, to which, indeed, at first sight it bears no slight resemblance.

Genus VIII. ALÆA.

Animal; tentaculis inferioribus punctiformibus.

Testa verè cylindrica. *Apertura* extùs plerumque marginata, et intùs denticulis sive lamellis incontinuis munita, marginibus subæqualibus: *peristomio* simplici.

I have separated this from the genus *Vertigo* as established by Férussac, for the reasons stated in my remarks on *Clausilia*. From *Pupa* it differs in the shell being always of a more cylindrical form, and in having the aperture generally thickened by an exterior rib, and never reflexed. The teeth too, when present, are never laminar or continued on the penultimate whorl. The animal agrees in most respects with that of *Vertigo*.

1. Marginata.

Animal nigro-griseum, nitidum. *Sustentaculum* crassulum. *Testa* subventricosa, nitida, glabriuscula, corneo-fuscescens.

Anfractus

Anfractus 5—7, suturâ profundâ. *Apertura* subrotundo-lunata, extùs costâ fulvâ, intùs denticulo unico in mediâ columellâ instructa. *Umbilicus* subapertus.

Long. 0.15.—Diam. 0.065.

Turbo muscorum. *Linn. Syst. Nat.* 1. *p.* 1240?

Helix muscorum. *Müll. Verm.* 2. *p.* 105?

Pupa marginata. *Drap. Hist. des Moll. p.* 61. *t.* 3. *f.* 36—38.

—— muscorum. *Lam. Hist. des Anim. sans Vert.* 6. *p.* 111.

Turbo chrysalis. *Turton's Conch. Dict.*

Not uncommon in marshy ground, under stones, at the roots of grass, &c. It varies exceedingly in size and the compactness of its spire.

2. Nitida.

Animal ———

Testa dolioliformis, ventricosa, substriata, corneo-fuscescens. *Anfractus* 4—5. *Apertura* subrotundo-lunata, edentula, extùs emarginata: *peristomio* posticè parùm reflexo. *Umbilicus* subapertus.

Long. 0.1 ferè—Diam. 0.05.

Pupa edentula. *Drap. Hist. des Moll. p.* 59. *t.* 3. *f.* 28, 29.

Vertigo nitida. *Fér. Tab. des Moll. p.* 64.

Turbo offtonensis. *Shepp. in Linn. Trans.* 14. *p.* 155?

At the roots of grass in a rather marshy piece of ground near Swansea, but rare. Mr. J. S. Miller tells me it is found plentifully around Bristol.

I am inclined to think this is the variety of the *Pupa umbilicata* noticed by Montagu, who says (with reference to that shell) that it is only half the size, and wants the tooth and marginated aperture.

3. Revoluta.

3. Revoluta.

Animal ———

Testa subventricosa, subattenuata, albida, glabra. *Anfractus* 5, sensim minores, suturâ levi. *Apertura* suborbicularis, extrinsecalis, edentula, nec marginata: *peristomio* posticè subreflexo. *Umbilicus* dilatatus, compressus, foramine cylindrico.

Long. 0.1.—Diam. 0.05.

Among the rejectamenta of a small stream at Marino near Swansea, where only one specimen has as yet occurred to me. The umbilicus is much more flattened and open than in the rest of the genus.

4. Cylindrica.

Animal ———

Testa attenuata, pellucida, striis argutis obliquis, pallidè fusca. *Anfractus* 5, suturâ profundâ. *Apertura* ovata, extùs parùm marginata, edentula. *Umbilicus* angustatus.

Long. 0.075.—Diam. 0.03.

Pupa muscorum (*a*). *Drap. Hist. des Moll. p.* 59.
Vertigo cylindrica. *Fér. Tab. des Moll. p.* 64.

Of this very beautiful little shell I found a single live specimen on the under side of a loose stone on Durdham Downs near Bristol; but I regret that I did not at the time examine the animal.

5. Vulgaris.

Animal nigro-griseum, nitidulum. *Tentacula* nudo oculo nequaquàm discernenda, armato punctiformia videntur.

Testa oviformis, subventricosa, glabra, nitida, rufescenti-brunnea. *Anfractus* 4—5. *Apertura* suborbiculato-lunata, marginibus disjunctis, extùs marginata, intùs 4 lamellis, nempè 1 columellari et 3 labralibus instructa: *peristomio* tenui, posticè subreflexo. *Umbilicus* angustatus.

Long. 0.075.—Diam. 0.04.

Turbo sexdentatus junior. *Mont. Test. Brit. p.* 337.

Pupa pygmæa. *Drap. Hist. des Moll. p.* 60. *t.* 3. *f.* 30, 31.

Vertigo pygmæa. *Fér. Tab. des Moll. p.* 64.

——— vulgaris. *Leach Mss.*

Not uncommon under stones, &c. in sheltered parts of the limestone rocks in the neighbourhood of Swansea and Bristol; and occasionally found with the following.

6. PALUSTRIS.

Animal nigro-griseum, nitidum. *Tentacula superiora* brevia, ad basin inflata; *inferiora* sub lente punctiformia. *Anterior pars* capitis proboscidiformis.

Testa dolioliformis, ventricosa, nitida, glabra, fusco-cornea. *Anfractus* 5. *Apertura* suborbiculato-lunata, marginibus disjunctis, extùs marginata, sinuata, intùs 6—9 lamellis, nempè 2—3 columellaribus et 4—6 labralibus coarctata: *peristomio* simplici. *Umbilicus* angustatus.

Long. 0.085.—Diam. 0.05.

Turbo sexdentatus. *Mont. Test. Brit. p.* 337. *t.* 12. *f.* 8. *Maton & Rackett in Linn. Trans.* 8. *p.* 183. *Pult. Dorset. ed.* 2. *p.* 52. *t.* 19. *f.* 12.

Pupa Antivertigo. *Drap. Hist. des Moll. p.* 60. *t.* 3. *f.* 32, 33.

Vertigo palustris. *Leach Mss.*

On

On the waterflag in marshy ground at Marino near Swansea, and among the rejectamenta of the Avon river near Bristol.

The *Helix minuta* of Müller, referred by Montagu with doubt to the present species, is probably the *Cyclostoma vitreum* of Draparnaud (a variety of the *Paludina acuta*), and is a freshwater shell.

Genus IX. VERTIGO. *Müll.*

Animal corpore attenuato. *Tentacula inferiora* punctiformia, valdè indistincta.

Testa cylindraceo-fusiformis, spirâ brevi, sinistrorsâ. *Apertura* extùs marginata, sinuata, intùs denticulis coarctata: *peristomio* subreflexo.

1. Pusilla.

Animal griseum, subtùs pallidius. *Sustentaculum* angustum.

Testa ventricosior, attenuata, glabra, nitidula, fragilissima, pallidè fusca. *Anfractus* 5. *Apertura* subquadrata, subtùs rotundata, lamellis 6—7 albis, nempè 2 vix 3 columellaribus et 4 labralibus munita: *peristomio* tenui. *Umbilicus* subangustatus.

Long. 0.085.—Diam. 0.045.

Vertigo pusilla. *Müll. Verm.* 2. *p.* 124.

Pupa Vertigo. *Drap. Hist. des Moll. p.*61. *t.*3.*f.*34,35.

Alive under moss in a coppice at Newton near Swansea, and among the rejectamenta of the Avon river near Bristol.

2. Angustior.

Animal ———

Testa ventricosior, subdolioliformis, pallidè fulva, argutè et

 lentissimè

lentissimè striata. *Anfractus* 4—5, penultimâ vix latiori. *Apertura* subtriangularis, dentibus 4—5, nempè 2 columellaribus et 2—3 labralibus insignita: *peristomio* subincrassato. *Umbilicus* angustatus.

Long. 0.06.—Diam. 0.035.

Turbo Vertigo. *Mont. Test. Brit. p.* 363. *t.* 12. *f.* 6.

Among the rejectamenta of a small stream at Marino near Swansea, but very sparingly.

Besides the very different contour and more contracted aperture of this shell, the circumstance of the teeth being more sunk in some specimens than in others (which peculiarly denotes the growth of dentate shells), sufficiently refutes the idea of its being the young of the *V. pusilla.*

Familia II. CARYCHIADÆ. *Leach.*

Divisio I. *Operculo testaceo.*
10. Cyclostoma.

Divisio II. *Operculo nullo.*
11. Carychium.
12. Auricula.

Genus X. CYCLOSTOMA. *Drap.*

Animal anteriore parte capitis proboscidali. *Tentacula* brevia, inflata. *Oculi* subpedunculati.

Testa turrita: *anfractibus* cylindricis. *Apertura* suborbiculata: *peristomio* incrassato, subreflexo, continuo. *Operculum* nucleatum.

1. ELEGANS.

Animal fusco-griseum: *proboscide* elongato, contractili.

Testa ovato-conica, acuminata, solidior, flavescenti-cinerea, sæpè

sæpè duplici serie macularum insignita, spiraliter cancellato-striata. *Anfractus* 5, ventricosi. *Apertura* orbiculata. *Umbilicus* foramine obliquo. *Operculum* solidum.

Long, 0.6.—Diam. 0.4.

Turbo reflexus. *Linn. Syst. Nat.* 1. *p.* 1238?
Nerita elegans. *Müll. Verm.* 2. *p.* 177.
Turbo elegans. *Mont. Test. Brit.* 342. *t.* 22. *f.* 7. *Maton & Rackett in Linn. Trans.* 8. *p.* 167. *Dillw. Cat.* 2. *p.* 863.
Cyclostoma elegans. *Drap. Hist. des Moll. p.* 32. *t.* 1. *f.* 5—8. *Lam. Hist. des Anim. sans Vert.* 6. *p.* 148.

Not uncommon at the roots of fern and in the clefts of limestone rocks near Swansea.

2. Truncatum.

Animal pallidum: *proboscide* elongato. *Tentacula* brevia, parùm acuminata. *Sustentaculum* breve. *Operculum* fragile, arcuatè striatum. (*Drap.*)
Testa elongato-cylindrica, glabra, fragilis, pallidè lutescens. *Anfractus* 4, suturâ distinctâ, subcrenatâ. *Apertura* ovata. *Umbilicus* vix ullus.

Long. 0.165.—Diam. 0.065.

Turbo truncatus. *Mont. Test. Brit. p.* 300. *t.* 10. *f.* 7.
Cyclostoma truncatulum, β. et γ. *Drap. Hist. des Moll. p.* 40. *t.* 1. *f.* 30, 31.

Of this I found a few specimens mixed with the *Cionella Acicula* and other land-shells in some fine sand from Weymouth-bay, into which they were probably carried down by some freshwater stream. Mr. J. S. Miller showed me several

several in his cabinet, which he said were from marshes in Hampshire.

The *Helix subcylindrica* of Montagu, which he informs us was sent him by Dr. Pulteney as found " on water-plants in rivers and ponds in Dorsetshire," is marine, and a different species, though classed with the present by Draparnaud.

Genus XI. CARYCHIUM. *Müll.*

Animal corpore angustato. *Tentacula* brevia, cylindrica.
Testa turrita, elongato-clavata seu fusiformis, spirâ acuminatâ. *Apertura* plerumque marginata, intùs subcontinuis lamellis instructa.

* *Edentula ; peristomio simplici.*

1. FUSCUM.

Animal tentaculis subulatis, ad basin approximatis. In loco tentaculorum inferiorum 2 maculæ nigræ inæquales discernendæ. (*Fér.*)

Testa clavata, obtusè acuminata, rufescenti-brunnea, nitida, lineolis transversis raris impressa. *Anfractus* 6. *Apertura* ovata : *peristomio* tenui, posticè subreflexo. *Umbilicus* patens.

Long. 0.125.—Diam. 0.05.

Turbo fuscus. *Walker Test. Min. Rar. f.* 42. *Mont. Test. Brit. p.* 330?

Auricula lineata. *Drap. Hist. des Moll. p.* 57. *t.* 3. *f.* 20, 21.

Carychium lineatum. *Fér. Tab. des Moll. p.* 100.

Monstrum spirâ sinistrorsâ.

Of this hitherto obscure shell (if it be indeed the *Turbo fuscus* referred by Montagu to Walker's plate, which was published

published in 1784,) several specimens have occurred to me, and one of the reversed distortion, among the rejectamenta of the Avon river near Bristol. It is, as Férussac, who has given a detailed description of the animal, very justly observes, quite an anomaly in the genus.

** *Aperturâ marginatâ, dentibus seu lamellis subcontinuis instructâ: peristomio incrassato.*

2. MINIMUM.

Animal albido-flavescens, pellucidum. *Sustentaculum* tenue, dilatatum.

Testa ovato-subclavata, acuminata, nitida, pellucida, albida, (sub lente) argutè et transversim striata. *Anfractus* 5, subtruncati. *Apertura* ovalis, lamellis 3, scilicet 1 columellari et 2 labralibus munita: *peristomio* subreflexo. *Umbilicus* vix ullus.

Long. 0.07.—Diam. 0.045.

Carychium minimum. *Müll. Verm.* 2. *p.* 125.

Turbo carychium. *Mont. Test. Brit. p.* 339. *t.* 22. *f.* 2. *Maton & Rackett in Linn. Trans.* 8. *p.* 184. *Dillw. Cat.* 2. *p.* 880.

Auricula minima. *Drap. Hist. des Moll. p.* 57. *t.* 3. *f.* 18, 19.

Common at the roots of grass, &c. in moist places.

3. POLITUM.

Animal ———

Testa clavata, subfusiformis, glabra, nitida, dilutè fusca. *Anfractus* 7, suturâ vix conspicuâ marginati. *Apertura* subcordata, sinuata, lamellis 5, nempè 2 inæqualibus

libus in columella, 2 in columellari labio, et 2 in labio externo: *peristomio* subincrassato. *Umbilicus* nullus.

Long. 0.25.—Diam. 0.1 ferè.

Turbo tridens. *Mont. Test. Brit. p.* 338. *t.* 11. *f.* 2. *Maton & Rackett in Linn. Trans.* 8. *p.* 181. *Pult. Dorset. ed.* 2. *p.* 51. *t.* 21. *f.* 15.

Helix (Cochlodonta) Goodalli. *Fér. Tab. des Moll. p.* 71.

Though confined to certain localities, this shell has been lately found in considerable plenty in different parts of Great Britain. For my specimens I am indebted to the kindness of Mrs. Smith, who collected several of them alive about eight or ten years ago on some loose fragments of rock in Brockley Coombe near Bristol. The physiology of the animal yet remains in considerable doubt; and it is much to be wished that some naturalist, who has an opportunity of doing so, would attend to the habits and peculiarities of this interesting species.

The *Helix tridens* of Müller is more closely allied to this species than has been supposed; and from its great resemblance in the form of the shell will probably rank under the same genus.

Genus XII. AURICULA. *Drap.*

Animal anteriore parte capitis proboscidali. *Tentacula* subulata.

Testa turrita, fusiformis, spirâ acuminatâ, incompletâ. *Anfractus* sese invicem involventes, ultimo plusquàm maximo. *Apertura* elongata, dimidium testæ æquiparans, ad basin subeffusa, lamellis continuis instructa. *Umbilicus* nullus.

The inhabitants of this genus, though from the nature of their

their organs of respiration they must rank with the terrestrial *Mollusca*, are strictly amphibious, living in the clefts of rocks and the under surfaces of stones which are exposed only by the recess of the tide. Their food (at least that of the *A. denticulata*, the only one of which I have observed the animal,) consists of decaying animal and vegetable substances. It is curious to observe the strange confusion that has taken place among later authors as to the real habitat of this class. Montagu and Draparnaud respectively assigned to their *Voluta denticulata* and *Auricula myosotis* a place among the marine and terrestrial *Mollusca*: the one from having observed the shells with their animals on *Algæ* at high-water mark on the Plymouth coast; and the other on dead and decaying wood on the shores of the Mediterranean. Baron Férussac indeed was perfectly aware of their peculiar organization, but errs in saying that they have the power of going out of the water. The last-mentioned author has arranged them under his *Gehydrophiles*, a very interesting sub-order of the pulmoniferous *Mollusca*, but a much too extensive one, since it embraces the *Voluta tornatilis*, *Turbo unidentatus*, *plicatus*, *&c.* of Montagu; all which, from opportunities I have had of examining their animals, I am perfectly assured do not agree with the present division, having a very different respiratory system and a truly marine habitat.

The want of the internal spiral septa of the shells first noticed by Montagu is very curious.

1. DENTICULATA.

Animal griseo-purpurascens. *Tentacula* brevia, annulata. *Proboscis* elongatus.

Testa oblonga, subventricosa, fragilis, glabra, purpureo-fuscescens.

fuscescens. *Anfractus* 6—8. *Apertura* oblonga, intùs subincrassata, plicis 3—5 columellaribus instructa: *peristomio* subreflexo.

Long. 0.3.—Diam. 0.125.

Voluta denticulata. *Mont. Test. Brit. p.* 234. *t.* 20. *f.* 5.

α. ventricosior, plicis columellaribus 2 vix 3.

Turbo bidentata. *Walker Test. Min. Rar. f.* 50 & 53.

Auricula myosotis. *Drap. Hist. des Moll. p.* 56. *t.* 3. *f.* 16, 17.

β. labio interno denticulato.

Voluta ringens. *Turton's Conch. Dict.*

γ. major; spirâ productiore, aperturæ labio denticulato.

Voluta reflexa. *Turton's Conch. Dict.*

Among the rejectamenta of rivers, &c., near their communication with the sea. The variety γ. is found, unmixed with the common sort, in the clefts of rocks on the Swansea coast near high-water mark, within the influx of the tide. This variety is less ventricose, and has the peristome not so much reflected on the columella. I was at first inclined to consider it a distinct species; but the intermediate gradations are almost imperceptible, and I have been assured it is found, together with the other varieties, in the crevices of the harbour walls at Weymouth.

I suspect that the *Voluta hyalina* of Montagu is only an imperfect specimen of this last variety.

2. Bidentata.

Animal albidum. *Tentacula* perbrevissima, nigro-marginata. (*Mont.*)

Testa ovata, ventricosa, solida, alba, glabra, nitida, spirâ brevi. *Anfractus* 5, suturâ valdè indistinctâ. *Apertura*

tura oblonga, plicis 2 columellaribus conspicuis: *peristomio* subincrassato, posticè subreflexo.

Long. 0.15.—Diam. 0.085.

Voluta bidentata. *Mont. Test. Brit. Suppl. p.* 100. *t.* 30. *f.* 2.

Auricula bidentata. *Fér. Tab. des Moll. p.* 103.

From the coasts of Devon; but I have never found it alive. It differs from the following in colour and thickness, in the teeth or folds being more conspicuous, and not sunk in the interior of the aperture, and especially in the tumidity of the last volution.

3. Erosa.

Animal ———

Testa ovato-oblonga, solidior, albida, spirâ rugosâ, sæpè decorticatâ. *Anfractus* 4—5. *Apertura* oblonga, intùs juxta peristomium subincrassata, plicis 2 columellaribus parùm obtectis munita: *peristomio* tenui, posticè subreflexo.

Long. 0.165.—Diam. 0.075.

Not uncommon on the Plymouth coast on the under surfaces of stones left bare by the tide. In Mr. Dillwyn's cabinet I observed a specimen which had been sent him by the late Colonel Montagu under the name of *Voluta bidentata*. In this the spire is more regularly produced; and it has that eroded appearance which is characteristic of the species.

4. Alba.

Animal ———

Testa fusiformis, acuminata, tenuis, pellucida, alba, transversim substriata. *Anfractus* 6. *Apertura* oblonga, angustior, plicis 2 columellaribus munita: *peristomio* simplici.

Long. 0.175.—Diam. 0.065.

Voluta alba. *Mont. Test. Brit. p.* 235? (not of the *Suppl.*) *Turton's Conch. Dict.*

Not uncommon among the rejectamenta of streams, near their communication with the sea.

The *Voluta triplicata* of British authors (if a true *Auricula*) has as yet only been found in Guernsey; and is therefore not admissible into the present catalogue.

Familia III. LIMNÆADÆ. *Leach.*

Tentaculis compressis, triangularibus.

Divisio I. *Testa cochleæformis.*

§ Testâ turritâ.

13. Limneus.

14. Physa.

Tentaculis compressis, subulatis.

§§ Testâ discoideâ.

15. Planorbis.

Divisio II. *Testa patellæformis.*

16. Ancylus.

Genus XIII. LIMNEUS. *Drap.*

Animal tentaculis brevibus. *Sustentaculum* latum, anticè bifidum. *Testa* ovato-oblonga, seu elongata, interdùm subconica. *Apertura* ovato-oblonga, ad basin effusa: *peristomio* simplici, posticè subreflexo: *columellâ* revolutâ.

All the inhabitants of this genus may be truly termed amphibious,

amphibious, since the nature of their food frequently obliges them to seek it on wet and marshy ground. During the spring they are greatly infested by a minute slender species of *Gordius*, which in number from two to ten attach themselves to the interior of the mantle near its connection with the neck of the animal. Draparnaud called them filamentary organs, and supposed that they performed the office of tentacula, probably from seeing them always in motion and appearing to issue from the back of the head. This troublesome parasite does not seem to be stationary, since I have not unfrequently observed it to change its place and take up perhaps more commodious quarters in another shell. It probably constitutes part of the food of the smaller *Dytiscidæ*. After I had put two sorts (the *D. trifidus*, and *D. crassicornis*, M.) into the glass vessel where the *Limnei* were kept, I could not detect any signs of the *Gordii*; though in other cases I have known them to survive even after their guardians had begun to putrefy.

The food of the *Limnei* is animal and vegetable matter in different states of putridity; which makes them deserve the perhaps not inapt epithet of "Scavengers of the waters." In the absence of other nourishment they will even devour each other, piercing the shell near its apex, and eating away the upper folds of its inhabitant. This accounts for the mutilated and often imperfectly repaired state of the upper volutions of some specimens.

* *Umbilico nullo, peristomio non reflexo.*

1. Glutinosus.

Animal lubricum, viscidum, album, punctis sparsum cinereis: *pallio* gelatinoso spiram obtegente. (*Müll.*)

Testa subglobosa, ventricosa, nitida, diaphana, fragilissima,

sima, lutescenti-cornea. *Anfractus* 2 vix 3; spirâ depressâ, vix exsertâ. *Apertura* amplissima: *peristomio* tenui.

Long. 0.3.—Diam. 0.2.

Limneus glutinosus. *Drap. Hist. des Moll. p.* 50.
Buccinum glutinosum. *Müll. Verm.* 2. *p.* 129.
Helix glutinosa. *Mont. Test. Brit. p.* 379. *t.* 16. *f.* 5.

Sent me by Mr. J. S. Miller, by whom it was found in tolerable abundance in ditches near Oxford. It is the only species not figured by Draparnaud in his *Histoire des Mollusques Terrestres et Fluviatiles de la France.*

** *Umbilico transverso, foramine in junioribus obtecto, peristomio reflexo.*

2. Auricularius.

Animal subflavum, punctis aureolis minutis sparsum.
Testa subrotundo-ovata, valdè ventricosa, glabra, pellucida, pallidè fulva, spirâ parùm exsertâ, acuminatâ. *Anfractus* 4. *Apertura* ovalis, perampla.

Long. 1.25.—Diam. 0.85.

Limneus auricularius. *Drap. Hist. des Moll. p.* 49. *t.* 2. *f.* 28, 29.
Helix auricularia. *Linn. Syst. Nat.* 1. *p.* 1250.

α. paulò minor; spirâ exsertiore striis argutis transversis exaratâ.

Buccinium Auricula, var. *Müll. Verm.* 2. *p.* 128.
Helix limosa. *Mont. Test. Brit. p.* 381. *t.* 16. *f.* 1?

Ditches and lakes in most of the midland counties in England.

Tab. 2. *f.* 23. of Lister's *Historia Animalium Angliæ,* which has

has been generally referred to this species, is rather a good representation of the *L. pereger*. Indeed the *L. auricularius* has not been figured in either of that author's works; and the only distinction made in the *Historia Animalium Angliæ* between the two species is by designating the former "*maximæ*."

3. Acutus.

Animal virescenti-fuscum, punctis nigris et flavis minutè sparsum.

Testa elongato-ovata, ventricosa, glabra, subpellucida, fulvescens, spirâ obliquâ, acuminatâ. *Anfractus* 4. *Apertura* ovata.

Long. 0.65.—Diam. 0.375.

α. pellucidior, striis remotis transversis.

Plentifully in a large pool on Crymlyn Burrows, unmixed with any of the other *Limnei* except *L. truncatulus*. Young shells are of a more elongated form than those of either the *L. auricularius* or *L. pereger*. It appears to be intermediate between the two last-named species; and I hesitated at first, knowing the great variation to which this genus is subject, to separate it from the *L. auricularius*, to which it is closely allied through its variety: but, independently of the more oblique and less ampullaceous form, and of its being invariably of a thicker consistency than that shell, the circumstance of the two species never being found together, though equally common in their respective localities, confirms me in my opinion. Besides, if they are not distinct, I am convinced that no real difference will be found to exist between any of the three species.

It is admirably described and figured (Plate VII. fig. 12.) in in Schröter's *Flusskonchylien*. A specimen in Mr. Dillwyn's cabinet, and which, if I mistake not, he said was also from the locality above mentioned, is named in Col. Montagu's handwriting as both *Helix auricularia* and *H. lutea*.

4. PEREGER.

Animal colore varians, plerumque flavo-maculatum. *Tentacula* flexilia. *Testa* ovato-oblonga, subventricosa, glabra, lutescens, sæpè limo fœdata, spirâ acutâ. *Anfractus* 4—5. *Apertura* ovata.

Long. 0.65.—Diam. 0.325.

Limneus pereger. *Drap. Hist. des Moll. p.* 50. *t.* 2. *f.* 34—37.
Buccinum peregrum. *Müll. Verm.* 2. *p.* 130.
Helix putris. *Penn. Brit. Zool.* 4. *p.* 139. *t.* 86. *f.* 137.
—— peregra. *Gmel. Syst. Nat.* 1. *p.* 3659. *Mont. Test. Brit. p.* 373. *t.* 16. *f.* 3.

α. major, subovata; spirâ brevi, acutâ.
Limneus ovatus. *Drap. Hist. des Moll. p.* 50. *t.* 2. *f.* 30, 31.

β. ovata; peristomio reflexo, subincrassato.

γ. ovalis, ampullacea; spirâ vix exsertâ.
Helix lutea. *Mont. Test. Brit. p.* 380. *t.* 16. *f.* 6.

δ. minor, oblongiuscula; spirâ acutâ, suturâ obliquâ.

Common every where in ditches, ponds, &c. It is exceedingly variable in size; some of the variety α. from Ireland exceeding an inch and a quarter, while few specimens of the variety δ. attain a quarter of an inch in length. Young shells of the varieties β. and γ. are remarkably ampullaceous.

I have no hesitation in referring the *Helix lutea* of Montagu

tagu to a variety of this species, having found it both in a living state, and thrown up together with other varieties on the sea shore near Swansea within the influx of the Briton-ferry river; but it would be curious to ascertain by what chemical process they receive their additional thickness.

5. Major.

Animal lutescenti-fulvum, subtùs pallidius. *Tentacula* subconica.

Testa ovato-subulata, acuminata, glabra (sub lente seriatim arguto-striata), fragilis, albescenti-fusca. *Anfractus* 6, subangulati. *Apertura* ovata.

Long. 1.65.—Diam. 0.85.

Limneus stagnalis. *Drap. Hist. des Moll. p.* 51. *t.* 2. *f.* 38, 39.

Lymnæa stagnalis. *Lam. Hist. des Anim. sans Vert.* 6. *p.* 159.

Helix stagnalis. *Linn. Syst. Nat.* 1. *p.* 1249.

α. pellucidior, minùs gibbosa.

β. albida, teretior; suturâ obliquiore.

Helix fragilis. *Mont. Test. Brit. p.* 369. *t.* 16. *f.* 7.

Bulimus fragilis. *Lam. l. c.* 6. *p.* 123?

Not uncommon in lakes, ponds, &c. Specimens of the variety *β*, which I have received from Oxfordshire, in all respects agree with a small specimen in the cabinet of Mr. Dillwyn, marked by Colonel Montagu with a reference to his *Helix fragilis;* and also with specimens in Mr. J. S. Miller's collection, sent by Dr. Leach under the specific name of *elegans*. The fig. 6. Plate VII. of Schröter's *Flussconchylien*, referred by Gmelin to the Linnæan *fragilis*, seems to agree well with this variety; but his fig. 8. Plate

Plate VII. (referred by Montagu to the same shell) is only a very distinct variety of the *L. pereger*, specimens of which I have seen from France. This last is I believe the *Lymnæa intermedia* of Lamarck.

6. Communis.

Animal lutescenti-fuscum. *Tentacula* subconica, acuminata.
Testa oblonga, acuminata, glabra, interdùm spiraliter rugosa, et sub lente striis transversis seriatim dispositis ornata, fusco-cornea. *Anfractus* 6—7. *Apertura* ovata: *labro* intùs sæpè violaceo, subincrassato.

Long. 0.875.—Diam. 0.325.

Limneus palustris. *Drap. Hist. des Moll. p.* 52. *t.* 2. *f.* 40, 41. & *t.* 3. *f.* 1, 2.
Helix limosa. *Linn. Syst. Nat.* 1. *p.* 1249?
—— palustris. *Gmel. Syst. Nat.* 1. *p.* 3658.
Buccinum palustre. *Müll. Verm.* 2. *p.* 131.
Stagnicola communis. *Leach MSS.*

Very common in ditches and slowly-running streams.

7. Elongatus.

Animal nigrum. *Tentacula* albida. (*Müll.*)
Testa oblongo-cylindracea, acuminata, fragilis, pellucida, glabra (sub lente pulchrè seriatim striatula), albido-lutescens. *Anfractus* 7—8, teretes. *Apertura* elongato-ovata: *peristomio* vix posticè reflexo.

Long. 0.525.—Diam. 0.175.

Limneus elongatus. *Drap. Hist. des Moll. p.* 53. *t.* 3. *f.* 3, 4.
Lymnæa leucostoma. *Lam. Hist. des Anim. sans Vert.* 6. *p.* 162.

Helix

Helix octona. *Linn. Syst. Nat.* 4. *p.* 1248. *Penn. Brit. Zool.* 4. *p.* 138. *t.* 86. *f.* 135.

—— octanfracta. *Mont. Test. Brit. p.* 396 & 588. *t.* 11. *f.* 8.

—— peregrina. *Dillw. Cat.* 2. *p.* 954.

α. subovata; anfractus 6, quorum infimus dimidium testæ subæquans.

Buccinum glabrum. *Müll. Verm.* 2. *p.* 135.

In many parts of the North of England; though a local shell. The variety is from Yorkshire. The outer lip of the aperture is often thickened exteriorly by a white rib.

8. Truncatulus.

Animal cinerascens. *Tentacula* brevia, acuminata.

Testa ovato-oblonga, acuminata, fragilis, substriata, flavescenti-cinerea. *Anfractus* 6, ventricosiores, supernè angulati, suturâ excavatâ. *Apertura* ovato-oblonga.

Long. 0.425.—Diam. 0.2.

Limneus minutus. *Drap. Hist. des Moll. p.* 53. *t.* 3. *f.* 5—7.

Buccinum truncatulum. *Müll. Verm.* 2. *p.* 130.

Helix Fossaria. *Mont. Test. Brit. p.* 372. *t.* 16. *f.* 9. *Maton & Rackett in Linn. Trans.* 8. *p.* 217. *t.* 5. *f.* 9. *Dillw. Cat.* 2. *p.* 964.

Bulimus peregrus. *Brug. Encycl. Meth. n.* 10.

α. minor, cornea, ventricosior.

β. magis cylindrica, fulva; suturâ obliquiore.

Nerita minuta. *Müll. Verm.* 2. *p.* 174?

Common nearly every where in ditches; often found in marshes occasionally overflowed by the sea.

The variety *β.* is remarkable for its more cylindrical form,

 obtuse

obtuse apex, and the deep umbilical perforation which is not interrupted by the reflexure of the peristome.

9. Tinctus.

Animal nigrescenti-fuscum. *Sustentaculum* amplum.

Testa ovata, subconica, ventricosa, fragilis, pellucida, glabra (sub lente ut in *L. elongato* seriatim striatula), violaceo-cornea, spirâ brevi, obtusâ. *Anfractus* 4—5. *Apertura* ovata: *peristomio* vix posticè reflexo.

Long. 0.225.—Diam. 0.15.

In a marshy piece of ground at Marino near Swansea. It seems to be an intermediate species between the *L. truncatulus* and the following.

10. Grayanus.

Animal ———

Testa ferè conica, subventricosa, acuminata, nitida, pellucida, substriata, violascenti-cornea. *Anfractus* 6. *Apertura* subovata: *peristomio* simplici, posticè albo, reflexiusculo.

Long. 0.125.—Diam. 0.08.

Sent me by Mr. J. S. Miller under the name of *Assiminea Grayana*, first given to it by Dr. Leach. From the Greenwich marshes.

11. Detritus.

Animal ———

Testa ovata, subconica, subventricosa, solidula, alba, sub lente spiraliter striatula. *Anfractus* 6, suturâ vix distinctâ. *Apertura* oblongiuscula, labro intùs subincrassato : *peristomio* tenui, subreflexo.

Long.

Long. 0.6.—Diam. 0.4.

Helix detrita. *Müll. Verm.* 2. *p.* 101. *Pult. Dorset. p.* 49. *2d edit. p.* 56. *t.* 19. *f.* 26. *Mont. Test. Brit. p.* 384. *t.* 11. *f.* 1.

—— substriata. *Gmel. Syst. Nat.* 1. *p.* 3667. *Dillw. Cat.* 2. *p.* 958.

Given me by Mr. Dillwyn, who thinks he procured them from the neighbourhood of Bantry, Ireland. I place it last, as a doubt may reasonably be entertained of its belonging to this genus; or indeed to the *Limnæadæ* at all. Mr. Bryer is said to have found it in several streams in Dorsetshire; and Dr. Turton says that he has himself seen it alive in Freshwater, Dublin. It is not the *Bulimus radiatus* of Bruguiere and Draparnaud.

Genus XIV. PHYSA. *Drap.*

Animal tentaculis filiformibus. *Sustentaculum* perbreve, latum, anticè integrum.

Testa sinistrorsa, oblonga, ampullacea. *Apertura* oblonga, ad basin effusa: *peristomio* simplici: *columellâ* revolutâ.

1. Fontinalis.

Animal nigro-griseum. *Tentacula* albida. *Pallium* amplum, in lacinias divisum.

Testa ovato-oblonga, ventricosa, fragilis, diaphana, cornea; spirâ brevi, obtusâ, excentricâ. *Anfractus* 4. *Apertura* ovato-oblonga.

Long. 0.3.—Diam. 0.2.

Physa fontinalis. *Drap. Hist. des Moll. p.* 54. *t.* 3. *f.* 8, 9.

Bulla fontinalis. *Linn. Syst. Nat.* 1. *p.* 1185.

Planorbis Bulla. *Müll. Verm.* 2. *p.* 167.

α. major,

α. major, ventricosior, albida.

β. ovalis, fulva; spirâ prominulâ.

Bulla rivalis. *Maton & Rackett in Linn. Trans.* 8. *p.* 126. *t.* 4. *f.* 2.

γ. oblongiuscula, fragilissima, resiliens; аperturâ oblongâ, angustiore.

Planorbis gelatinus. *Müll. Verm.* 2. *p.* 170?

δ. minor, globosa.

Bulla fluviatilis. *Turton's Conch. Dict.*

On aquatic plants in slowly-running streams.

The variety β., which has I suspect been mistaken by the learned authors of the Catalogue of British Testacea for a distinct species, is of a paler colour, less fragile texture, and has the spire, which consists of from five to six volutions, more produced. Such I have received from Oxfordshire, of a larger size. In the *Physa acuta* of Draparnaud, specimens of which I have from one of the North American lakes, the spire is nearly exactly central; and, though not more produced, tapers to an exceedingly fine point. The aperture is also narrower and more elongated. The variety α. was favoured me by Mr. Dillwyn, who in company with Dr. Leach found it in a small stream on Monavallach mountain near Kilmacthomas, Waterford.

The animal is phytophagous, feeding principally on water-cresses and other aquatics. The spawn is cast in the beginning of April and following months, and at first appears a globular and confused mass, of a clear white colour; but in process of time and before the young are excluded, its form alters to oblong, and the embryos are very distinctly seen, in number from three to ten, inclosed in its gelatinous and now transparent covering. In about a month or five weeks,

weeks, the young, with their testaceous coats completely formed, and about the size of a pin's head, burst their envelope, and immediately enter upon their new functions, swimming and walking with great activity.

2. Hypnorum.

Animal nigrescens. *Tentacula* supernè albida. *Sustentaculum* latum.

Testa elongato-fusiformis, subventricosa, acuminata, fragilis, diaphana, polita, fulvo-cornea. *Anfractus* 7, valdè turriti. *Apertura* oblonga.

Long. 0.5.—Diam. 0.2.

Physa hypnorum. *Drap. Hist. des Moll. p.* 55. *t.* 3. *f.* 12, 13.
Bulla hypnorum. *Linn. Syst. Nat.* 1. *p.* 1185.
Planorbis turritus. *Müll. Verm.* 2. *p.* 169.

In slowly-running streams in many parts of Great Britain. Some specimens before me, from the garden ponds of Fremington-house, Devonshire, are of unusual size, measuring full three quarters of an inch in length. I have only found them in the hottest days of the summer and autumn months on the surface of the water, where they lie floating with their shells downwards.

Genus XV. PLANORBIS. *Müll.*

Animal tentaculis filiformibus, acuminatis. *Sustentaculum* anticè integrum, rotundatum.

Testa depressa: *anfractibus* cylindraceis: *spirâ* vix unquàm exsertâ: *aperturâ* subrhomboideâ, marginibus inæqualibus: *peristomio* simplici.

* *Anfractibus*

* *Anfractibus plurimis, connexis.*

1. VORTEX.

Animal violaceo-fuscum. *Tentacula* albida.

Testa suprà subconcava, glabra, tenuis, pellucida, fuscescenti-cornea, subtùs plana, carinâ marginali. *Anfractus* 6—8, sensim decrescentes. *Apertura* compresso-rhomboidea.

Long. 0.065.—Diam. 0.4.

Planorbis Vortex. *Müll. Verm.* 2. *p.* 158. *Drap. Hist. des Moll. p.* 44. *t.* 2. *f.* 4, 5.

Helix Vortex. *Linn. Syst. Nat.* 1. *p.* 1243.

α. anfractu ultimo in carinam supernè obliquato.

β. minor, carinâ obsoletâ.

Planorbis Vortex, *β.* *Drap. Hist. des Moll. p.* 45. *t.* 2. *f.* 6, 7.

——— spirorbis. *Müll. Verm.* 2. *p.* 161. *Lam. Hist. des Anim. sans Vert.* 6. *p.* 153.

Helix spirorbis. *Gmel. Syst. Nat.* 1. *p.* 3624. *Mont. Test. Brit. p.* 455. *t.* 25. *f.* 2.

Common in ditches, &c. The presence of a keel, and the consequent flatness of the under side, are not constant characters.

2. CONTORTUS.

Animal fuscum. *Tentacula* brevia, pallida.

Testa suprà subconcava, subtùs concava, perforata, glabra, tenuis, pellucida, fulvescenti-cornea. *Anfractus* 8, extùs rotundati, suturâ excavatâ. *Apertura* valdè compressa.

Long. 0.075.—Diam. 0.25.

Planorbis

Planorbis contortus. *Müll. Verm.* 2. *p.* 162. *Drap. Hist. des Moll. p.* 42. *t.* 1. *f.* 39—41.
Helix contorta. *Linn. Syst. Nat.* 1. *p.* 1244.

In ditches, &c.; but more local than the last.

** *Anfractibus paucis.*

3. Corneus.

Animal nigrum. *Tentacula* longa, curvata, sordidè cinerea. (*Müll.*)

Testa suprà concava, perforata, subtùs plana, subumbilicata, tenuis, substriata, castaneo-fusca seu cornea. *Anfractus* 6, extùs rotundati. *Apertura* subdilatata: *peristomio* reflexiusculo.

Long. 0.45.—Diam. 1.25 ferè.

Planorbis corneus. *Drap. Hist. des Moll. p.* 43. *t.* 1. *f.* 42—44.
——— Purpura. *Müll. Verm.* 2. *p.* 154.
Helix cornea. *Linn. Syst. Nat.* 1. *p.* 1243.

In slow rivers and large pools of the midland counties of England.

4. Turgidus.

Animal ———

Testa suprà planiuscula, subtùs plana, lateribus inæqualissimis, utrinque subumbilicata, fragilis, hyalina, substriata, sordidè alba. *Anfractus* 6, subangulati. *Apertura* inæqualis.

Long. 0.2.—Diam. 0.55.

Planorbis albus. *Shröter Flussconch. t.* 5. *f.* 28.
Helix turgida. *Gmel. Syst. Nat.* 1. *p.* 3641.

 A single

A single dead specimen only has as yet occurred to me of this curious shell, which was found in Crymlyn Bog near Swansea. It is totally different from any other British *Planorbis*; and has somewhat the form of the last. The whitish bands remarked by Shröter on the body volution of his specimens are wanting in this.

5. Umbilicatus.

Animal nigrescens. *Tentacula* rufa. (*Müll.*)

Testa suprà umbilicata, subtùs plana, subperforata, carinâ marginali distincta, tenuis, substriata, flavescenti-cornea. *Anfractus* 5—6, rotundati, globosi. *Apertura* subrotundo-rhomboidea.

Long. 0.175.—Diam. 0.6.

Planorbis umbilicatus. *Müll. Verm.* 2. *p.* 160.

——— marginatus. *Drap. Hist. des Moll. p.* 45. *t.* 2. *f.* 11, 12.

Helix complanata. *Linn. Syst. Nat.* 1. *p.* 1242. *Dillw. Cat.* 2. *p.* 897.

——— Planorbis. *Penn. Brit. Zool.* 4. *p.* 133. *t.* 83. *f.* 123. *Maton & Rackett in Linn. Trans.* 8. *p.* 188. *t.* 5. *f.* 13.

In ditches, &c. Young shells show scarcely any trace of a keel; and, independently of the greater thickness and convexity of the volutions, they cannot be mistaken for the following, in which the carina is in every stage of growth equally distinct on both sides, owing to the greater slope of the body whorl.

6. Carinatus.

Animal fuscum. *Tentacula* incurvata, opaca.

Testa

Testa suprà umbilicatula, subtùs convexiuscula, vix perforata, utrinque in carinam acutam obliquata, lateribus subinæqualibus, tenuis, substriata, flavescens. *Anfractus* 6, subdepressi. *Apertura* angulata.

Long. 0.2.—Diam. 0.65.

Planorbis carinatus. *Müll. Verm.* 2. *p.* 157. *Drap. Hist. des Moll. p.* 46. *t.* 2. *f.* 16.

Helix Planorbis. *Linn. Syst. Nat.* 1. *p.* 1242. *Gmel. Syst. Nat.* 1. *p.* 3617.

—— complanata. *Mont. Test. Brit. p.* 450. *t.* 25. *f.* 4.

—— planata. *Maton & Rackett in Linn. Trans.* 8. *p.* 189. *t.* 5. *f.* 14.

In ditches, &c.; but I have never found it mixed with the last.

7. Lutescens.

Animal pallidè flavescens. *Tentacula* pellucida. (*Mont.*)

Testa dilatata, valdè depressa, suprà umbilicatula, subperforata, subtùs convexiuscula, utrinque in carinam acutam prominulam obliquata, lateribus æqualibus, fragilissima, hyalina, glabra, albido-lutescens. *Anfractus* 4 vix 5. *Apertura* acuta, angulosa.

Long. 0.125.—Diam. 0.5.

Planorbis lutescens. *Lam. Hist. des Anim. sans Vert.* 6. *p.* 153.

Helix carinata. *Mont. Test. Brit. p.* 451. *t.* 25. *f.* 1.

—— Planorbis. *Dillw. Cat.* 2. *p.* 896.

In stagnant pools in some of the midland counties of England; often mixed with the last, but much less common.

Schröter has noted all the three last species, though, as is evident from his referring his figure of the *Planorbis carinatus*

rinatus in his *Einleitung* to the *Helix complanata* of Linnæus, he has not separated the other two. His fig. 13. Pl. V. of the *Flussconchylien* is an exact representation of the *Pl. lutescens*; and in speaking of his "*Helix planorbis crassa*" (our *Pl. umbilicatus*), he says, "The specimen from Hamburgh is black, with the keel sharp and visible on both sides.

Much confusion existed in Müller's time as to the *Helix Planorbis* and *complanata* of Linnæus; nor has it been in any wise removed by succeeding authors. In their eagerness to adapt their new discoveries to the pages of that illustrious naturalist, they seem to have lost sight of the circumstances under which even the latest edition of the *Systema Naturæ* was written, and to have given him credit for trivial distinctions, which it was scarcely possible could, in that state of science, have been attended to, and which often they themselves but imperfectly understood. The *Helix Planorbis* of that work has been referred by the three authors who have last treated on the subject of British Conchology, to as many distinct species; and nearly as great uncertainty has prevailed as to the true *H. complanata*.

8. Draparnaldi.

Animal ———

Testa utrinque subumbilicata, perforata, carinâ mediâ subprominulâ, lateribus æqualibus, tenuis, pellucida, glabra (sub lente transversim argutissimè striata), lutescenti-fusca. *Anfractus* 5, convexiores. *Apertura* dilatata, subrotundo-rhomboidea: *peristomio* libero.

Long. 0.1.—Diam. 0.325.

Planorbis spirorbis. *Drap. Hist. des Moll. p.* 45. *t.* 2. *f.* 8, 9?

Planorbis

Planorbis deformis. *Lam. Hist. des Anim. sans Vert.* 6. *p.* 154.
Helix rhombea. *Turton's Conch. Dict.?*
—— Draparnaudi. *Shepp. in Linn. Trans.* 14. *p.* 158.

Sparingly among the rejectamenta of the river Taaf near Cardiff. It somewhat resembles an over-grown specimen of the following; but differs in the disproportionate size and medial carina of the last volution, and, above all, in its colour and fine transverse striæ.

9. Albus.

Animal grisescens. *Tentacula* longa, flexilia.
Testa utrinque subumbilicata, perforata, tenuis, pellucida, reticulato-striata, albida, epidermide fusco induta. *Anfractus* 5, convexiores. *Apertura* subrotundo-rhomboidea: *peristomio* vix soluto.

Long. 0.075.—Diam. 0.2.

Planorbis albus. *Müll. Verm.* 2. *p.* 164.
—— hispidus. *Drap. Hist. des Moll. p.* 43. *t.* 1. *f.* 45—18. *Lam. Hist. des Anim. sans Vert.* 6. *p.* 154.
Helix spirorbis. *Linn. Syst. Nat.* 1. *p.* 1244.
—— alba. *Gmel. Syst. Nat.* 1. *p.* 3625. *Mont. Test. Brit. p.* 459. *t.* 25. *f.* 7.

Common on aquatic plants in ditches and slowly-running streams. The term "souvent hispide," applied by Draparnaud to this shell, may perhaps have originated in an accidental erosion of the epidermis.

10. Glaber.

Animal ——
Testa suprà planior, subtùs umbilicata, utrinque perforata,

rata, tenuis, nitida, diaphana, glabra, alba. *Anfractus* 4 vix 5, convexiusculi. *Apertura* subrotundo-rhomboidea: *peristomio* vix soluto.

Long. 0.05.—Diam. 0.175.

Found with the last; though much less common. It is a much more depressed shell than the *Pl. albus*, of a white colour, more polished and transparent, and is destitute of any markings. The upper side is uniformly more even, and the under exceedingly concave.

11. Imbricatus.

Animal grisescens. *Tentacula* longa, flexilia, acuminata.

Testa depressa, suprà planior, subtùs convexiuscula, umbilicata, tenuis, pellucida, transversim imbricato-striata, fulva, epidermide fusco lamelloso induta. *Anfractus* vix 3; *ultimo* in carinam obtusam obliquante. *Apertura* subrotundo-rhomboidea: *peristomio* soluto.

Long. 0.015.—Diam. 0.1.

Planorbis imbricatus. *Müll. Verm.* 2. *p.* 165. *Drap. Hist. des Moll. p.* 44. *t.* 1. *f.* 49—51.

Turbo nautileus. *Linn. Syst. Nat.* 1. *p.* 1241. *Gmel. Syst. Nat.* 1. *p.* 3612.

Helix nautilea. *Mont. Test. Brit. p.* 464. *t.* 25. *f.* 5.

a. duplò minor, albida, striis rarioribus.

Planorbis cristatus. *Drap. l. c.*

On the *Iris Pseudacorus* (on the decaying leaves of which the animal feeds), in pools and ditches, in the autumn; but not common.

12. Nitidus.

Animal nigrum. *Sustentaculum* latum.

Testa

Testa depressa, utrinque planior, subumbilicata, subtùs perforata, fragilis, diaphana, politissima, ferrugineo-cornea aut albida. *Anfractus* 3—4; *ultimo* in carinam acutiusculam utrinque obliquante. *Apertura* elongata, angulata: *peristomio* non reflexo, columellæ insidente.

Long. 0.05.—Diam. 0.175.

Planorbis nitidus. *Müll. Verm.* 2. *p.* 163.
——— complanatus. *Drap. Hist. des Moll. p.* 45. *t.* 2. *f.* 20—22.
Helix fontana. *Lightf. in Phil. Trans.* 76. *t.* 2. *f.* 1. *Mont. Test. Brit. p.* 462. *t.* 6. *f.* 6.

On aquatic plants in ditches; but not very common.

13. Lineatus.

Animal griseo-fuscum. *Tentacula* filiformia. (*Lightf.*)

Testa suprà convexa, subtùs planior, perforata, utrinque subumbilicata, fragilis, diaphana, politissima, albido-lutescens. *Anfractus* 5—6; *ultimo* in carinam inferiorem obtusam utrinque obliquante, septis internis 3 vix 4 albis partito. *Apertura* elongata, angulata: *peristomio* non reflexo, columellæ insidente.

Long. 0.15.—Diam. 0.275.

Planorbis nitidus. *Drap. Hist. des Moll. p.* 46. *t.* 2. *f.* 17—19?
Helix lineata. *Walker Test. Min. Rar. t.* 1. *f.* 28.
Nautilus lacustris. *Lightf. in Phil. Trans.* 76. *t.* 1. *f.* 1—7.

My specimens were presented to me by Mr. J. S. Miller, and I believe came from the neighbourhood of London. The internal plates seem to stand in the place of the teeth or folds which barricade the apertures of many other Mollusca;

lusca; and, I should think, would not impede the free ingress and egress of the inhabitant. They are noticed by Müller and Draparnaud, and were considered by the former (to whom both species appear to have been known) as the marks of growth or repair.

Genus XVI. ANCYLUS. *Müll.*

Animal tentaculis brevibus, cylindricis, subtruncatis. *Sustentaculum* anticè integrum.

Testa conica: *apice* acuto, recurvo: *spirâ* nullâ.

1. FLUVIATILIS.

Animal grisescens. *Sustentaculum* posticè dilatatum.

Testa ovata depressiuscula, vertice subcentrali, posteriùs inflexo; fragilis, nigrescenti-fusca, transversim radiato-striata, intùs cærulescens nitida. *Apertura* subovata.

Long. 0.125.—Diam. 0.25.

Ancylus fluviatilis. *Müll. Verm.* 2. *p.* 201. *Drap. Hist. des Moll. p.* 48. *t.* 2. *f.* 23, 24.

Patella lacustris. *Linn. Syst. Nat.* 1. *p.* 1260? *Penn. Brit. Zool.* 4. *p.* 143.

——— fluviatilis. *Da Costa Brit. Conch.* 1. *t.* 2. *f.* 8. *Gmel. Syst. Nat.* 1. *p.* 3711. *Mont. Test. Brit. p.* 482.

α. major, pellucidior, viridescenti-albida; vertice elatiore.

On stones in running streams. The variety is found in cold mountain springs, and has often a greenish tinge, probably arising from some minute adherent Conferva or other adventitious matter.

2. LACUSTRIS.

2. Lacustris.

Animal nigrescens. *Tentacula* breviora.

Testa oblonga, subdepressa, vertice excentrico; fragilis, membranacea, concentricè substriata, nigrescens. *Apertura* oblonga.

Long. 0.1.—Diam. 0.35.

Ancylus lacustris. *Müll. Verm.* 2. *p.* 199. *Drap. Hist. des Moll. p.* 47. *t.* 2. *f.* 25—27.

Patella oblonga. *Lightf. in Phil. Trans.* 76. *p.* 168. *t.* 3. *f.* 1—5.

——— lacustris. *Gmel. Syst. Nat.* 1. *p.* 3710. *Mont. Test. Brit. p.* 484.

On water-plants in ditches, lakes, &c.; though rather a local species. It is not uncommon in Blackpill marsh near Swansea, mixed with the *Planorbis nitidus.*

ADDITIONS AND CORRECTIONS.

Page 324, *for* Cianella, *read* Cionella.

Helix fusca, p. 330.

Animal lutescenti-griseum, dorso flavescenti. *Tentacula* prælonga, flexilia.

Since writing the above list, I have discovered this local species in great abundance in moist parts of Penllergare wood, near Swansea, on the leaves and stems of the *Heracleum Sphondylium* and other plants.

Helix nitida, p. 339.

The variety β. is found not uncommonly under leaves, decaying *Boleti, &c.* in the woods at Penllergare.

LIMNEUS TINCTUS, p. 378.

Is the young of a small variety of *communis;* but so very dissimilar in its form from that shell, that I could not, till after a careful examination, and comparison of a series of specimens of both species, be brought to unite them.

XIX. *On*

XIX. *On Chamæmeles coriacea and Sempervivum glutinosum. By the Rev. R. T. Lowe, B.A. Travelling Bachelor to the University of Cambridge. Communicated by Francis Boott, M.D. F.L.S.*

Read June 2, 1829.

IN the 13th volume of the *Linnean Transactions*, Mr. Lindley has described, under the name of *Chamæmeles coriacea*, a plant which was originally discovered by Masson in Madeira, and named *Cratægus coriacea.* This description appears to be the only one, founded upon an examination of specimens, in existence; the accounts given by DeCandolle and Sprengel in their latest works being apparently wholly derived from it, and not claiming to rank as independent descriptions by furnishing any fresh or additional particulars of their own. It may therefore be inferred that the plant is of sufficient rarity to render the completion of its history a matter of interest. This must be my apology for undertaking the task without having it in my power to consult Mr. Lindley's original paper and description; for which reason I shall confine myself principally in this place to an account of the fruit, which, not being mentioned by DeCandolle and only guessed at by Sprengel, seems to have remained hitherto unknown. The present description then is to be considered in the light of a supplement to the original observations and description of Mr. Lindley; on which account I am desirous it should be honoured by a place in the *Transactions* of the Society in which they have already appeared.

 C. coriacea

C. coriacea is one of the rarest plants in Madeira; and at present I am only acquainted with one locality for it. This is on the sea-cliffs to the eastward of Funchal, about a mile out of the town along the Caniço road. As this is a direction very likely to be taken in a short botanical ramble by a casual visitor, it might well be supposed by such a person that the plant was far more common than a longer residence would discover to be the case. It grows at the summit on the extreme verge of the cliff (in this place about two hundred or three hundred feet high), or on its perpendicular face a little lower down, forming a thick evergreen bush about four or five feet high, with something of the habit of the pomegranate (*Punica Granatum*). The soil (if soil it can be called) an arid crumbling tufa, mixed with basaltic debris. The flowers are produced abundantly in the months of December, January, or February, according to the earliness of the autumnal rains. Very few of them come to perfection, and the fruit is not ripe before the following November or December. It is indeed so rarely perfected, that from the whole of the bushes, five or six in number, which had been covered the same month of the preceding year with a profusion of flowers, I only obtained, last December, eleven in a full-grown ripe state.

When thus mature, the fruit or haw is quite smooth and even, of a globose-oblong subpyriform shape, flattened or truncate at the apex, and depressed or with a small hollow in the centre, which is nearly covered and concealed by the converging, withered and blackened, or discoloured segments of the calyx. It is about the size of the fruit of *Cratægus oxyacantha*, which indeed it exactly resembles externally in every thing but colour; this being in the present plant, when fully ripe, pale yellowish-white, or rather a rich cream-colour. Length, at most half an inch; breadth, three-eighths. Flesh (*sarcocarpium*) thick, i. e. a little

little more than one-sixteenth of an inch; mealy, rather dry and insipid, much resembling in flavour the fruit of *C. oxyacantha*, but rather bitter. When first cut or broken, the flesh is quite white internally, but changes almost immediately to a reddish rusty-brown if the cut or fracture be transverse, not so remarkably if otherwise: it invests an uniformly single, one-celled *carpell*, of an ovate or rather oval form and smooth, i. e. not in any way conspicuously furrowed or even rough, with a slightly prominent suture up one side; but in all states perfectly closed, and not bursting or splitting open. The substance of this (the *endocarpium*) is of irregular thickness, very hard and bony. Seed single, erect, narrow-elliptic, narrowing at each end, and even pointed at the upper; invested with a thin light-brown skin (*spermodermium*). Its substance (*amygdala*) is pale greenish internally; and a transverse section shows it to be beautifully convolute spirally, or composed of two leaves or laminæ applied face to face and rolled together spirally in a longitudinal direction.

The above is extracted nearly verbatim from notes made on the fresh fruit; but in more botanical language it will stand thus:

Fructus: pomum calyce baccato carpelloque solitario constans.

Epicarpium glabrum, tenue.

Sarcocarpium crassiusculum, farinoso-carnosum, subsiccum, endocarpio adhærens.

Endocarpium uniloculare, indehiscens, clausum, osseum, durum, crassiusculum, glabrum, suturâ distinctâ, monospermum: *semine* erecto.

Spermodermium tenue, glabrum, membranaceum.

Amygdala: cotyledonibus foliaceis, contiguis, convolutis.

By

By a misapprehension, easily accounted for, it has been stated that this plant is called "*Buxo*" in Madeira. It is not uncommon here, as perhaps elsewhere, with a countryman when hard pressed for a name, to conceal his ignorance by coining an extempore one for the occasion; or rather, possibly, by taking the first that occurs of some similar object or plant. In the case of the present plant, it is therefore probable that some countryman who was applied to for its Portuguese name, misled by a fancied resemblance, really mistook it for the *Buxo;* which, as any common Portuguese Dictionary will confirm, is the common garden Box (*Buxus sempervirens*). Misled myself by the above statement given in DeCandolle's *Prodromus*, on my first arrival here I made all possible inquiry after the *Buxo* of Madeira; and the result of every requisition for a supply, never failed to be a huge bunch of common Box, or *Buxus sempervirens*, procured from some garden, of all which in Madeira it is a favourite and constant inmate. Various disappointments of this sort confirmed a suspicion, entertained from the first, of the improbability that the common and well-known name *Buxo* (Anglicè Box) should be properly applied, peculiarly and *par excellence*, to another quite different plant. These ideas have been since strengthened to certainty, since my discovery of the true *Chamæmeles coriacea*, by the assurance that it is not at all known or distinguished by any particular common name here: and indeed the plant is far too rare and unimportant as far as regards practical utility, to render it probable it should have obtained one.

Among the few plants of much importance in their domestic uses peculiar to Madeira, *Sempervivum glutinosum*, or *Ensaião* as it is called by the country-people (pronounced *In-say-oung* or *En-sai-yound*), is distinguished for the use made of it by fishermen in preserving their lines. This species, belonging to a genus which peculiarly characterizes the vegetation of this island

as

as well as of the Canaries, grows in the greatest abundance on the rocks in all parts: and though particularly plentiful on the sea-cliffs, it is by no means confined to maritime situations, but occurs in almost equal abundance in the interior to a considerable elevation. All parts of the plant, but the stems particularly, are covered with a clammy viscid secretion, as if coated with moist varnish. It is probably this, chiefly, which renders the plant so useful to the fishermen in preserving their lines and defending them from the action of the salt-water. This is the account they give themselves of its use; to which may perhaps be added, the stiffness and smoothness it gives, rendering them less liable to entangle. It also, no doubt, in some measure strengthens them, and diminishes friction; and the dark colour renders them less visible in the water.

It is thus applied.—A large quantity of the plant being collected, the stems are bruised with stones (usually by children), till the bark can be readily stripped off; the leaves and young shoots or flower-stems being rejected, as, perhaps, containing a weaker, less viscid juice, which would too much dilute the rest: the bark thus collected, is pounded in a rude mortar, till its fragments are sufficiently small to allow a handful of them to be rubbed with a cloth backwards and forwards along the outstretched lines till they are well saturated with the juice: they are then coiled up, and put to steep till the following day in some alkaline liquid, (usually common urine,) when the rubbing is again repeated, if necessary; that is, if the line does not appear uniformly black and evenly coated in all parts. If when dried there still appear in it any knots or inequalities, it is put to soak in sea-water, for the purpose of softening previous to any more rubbing. When quite finished, it has become black, perfectly smooth and even, and shines as if coated with varnish, or rather with the wax used by shoemakers, whose waxed threads it much resembles,

except

except that it is not at all clammy. It is also rather hard and stiff, but still perfectly flexible. Some affirm that the first rubbing with the pounded bark is sufficient, if well and thoroughly done, the others being merely to remove inequalities: while others say, that three or even four rubbings with bark are necessary. This want of agreement proves it perhaps immaterial.

Funchal, Madeira.

XX. *On*

XX. *On the Parasitical Connection of Lathræa Squamaria, and the peculiar Structure of its Subterranean Leaves: in a Letter to Robert Brown, Esq., F.R.S. V.P.L.S. By J. E. Bowman, Esq., F.L.S.*

Read November 3, 1829.

THE study of Vegetable Physiology, comprehending the affinities and properties of plants, and the relation they bear to the animal kingdom, constitutes, doubtless, in every point of view, the most important as well as the most delightful branch of botany, and claims for it a rank among the natural sciences, to which it would not be intitled, if confined merely to nomenclature and system. Though the general laws which govern the structure and œconomy of vegetables be now tolerably understood, there are many deviations from them, which offer to the philosophic botanist subjects peculiarly worthy of his study and investigation. Here a vast and almost unexplored field lies before him, where analogy can contribute little assistance, and where his progress must be proportionably slow and unsatisfactory.

Perhaps the most striking exceptions to the prevailing laws are found in the tribe of parasitic plants, whether they be Phænogamous or Cryptogamous. Having in the course of the last and present season detected some interesting peculiarities in an individual of the former of these divisions, the *Lathræa Squamaria**, which

* It is suspected that we have two British species, or at least varieties of this plant. I have in Loudon's *Magazine of Natural History*, vol. 1. p. 105, stated the differences between

which I believe to be new to botanists, I venture to lay them before the Linnean Society.

I regret that my attempts to investigate the germination of the seeds and the character of the cotyledons have not yet been fully satisfactory. The two last seasons I sowed the seeds between dead leaves, in pots filled with the soil in which the plant grows, and placed them in its native situation: but in both instances they failed to germinate; at least they still remain inactive. Neither have I been able, by dissection, to trace any division of the cotyledons. However, in one of my attempts to ascertain the parasitical connection of the plant, I detected among the mass of roots, when cleared from the soil, what proved on examination to be a minute embryo. This I have represented, both of the natural size and also in two positions highly magnified, at Tab. XXII. Fig. 1. *a*, *b*, *c*. Though the cotyledons

between our Welsh plant, and that figured in *English Botany*, tab. 50, and the description in *English Flora*, vol. 3. p. 128; to which I may add, that all the specimens which have afforded the materials of the present paper, have the upper lip of the corolla *entire*, or very slightly notched; while in the authorities just quoted, it is represented as *deeply cloven*. In Curtis's figure (*British Entomology*, vol. 4. tab. 160) it is undivided. The height of the flowering stems, in favourable situations, is even more gigantic than I have stated in Loudon's *Magazine*, being sometimes 15 or even 18 inches, bearing from 50 to 60 flowers; on one I counted 63. The subterranean stems are often from 2 to 3 feet long, surrounded at intervals of 5 or 6 inches by thick irregular whorls of cylindrical, often forked branches, closely beset with scales; and it is often in these parts so swollen and distorted, that it can with difficulty be traced through the labyrinth. Its usual habit is horizontal, producing at the upper whorls, 1, 2, or 3 flowering branches, which are the only parts that ever emerge into day; and it sometimes happens, that the whorls which bear them one season throw up none the next, and *vice versâ*. New branches are added to the subterranean stems every season, and the extremities of the old ones are lengthened out by fresh shoots, both being clothed with a delicately white and succulent herbage, which is permanent and never renewed. Tab. XXII. Fig. 2. is decisive as to their perennial character, the smaller scales just above the crown of the root (*a*) being evidently those of the embryo plant.

unfortunately

unfortunately are not in a perfect state, their situation and foot-stalks are sufficiently apparent, and refer it to the Dicotyledonous family*. The four scales and the radicle were perfect; but from the minuteness and delicacy of the embryo I could not satisfy myself whether the larger rudiment of the cotyledon consisted of the petiole only, or the decaying and collapsed state of the whole lobe. Those most conversant with the compound microscope can best appreciate the difficulty of correctly defining such minute objects amid the deceptions arising from the discordant reflections and evaporations of the fluid employed, and of the surrounding lights and shades. From viewing it in different directions and in a variety of lights, as well as from the close resemblance of its scales in shape and texture to those of the perfect plant, I was however assured of its being an embryo *Lathræa*, before I noticed the solitary tubercle near the extremity of one of its radical fibres. This determined me, in the absence of its more complete development, to take the sketches already referred to, though I lay them before the Linnean Society with less confidence than any other in the series of drawings which elucidate this paper.

After many ineffectual attempts, I at length succeeded in obtaining specimens of the *Lathræa* with its real original root; and this part so satisfactorily helps us to understand the early growth of the plant, that the failure of observations on the germination of the seeds is the less to be regretted. I caused a circular trench, about two feet in diameter, to be dug round the

* The oily nature of the seeds, and the uniform ligneous reticulated fibre in which the sap-vessels of the subterranean stem are interspersed, though without a concentric arrangement, support this view: but I do not think the sap-vessels have a spiral structure. The bark consists of a simple cuticle, and a broad circle of spongy cellular tissue, which ranges round the woody fibre, and occupies more than half of the radius of the stem.

flowering stems of a young plant, carefully cutting and sawing off all the roots of the Ash-tree (under which it grew) that came in contact with the spade, without disturbing the central mass. When the trench was sunk lower than the horizontal roots of the tree, I caused the labourers to undermine the insulated lump on all sides, and to lift it carefully into a large garden basket, in which they carried it into a neighbouring and rather rapid stream: here, by repeated and cautious agitation, I at length washed away all the soil, leaving exposed the roots and fibres of the Ash, and the subterranean stems of the *Lathræa* completely matted and entangled together. On separating them, I had the satisfaction to find the parasite with its root, of the size, shape, and habit represented in Fig. 2. This clearly shows its true character, and solves the problem, that though its base is not inserted into the stock, as in *Orobanche*, but is spindle-shaped and terminates in many forked fibres, it is strictly parasitical, each fibre being furnished with very minute tubercles, which fix themselves on the roots of the tree to extract their juices. It is only by means of these that the fibres can perform their office of ducts. As these tubercles are also copiously found on the fibres of the subterranean stem, and will be best described with it, I shall for the present defer the detail of them, noticing only two or three of an extraordinary size, which may be seen in Fig. 2. *b*, on the upper part of the caudex of the root. These are of a much firmer and more woody texture than the smaller ones, and their interior organization is more complex, though they perform the same functions. A magnified longitudinal section of one of them is shown in Fig. 4; but it will be better understood hereafter. The exterior of the caudex is of a red-brown, and tolerably smooth; its texture is solid and woody. A cross section of it exhibits very numerous *angular* cells connected by a fibrous network, which forms the solid portion.

It

It is evident from an inspection of Fig. 2, that in an early stage of its growth the embryo-stem, contrary to the almost universal rule, *avoids the surface, and takes a downward direction in common with the root.* The intention of this is sufficiently apparent; for when once it finds itself among the roots and fibres of the tree, it no longer continues to descend, but spreads *horizontally*, fixing its tubers upon them, and commencing its attacks on every hand. This is one of those instances of adaptation effected in direct opposition to an established law, which fills us with unceasing wonder, and cannot fail to exalt our views of the Mighty Author of Universal Nature. A necessary consequence of the downward tendency of the young stem is, the contrary direction of the flowering branches, one of which is shown at *c*, in Fig. 2, evidently seeking its natural element, the atmosphere. They are invariably curved at their base till they acquire a perpendicular position, and are the only portion of this singular plant which ever appears above the surface of the soil. As this takes place before the trees acquire their leafy honours, it weakens the opinion, that their unnatural and sickly hue is owing to a deficiency of light.

It seems probable, from the sound and healthy appearance of the root, and from the large tubers on the caudex being in full activity, that it continues for many years; at all events, that it does not decay as soon as the smaller tubers of the stem have begun their operations. Yet I have little doubt, that if it were possible to separate the root from the stems without disturbing them, they would receive adequate and ample nourishment from their own tubers to supply the flowering stems they respectively produce.

I shall now endeavour to describe the nature of the parasitical connection of our plant with some minuteness, as it has hitherto been

been very imperfectly understood. Its subterranean stem throws out from between the scales many succulent and tender fibres, bearing a profusion of minute tubercles or bulbs, which fix themselves upon the roots of the Ash, Hazel, &c. and extract their juices in the manner shown in Fig. 3. These tubercles are principally formed near the extremities of the fibres; they are either solitary or in groups of two or three, and bear some external resemblance to small beads, or the knotty excrescences on the roots of some leguminous plants. The connecting fibres are so tender, that it is difficult to get them up without breaking off the tubers, which are left behind upon the root of the stock. The tubers are brown, semiglobular, and succulent, and usually not larger than a small pin head; so that, even should a few remain on the fibres after being dug up, they might escape observation among the soil that adheres to them. Hence I attribute their having so long escaped the notice of botanists. Neither these tubers nor their fibres are to be found in the very spirited woodcuts of Matthiolus, Parkinson, or Gerarde*. Sir J. E. Smith (*English Flora*, vol. 3. p. 128.) alludes to the fibrous character of the root; but though he says he believes it to be parasitical, he does not explain in what way. On first washing the Ash roots, I was astonished to find some of them thickly studded with the tubercles adhering closely to the bark on all sides, and to the fibrous roots of the parasite, in the manner I have represented in Fig. 3. To remove all doubt on this head, I traced these fibres from the tubers to their insertion in the stem between the imbricated scales of the *Lathræa*, and, by the aid of the microscope, through its cellular bark to their junction with the ligneous part which ranges round the medulla. It was necessary

* The figure in Matthiolus is the largest and best of the three; but the flowers in all are too small, and too thinly scattered on the stem. The cut in Gerarde (edit. 1597) is a copy from Matthiolus, but reversed and on a smaller scale.

cessary to ascertain this, as many of the tree roots are constantly found entangled between the scales.

When the tubers are first formed on their fibres, they are nearly round (Tab. XXII. Fig. 5. *a*.), but after their attachment to the bark they become compressed and semiglobular. On being carefully removed, their under surface at the point of contact has an irregular warty appearance, arising more from the firmer texture of the vessels about to be described, than the almost gelatinous substance in which they are imbedded. These appearances are shown in the magnified figure 5, as is also the surrounding lacerated cuticle, which probably excludes the atmosphere in the soil from all interference with the process of unnatural exhaustion. Tab. XXIII. Fig. 1. & 2. represent highly magnified perpendicular sections of the tuber attached to the root of the Ash (of which latter, the portion shown is a transverse section). Fig. 2. represents it cut through longitudinally *in the direction* of its fibre: and Fig. 1. at right angles with, or *across* it. A reference to these will help the Society to understand its organization and functions. The tuber consists of a succulent and nearly homogeneous substance, showing only a cellular texture near its circumference, which gradually becomes more delicate interiorly, and in the central parts is entirely wanting. From its under surface, or point of attachment, it sends down a tap or funnel-shaped process, generally straight but sometimes curved, which penetrates through the cortical layers of the root to various depths into the alburnum, but never into the solid woody fibre. The tap does not send out any lateral auxiliary branches; but a single filament or duct passes through it, thickening in its progress upwards; and on its entering the body of the bulb dividing into several branches, each traversing its substance in a tortuous manner, and frequently intersecting the others, but finally approaching and unitedly forming

forming a confused mass under the point in contact with the fibre. By this system of vessels the food of the parasite is doubtless alienated and conveyed along the root-like fibres into its subterranean stem; and from their dispersed and sinuous course within the tuber, it is probable the sap may there undergo a necessary change. These vessels consist of a close series of minute semi-opake oval bodies, and have a moniliform or beaded structure. Tab. XXIII. Fig. 3. shows a transverse section of a tuber and its central vessels.

Some of the many tubers I examined, differed materially from the rest, and deserve attention, from the light they appear to throw upon the nature of the action excited by parasites in general. The section Tab. XXIII. Fig. 4. is one of these; it is divided in the direction of the fibre and of the vessels of the Ash root on which I found it. The interior of the tuber was more densely and uniformly cellular than usual; and instead of the meandering group of beaded ducts in the centre, it had on each side, near its circumference, a separate set of anastomozing vessels, strong and darker coloured near their contact with the fibre, but becoming gradually paler and more delicate as they approached the middle and lower portions of the tuber. Each fascicle communicated with the fibre by a single detached trunk, and the spaces between a few of the larger reticulations only, were transparent; the remainder of the section being much more opake than in Tab. XXIII. Fig. 1. & 2. Here also was no trace of the funnel-shaped process; and the only symptom of derangement or disease in the bark and alburnum of the Ash root, was a number of small globules, mostly detached, but more closely congregated beneath the centre of the tuber. Both the funnel and dark anastomozing vessels just described, were wanting in other tubers; but they contained the transparent globules, which were also seen more perfectly formed in the alburnum underneath.

neath. One had a dark group of them under the fibre, but instead of a regular set of tortuous vessels through its centre, it had well-defined but mostly detached globules interspersed, and indications of a tap striking downwards into the alburnum. Several others had a tap in different stages of development, sometimes irregular and ill-defined. In some, the globules (which were filled with fluid) seemed to have formed fissures or cavities in the alburnum, similar to those in TAB. XXIII. Fig. 1. & 2; while many of the tubers were without either tap, beaded vessels, or the transparent globules, and consisted only of the delicate cellular substance already described.

I think it probable that all these, including the section Fig. 4, were tubers in the early stages of their action on the parent root; and that the globules interspersed in them and in the bark and alburnum underneath, with a central tendency, were preparing the way for the yet undeveloped inferior appendage or funnel. It is difficult to conceive how so delicate and succulent a substance can penetrate the comparatively hard bark and alburnum of the root, but by means of some chemical change, or corrosion effected by the union of their respective juices. The irregular fissures or cavities in the alburnum exhibited in TAB. XXIII. Fig. 1. 2. & 5, are generally present under those tubers which have pierced it with their funnels. The septa and parts immediately in contact are frequently brown and discoloured, indicating disease from being drained of their sap. They are always surrounded by a light-coloured border, as in the figures, probably a new layer of liber formed by the renovating power of Nature to check the progress of the morbid action. Beyond this border, the surrounding parts are constantly sound and healthy, the injured portion seldom extending wider than the space covered by the tuber.

I am inclined to think that the tubers are renewed annually, like

like the radical fibres of trees and perennial plants. This opinion is strengthened, from a larger portion of those which I have examined in October and November having had taps inserted into the returning vessels of the alburnum, than those I have examined in the spring, the greater number of which had short or imperfect taps, and were often without the interior system of beaded vessels. If a root on which they have fixed be carefully examined, some minute scars may be observed on the bark, each divided, by a straight fissure with prominent lips, into two equal parts. These are the cicatrized wounds caused by old and decayed tubers, some of which may be seen of the natural size on the broken extremity of the Ash root (Tab. XXII. Fig. 3. *a*); and a magnified transverse section of one, with the cavities within, surrounded by its margin of new liber, at Fig. 5.

The organization of the large tubers of the caudex differs from that of the small ones of the extremities, in having a more crowded system of beaded and nearly parallel vessels (instead of the central intersecting set of the latter) distributed through its whole substance. These vessels are intersected by a dark-coloured regular cone, in the situation represented in the longitudinal section (Tab. XXII. Fig. 4.), which seems to consist only of a more dense assemblage of the vessels themselves, and whose entire figure would be that of the concave bottom of a glass bottle. A cross section of this tuber exhibited its numerous vessels in detached spots. The tap was broken off in the root of the stock, but its situation is indicated by the letter *a*.

I now pass on to that portion of this singular plant from which it has severally been called *Dentaria*, *Squamaria*, and Toothwort, and whose true character seems to have puzzled both the older and more modern botanists; I mean the squamæ, or tooth-shaped scales. Matthiolus (*Comm. in Lib. quartum Dioscoridis*, p. 314. edit. Ven. 1583.) evidently took them for roots; "*Radice*

"*Radice nititur albicante, magna, succosa, fragili, compactili squamarum congerie:*" yet it will scarcely be contended that his "*miro sane naturæ artificio elaborata*" refers to anything beyond their exterior appearance. Linnæus, Withering, Willdenow, &c., also call them roots; and the able author of *Vegetable Physiology* * considers them as "scaly appendages to the roots." Sir J. E. Smith in *English Botany* (vol. i. tab. 50.), and in his *Introduction to Botany* (chap. xii.), also calls them roots, though he was subsequently led (*English Flora*, vol. iii. p. 128.), from the analogy of this genus to *Melampyrum*, to refer them to their true character of a subterranean herbage. He seems nevertheless, incorrectly I presume, to confound them with the bracteas of the flowering branches, which he distinctly calls *leaves*. The idea of their being roots, though erroneous, was venial enough from their underground situation, and is probably as old as a knowledge of the plant itself. It has perhaps been perpetuated among botanists by a remark made by Linnæus, and alluded to by Mr. Brown in his very luminous paper on the *Rafflesia* (*Linn. Trans.* vol. xiii. p. 226.), "that the whole tribe of parasitic plants are distinguishable by the imperfect development of their leaves, and the entire absence of green colour." The learned author last quoted justly observes that plants parasitic *on roots* are chiefly thus distinguishable. This rule however is not universal, an exception being found in the genus *Cuscuta*; which, after the decay of its original root, has no connection whatever with the earth, but is nourished and supported solely by radicles fixed upon the *stems* of other plants. Many if not all of the foreign species of *Cuscuta* have a similar economy, and are destitute of leaves and of green colour; indeed I know of no plant without true leaves that is green. I

* No. XIV. of the Treatises published by the Society for the Diffusion of Useful Knowledge, p. 29. col. 2.

am therefore inclined to believe that the pale and sickly hue of such parasites, whether fixed on roots or stems, results at least as much from this circumstance as from the surreptitious nutriment on which they feed. The absence of true leaves constitutes one essential physiological distinction between *Cuscuta* and *Viscum*; and though *Listera Nidus avis*, *Monotropa*, and *Orobanche* are parasitic on roots, they are also destitute of leaves furnished with pores. All such plants are consequently incapable of drawing sustenance from the atmosphere, and of being acted on by the powerful stimulus of light, and can only derive the necessary supply of food through the medium of their lower extremities. It may be said that as they find their food ready provided for them by the stock on which they grow, leaves would be superfluous; and that Nature, in depriving them of these usual organs of assimilation, has, in the plenitude of her power, prepared it for them through the medium of a foreign source. But this does not explain the cause of the absence of green colour; indeed the instance of the Misletoe renders the reasoning inconclusive. This plant is perhaps more strictly parasitical than any of those just named, yet it is *green*;—a necessary consequence, as I conceive, of having *leaves*, though they be sparingly supplied with pores*.

I hope to make it appear that the *Lathræa* differs in structure from all the parasites just named; and that, though it be

* I have observed that the Misletoe dies with the tree on which it grows; and from a notice in the *Magazine of Natural History* (vol. ii. p. 294.), it seems that the *Lathræa* does so too. It has long been doubted whether *Listera Nidus avis* be strictly parasitical. Whatever it may be in the earlier stages of its growth, it certainly is not so in its more advanced state. If it be carefully got up in a clod, and the soil afterwards washed from around it, the base of the central root or caudex may be seen to terminate in a short curved spur, which tapers to a fine point, and evidently is not attached to any other vegetable. The cuticle of the stem and its bracteas has no perspiring pores.

parasitic

parasitic *on roots*, it is copiously supplied with *true leaves*, while it shares, in common with them, the appearance indicative of the want of those organs. Assuming for the present that the tooth-like scales of the subterraneous stem are really leaves, the apparent anomaly will be reconciled by reflecting that their functions are necessarily performed in the total absence of light, that essential agent in the production of the common livery of the vegetable kingdom. Neither is their cuticle perforated by any pores. In order to ascertain if light would produce any change, on the 20th of November last I carefully laid them bare and washed away the soil; but after having been as much exposed as their gloomy situation would admit till the middle of January, they had not acquired the slightest approach to a green colour, nor any absorbing pores. Frost now set in; and on again examining them on the 5th of February, I found the uncovered parts blackened and destroyed by this unnatural exposure. A head of flowers has since shot up within two inches of the spot, without any change in its natural appearance.

The general shape and character of the leaves, though they vary considerably in detail, are known to most botanists, and may be understood by reference to Tab. XXII. Fig. 2. & 3, and Tab. XXIII. Fig. 6. 7. & 8. If their outer or convex surface be viewed attentively by the naked eye, especially those on the newly formed branches, a number of longitudinal parallel striæ, or tubes, may be observed under the cuticle, whiter and more diaphanous than the contiguous parts, but having no apparent orifice or external communication. On dissecting the leaf, these are found to be so many hollow cells or chambers imbedded within its solid succulent substance; and varying in number from six to twelve according to the size of the leaf. A lens of moderate power shows their interior surface to consist of a variety of irregular corrugations or tortuous ridges, which increase the superficial area very considerably.

siderably. A longitudinal section of one of these cells may not inaptly be compared to the folds within the helix of the human ear; but its usual form may be seen in the magnified perpendicular section, Tab. XXIII. Fig. 7; and its cross section in Fig. 8. 10. & 11. The compound microscope shows every part of its surface to be lined with innumerable oval transparent glands or papillæ, some sitting, but for the most part raised on pedicels of various lengths, and all pointing towards the centre of the cavity. These glands are so minute as to be barely visible with the lowest magnifier of the compound microscope. Their situation may be seen in Fig. 10. & 11; and their shape, very highly magnified, in Fig. 12. They are marked by four longitudinal depressions, which indicate as many septa or valves within, the intermediate spaces being hollow (see *d.* and *e.* of Fig. 12.); but I have not been able to ascertain whether the apex of the gland, or the pedicel, be perforated. They have a very beautiful appearance under the compound microscope, either in a transverse section of the cell, or when the lining of the cell is viewed as an opake object. On account of their extremely delicate texture, they soon shrivel up as the section dries.

Though satisfied, from the elaborate structure of these secret chambers, that they were destined to perform some important office, and that they must, some way or other, have an exterior communication, it was not till after repeated observations and many tedious and unavailing efforts, that I had the good fortune to discover it. If the longitudinal section of the leaf and one of its cells (Tab. XXIII. Fig. 7.), or the more highly magnified part of it (Fig. 9.), be attentively examined, a very narrow interstitial opening or passage may be traced from *a.* inwards, between the incurved lower edge of the leaf *d*, and the underside of the leaf-stalk *e*, and leading into the inclosed wider space within, *b.* This inner space (a cross section only of which can be shown

in

in this figure) runs along the whole underside of the leaf beneath the course of the dotted line *a. b.* of Tab. XXIII. Fig. 6; and communicates, by means of an oblong narrow orifice (Fig 9. *c.*), with the bottom of each of the perpendicular leaf-cells. This appearance may be best detected in a very thin longitudinal section of the leaf placed under the microscope; and though the inner curvature of the leaf *d.* will sometimes adhere to the leafstalk *e*, and close the aperture, the application of a needle or bristle will immediately discover it. The cuticle of the leaves is destitute of pores on both its surfaces*. When highly magnified, it appears to be traversed by an irregular network of veins, the reticulations a little prominent, and connected by a transparent but strictly imperforate membrane.

Keeping in view this very curious and singular structure, I think its œconomy cannot be misunderstood; viz. that the squamæ or scales of the subterranean stem are *real leaves*, and that the prominent glandular papillæ of their interior cells perform the office of true cuticular absorbents. Under ordinary circumstances, leaves freely exposed to the action of the air and of light, and provided with a porous cuticle, receive carbonic acid gas into the cells of their parenchyma, where the oxygen is separated and thrown off, and the carbon assimilated with the hydrogen imbibed by the roots. But in the case of the *Lathræa*, where they are destined to perform their functions, not only in the dark, but buried in the earth, such an arrangement would have been inexpedient; it is therefore substituted by another,

* So is the cuticle of the flower-stem, the individual flower-stalks, the calyx, and both surfaces of the bracteas. The copious woolly hair on the flower-stem and calyx, when highly magnified, appears jointed like a bamboo cane, and tipped with a globular or oval summit; but I cannot ascertain whether they are perforated. The bracteas have neither the internal cells nor the bladders of the true leaves; but there are often several at the base of the flower-stem, of an intermediate character, being partly succulent and chambered like the latter, and partly thin and solid like the former.

admirably

admirably adapted to their peculiar circumstances and situation. Had the cuticle been furnished with air-valves, the soil would have continually clogged and impeded their office; they are therefore removed by a contrivance, as beautiful as wise, and placed within the convoluted chambers excavated for them in the interior of the leaf, where they perform securely and unseen their destined office. If it be doubted whether, from the unusual form and prominence of these papillæ, they are the real absorbents of the leaves, I would hint the probable advantage of some such arrangement to enable them more effectually to act upon the very small supply of air admitted into the cells, which is, moreover, always in a stagnant state. It will not, I think, be contended that they absorb *moisture* rather than *air;* and as this forms the grand distinction between *roots* and *leaves*, I trust I have satisfactorily proved them to be the latter; though, because their functions are performed in the dark, one material effect of these organs is not produced.

The succulent or solid portion of the leaves also deserves attention from its singularity of structure. It consists altogether of a framework of cellular substance, chiefly in hexagonal compartments, resembling a number of hollow dodecahedron crystals closely fitted together (see the sections, Tab. XXIII. Fig. 10. & 11.). Each cavity, besides the watery juice which fills it, contains several oval or pear-shaped and perfectly transparent bladders, quite detached from each other and from the sides of the cells, and lying over one another in an irregular manner (see Tab. XXIII. Fig. 13.). They are from their minuteness invisible to the naked eye, but exhibit a very curious appearance in a thin section of the leaf under the compound microscope. In one of these sections, placed between the talcs of an ivory slider in April 1828, they still retain their original shape and size; from which I at first concluded they were distended with air. Subsequent experiments

ments have, however, proved them to be filled with a glutinous or mucilaginous fluid of much greater specific gravity than water; in which, though no larger than particles of the finest pollen, they sink as freely as grains of sand. As they are not attached to the sides of the cells, they may be easily separated by macerating the leaf in water, and carefully removing the fecula with a camel-hair pencil, when they will be found at the bottom like a mass of impalpable particles of pounded glass. On evaporating the water, and submitting them to a very considerable dry heat, they still remain distended; but on bruising them with the flat side of a knife, they give out a fluid, which, though it becomes stiff and fixed by heat, almost immediately regains its viscidity by re-absorption from the atmosphere. From their extreme minuteness this experiment can only be tried by collecting the bladders in considerable quantity and examining the expressed fluid under the microscope. In pure alcohol they generally remain quiescent, not more than one in fifty, even of the smallest, ranging about like particles of pollen similarly treated. When held over a spirit-lamp, either in distilled water or in alcohol, they burst simultaneously, but the shrivelled transparent skins still lie at the bottom of the fluid. The mucilage diluted in alcohol retained its transparency; in distilled water it gave a red tinge to blue litmus paper, but did not affect the red litmus; and on dropping into it a little diluted sulphuric acid, a few milky or opal-coloured flakes were formed. No sensible effect was produced by prussiate of potash or superacetate of lead. I tried in vain to crystallize it by evaporation; indeed, when removed out of a dry atmosphere, it almost immediately resumed its viscidity. I am therefore disposed to consider the contents of these bladders, a kind of liquid sugar, incapable of crystallization, from the little free acid it seems to contain; and that it is secreted from the aqueous juices in

 which

which the bladders float, to minister to the support of the plant during the decay of the old and the formation of the new tubers. The scaly roots of *Lilium candidum* and the tunicate ones of *Narcissus* are provided with similar bladders in their cellular substance, which also are detached and sink in water. In the former they are smaller and more numerous than in *Lathræa;* and those in the upper portions of the scales are chiefly concentrated round the fascicles of spiral sap-vessels. It is worthy of remark, that the cuticle of these scales has also no absorbents, nor do they become green by long exposure to light.

I have already hinted, that the partial shade in which the *Lathræa* is always found cannot be the sole cause of its pale and sickly colour. Many other plants, which grow promiscuously with it, flourish, and severally possess their full and peculiar tints of green*. These all draw their nourishment immediately from the soil; have leaves furnished with cuticular pores, and are powerfully attracted by light. Not so our *Lathræa;* for when its flower-stems have acquired their full altitude, they are always *perpendicular;* and in groups of twenty or thirty in the most umbrageous situations, the rows of flowers (which have always an unilateral direction) are as frequently turned *from* the only side on which light is admitted as *towards* it. I have repeatedly witnessed this singular fact; and have even seen it come up within, though near the door of, a dark hovel, without the stem or its flowers evincing any tendency to incline towards the light. Again, it will be recollected that the various species of *Orobanche* and *Cuscuta* show no inclination to put on the usual vegetable robe of green, though not hidden "from day's garish eye." It is therefore, I conceive, in the structure and

* Such as *Melica uniflora, Sanicula europæa, Allium ursinum, Scilla nutans, Geranium Robertianum,* &c. &c.

mode

mode of growth, that we must endeavour to find a solution of this problem.

By laws which almost universally prevail in the vegetable kingdom, plants imbibe moisture from the soil by means of their radical fibres, and gases and moisture from the atmosphere through the medium of pores in the cuticle of their leaves. These elements are conveyed into the parenchyma, where innumerable and inconceivably delicate organs, stimulated by light and heat, throw off the oxygen and retain the hydrogen and carbon. These essential ingredients at once produce the green colour, and are converted, by a mysterious and hidden process, into the several substances of the vegetable body. Parasitical plants, in one or more respects, and in different ways, are exceptions to these general laws. Though the *Lathræa*, unlike many of its tribe, has leaves amply supplied with absorbents, these organs are doubly concealed in a cold subterranean laboratory, and there destined to breathe in darkness; while the flowering stem,—the only part in contact with the light,—is destitute of those cuticular pores through which air can be admitted, and by means of which the ordinary functions can be performed. The materials and the stimulus are at hand, but for want of the proper apparatus they cannot act. Again: the radicles of the *Lathræa* do not imbibe moisture immediately from the soil, but extract the already assimilated juices of its foster-parent; and whether we suppose these juices to be derived from the inner cortical layers after the accession of carbon through the leaves, or from the alburnum, where they are in a less combined state; they probably contain no free hydrogen to minister to the generation of the green colour. They may also undergo a further chemical change, either in consequence of the partial disease occasioned by the attack of the tubers, or in passing through the substance of the tuber itself. We know that in the dark, plants

 invariably

invariably acquire a pale and sickly tint for want of the stimulus of light to fix the carbon and throw off the oxygen. DeCandolle says, that under such circumstances they are *without* perspiring pores. We also know, that the etiolated parts of some varieties of Celery, the under surface of the leaves of *Nymphæa*, *Hydrocharis*, &c. &c. are tinged with the same beautiful violet hue as the flowering-stems of the *Lathræa*. These striking coincidences render it probable that the cadaverous appearance of our plant is chiefly owing to the absence of leaves and of pores on the flowering-stems, to the condition of the absorbents of the subterranean leaves, and to its subsisting on food elaborated by a foreign agent. But in what manner, and in what degree, each of these causes operates and combines, Chemistry has not yet discovered; nor will she probably be ever able to draw aside the impenetrable veil which checks our researches, and baffles the proud philosophy of man. By the aid of the microscope we can often detect the mechanical contrivances by which various operations in Nature are effected; we can explore her laboratory, determine the elements, inspect the apparatus, and witness the results. But we can no more explain the delicate and subtle chemistry by which, in the vegetable body, the air inhaled by the leaves is assimilated with the juices drawn up through the roots, and converted into woody fibre, and into innumerable secretions, odours, and colours, than we can tell how, in the animal, distinct and discordant fluids are all elaborated from the blood, to support the various functions of life, and the organs of sense and intelligence!

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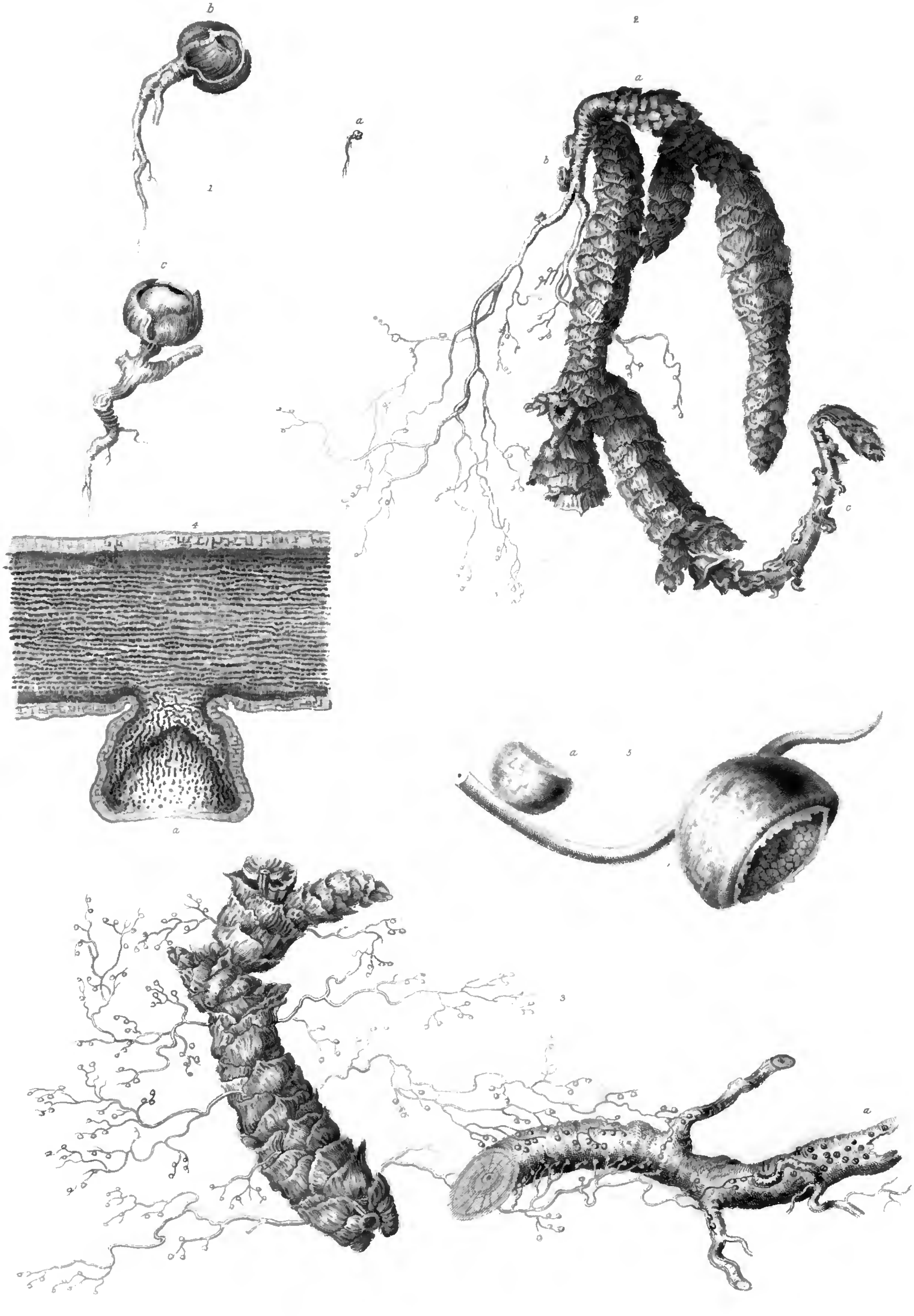
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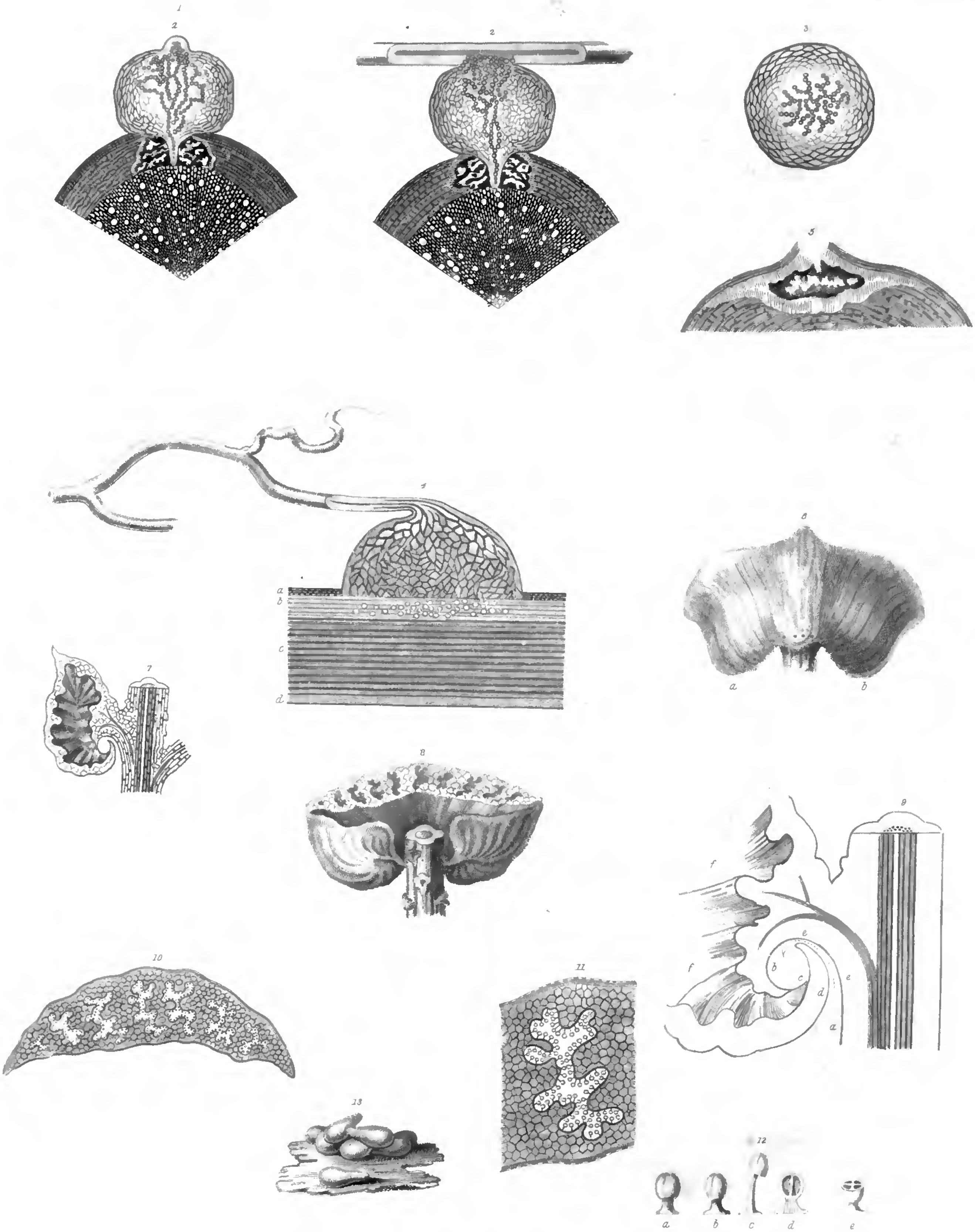

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EXPLANATION OF THE PLATES.

Tab. XXII.

Fig. 1. An embryo plant: *a*, the natural size; *b* and *c*, highly magnified in different positions.

2. An entire plant, showing the large tubers on the caudex of the root at *b;* the small ones on the fibres, and a young abortive flower-stem, *c*, in its progress towards the surface of the soil.

3. Portion of a subterranean stem with its tuberiferous fibres, and a portion of an Ash-root with some of the tubers fixed upon it. *a*. Wounds in the bark caused by old decayed tubers.

4. Longitudinal section of part of the caudex and one of its large tubers magnified, showing its complex system of vessels; some of which, towards the base, *a*, are cut through transversely.

5. Portion of a fibre with a young tuber before its attachment; and another torn from the bark, showing the lacerated edge of the cuticle and the reticulated portion in contact with the bark. The dark central spot is the branching off of the exhausting vessels:—highly magnified.

Tab. XXIII.

Fig. 1. Perpendicular section of a tuber cut across its fibre, showing its beaded system of vessels, the insertion of its tap-shaped base into the alburnum, and the border of new liber formed round the cavities to stop the progress of the diseased parts. *a*. Section of the connecting fibre.

2. Ditto, ditto, in the direction of its fibre.

Fig. 3.

Fig. 3. Transverse section of a tuber and its vessels.

4. Perpendicular section of a tuber at an early stage of its attachment to the bark. *a, b, c, d.* The bark, alburnum, solid wood, and pith of the tree-root.—Fig. 1. 2. 3. & 4. are all highly magnified.

5. Transverse section of the cavity formed in the root of the Ash under an old decayed tuber, with the surrounding border of the new liber to check the progress of the injury:—highly magnified.

6. Exterior surface of a subterranean leaf. The dotted line *a, b* indicates the direction of the inclosed space which communicates with the interior chambers.

7. Perpendicular section of ditto, and one of its chambers.

8. Transverse section of ditto passing through its imbedded chambers.—Fig. 6. 7. & 8. are equally magnified.

9. The lower portion of Fig. 7. enlarged *ad libitum*, to show the passage by which air is admitted into the cells of the leaf, in the direction of *a, b.* *b.* Is the space inclosed by the incurvation of the base of the leaf, *d;* and *c.* The orifice into the cell, *f.* *e.* The leafstalk.

10. Transverse section of a leaf, more highly magnified than Fig. 8, showing its cellular texture, and the convolutions of the chambers, with their papillæ.

11. One of the chambers of ditto, still more highly magnified, to show more distinctly the papillæ scattered over its inner surface.

12. *a, b, c.* The papillæ very highly magnified. *d, & e.* Perpendicular and transverse sections of ditto, showing their valves and interior cells.

13. Minute pear-shaped bladders lodged within the cavities of the cellular substance of the leaf.

XXI. *On*

XXI. *On the Origin of Buds.* *By the Rev.* Patrick Keith, *F.L.S.*

Read April 7, 1829.

Phytologists have been at all times much puzzled to account for the origin of buds. Hence the variety of opinions which they have advanced, or advocated, on the subject. Pliny believed them to be formed from the pith, but without giving us any particular account of the ground of his belief*. Malpighi believed them to be formed from the pith, or from the cellular tissue which he regarded as *viscera* peculiarly destined to the elaboration of the sap and protrusion of future buds †. Du Hamel seems to have entertained different opinions upon this subject at different periods. In the outset of his researches he believed buds to be formed from the wood or pith of the former year. But what are we to say of the first year itself? Afterwards he regarded them as proceeding from pre-organized germs existing in the proper juice, and deposited by it in the course of its descent from the leaves, so as to pervade the whole plant. Where the pre-organized germs were themselves formed, I think we are not told. But his proof of their existence is as follows: —Having taken some cuttings of a willow, he stuck them in the ground, and made them, at the same time, to pass through a barrel filled with earth, so as to have a portion exposed to the air between the ground and the barrel, and another portion projecting above the top of the barrel. The part inserted in the

* *Nat. Hist.* lib. xvii. cap. 21.

† *Anat. Plant.* 13.

ground

ground produced roots, and the part passing through the earth contained in the barrel produced also roots; but the other two portions produced branches. It was of little consequence whether the cuttings were inserted in the ground by the upper or under extremity, as relative to their original growth, and they vegetated even when made to pass through the barrel horizontally. Hence Du Hamel concluded that germs both of the root and branch are dispersed throughout the whole extent of the plant, and are developed as the exigency of the case requires *.

Others have contended that buds are generated only from the *plexus* of the vessels of the inner bark; because, perhaps, it is from the inner bark that the union of the graft and stock is effected in the well-known operation of grafting.

Mr. Knight seems to have embraced the opinion of Du Hamel with some slight modifications. I do not mean to say that he has adopted the appellation, or even the notion of pre-organized germs. But he contends that buds are generated in the alburnum by means of the agency of the descending proper juice; and thus dispersed, as we may infer, over the surface of the whole plant. His proof is as follows:—The runners connecting the tubers of a potatoe with the root were intersected and immersed by both portions in a decoction of logwood. The decoction passed along in both directions. But it was in the direction of the tubers that the proof wanted was elicited. For there, the decoction was found to have passed through an elaborate *plexus* of vessels between the bark and alburnum, which was seen to approach the skin at the base of the buds †. Hence it was inferred that buds are formed by the agency of the descending proper juice in its passage through the vessels of the inner bark.

* *Phys. des Arb.* liv. iv. chap. v.

† *Phil. Trans.* 1803, p. 289.

Also

Also the alburnum, according to Mr. Knight, possesses the power of regenerating buds. A number of plants of the Apple, Pear and Plum, which were raised from seed in the spring of 1802, were again cut down to the collar in the autumn with part of the root exposed. In the beginning of the following spring, protuberances were observed on the bark of the exposed roots, which were found to be processes issuing from the alburnum. They were incipient buds, and were ultimately protruded into shoots. Experiments upon the stem and root of aged trees gave the same result; establishing, as Mr. Knight thinks, the position, that the alburnum, or the proper juice deposited in it, possesses the peculiar property of the organizing of buds; whence it follows, as a corollary, that the origin of any bud is not more deeply seated in the stem than the layer of alburnum from which it is protruded into a shoot.

This common doctrine of Du Hamel and of Knight, and I might add of Mirbel also, is combated by a late writer on the subject of Vegetable Physiology; who contends, in direct opposition to their theory, that all buds protruded from the surface of the plant, *at whatever period of its growth, have been originally formed* at the centre of the stem or branch on which they appear; that is, in the original or annual shoot; and have been pushed outwards horizontally through every additional layer of alburnum while yet in a soft state, though it requires some peculiar excitement to protrude them into shoots, which may not occur till after a period of many years *. The bud in its progress outwards is represented as leaving behind it a pale streak of parenchyma indicating its path, which is in the direction of the medullary rays, and very perceptible in a transverse section of the Willow taken near the place of the protrusion of a young shoot. This rule can apply only to woody

* *Library of Useful Knowledge.*

 plants

plants which have their diameters augmented by the addition of annual and concentric layers. It may include dicotyledonous perennials; but dicotyledonous annuals, and monocotyledonous plants, as well as plants without cotyledons, it cannot possibly apply to.

It is admitted that buds, though not originating as above, may be produced from any layer of alburnum by artificial means;—what are these means?—but it is contended that Nature never protrudes a branch-bud except in the aforesaid way. At all events, the discovery is not entirely new. It is at least as old as the researches of Mrs. Ibbetson, who saw, as I believe, through the medium of the microscope, the buds in the very act of crossing the concentric layers on their way to the alburnum, and who has advocated and illustrated the fact and the doctrine with the most laudable zeal*. She thought, indeed, that the bud is originally formed in the root, from whence it ascends by "*the line of life*"—that is, the medullary sheath—till at last some unknown but potent and irresistible cause gives it a horizontal direction, and forces it ultimately to the circumference, in spite of all intervening layers of wood, however numerous and however hard. This was indeed very difficult to believe; and was, as I should suppose, never much believed.

But the subject was not left to be elucidated merely by the labours of Mrs. Ibbetson. It had long occupied the attention of M. Du Petit-Thouars, a French botanist distinguished for his able Illustrations of the Plants of Madagascar. In a paper entitled *De la Terminaison des Plantes*, and read at a sitting of the Royal Academy of Sciences on the 7th of October, 1816, he exhibits the result of his observations, and develops his views at some length. The following extracts will show that the doctrine of the central origin and horizontal protrusion of buds

* *Phil. Mag.* vol. 45. 56.

comes

comes from his hands considerably improved. "A partir de là [the terminal bud], je peux redescendre jusqu'à la base, en suivant une ligne plus ou moins droite, que je regarderai comme l'origine de toutes les branches, c'est l'axe de l'arbre." Again,—" A mesure que l'augmentation en diametre a lieu, ce Bourgeon s'eloigne de plus en plus de son point de depart; mais à tel point qu'on l'examine, on aperçoit toujours une trace horizontale qui le lie à la moelle centrale. Ainsi, si, comme cela arrive quelquefois, on en trouve un sur un tronc d'un pied d'epaisseur, il est evident qu'il se sera écarté horizontalement de six pouces de son point de depart."

This view of the subject approaches very near to that of the writer who now advances the doctrine in opposition to the views of Du Hamel and of Knight. Indeed they are both very similar to the view of it that was originally exhibited by Du Hamel himself. Having taken the trunk of a Lime-tree of about four or five inches in diameter, and about the middle of which there was a bud, and having cut it asunder obliquely in the direction of the bud, Du Hamel found that he could trace a ray of a whiter shade than the rest of the wood, extending from the pith to the bud. Hence he concluded that the bud is formed from the pith, and that the ray extending from the one to the other is with propriety denominated a medullary ray*. This conclusion he afterwards abandoned; but it is evident that it embraces the doctrine in question, the ground of which I have lately been induced to investigate with some care. I had been looking out, in the course of last summer, for a good subject of inspection, and found rather opportunely the stem of a Willow of about twelve or thirteen years old, which having been felled in the preceding winter or spring, was left lying on the ground, at its full length, and in rather a moist situation, and was in the

* *Phys. des Arb.* liv. i. chap. iii.

month of August furnished with a number of young shoots protruding from its upper surface. These shoots were evidently formed posterior to the felling of the stem; and if the doctrine was true, they were of course traceable to the centre. Accordingly, having taken a number of transverse sections of the stem of the above Willow, I found that I could, in all cases, trace the path of the progress of the bud by means of the streak of parenchyma, extending from the centre, or nearly so, to the base of the shoot. There were many other streaks terminating, not in shoots, but in an emerging point between the alburnum and bark, which point contained, no doubt, a bud that might have been protruded into a shoot in some future year, if the tree had been allowed to continue growing.

There is a capability afforded no doubt in the annual protrusion of the bud into every additional layer of alburnum, that accounts well for the ready supply and regeneration of buds which almost all perennials furnish when lopped or accidentally mutilated. The fact is evidently hostile, as far as it goes, to the opinions of Du Hamel and of Knight, but it does not amount to a refutation of them: for that which is true of the Willow may not be true of every other tree. There are some trees in which no trace can be observed of the horizontal streak of parenchyma, from the origin of the shoot to the centre of the stem.

At the same time, the opinions of Du Hamel and of Knight, though strongly sanctioned, are not altogether indisputably established by the facts which they adduce in support of them. For it may be said that the result of their experiments would have been the same, whether we suppose buds to originate at the centre, or at the circumference. The buds had, indeed, gained the circumference; but whence they came, or by what route, there is no positive evidence to show. Yet this question might

might have been decided by experiments made by the above or by other phytologists many years ago, if the experimenters had but instituted them with that particular view. Dr. Hope's experiment, for example, might have decided it. If any bud issued from the wood that was formed within the displaced and hollow bark of the Willow on which his experiment was made; then buds are, to say the least, occasionally generated and protruded into shoots without having been formed originally at the centre, and without having come horizontally to the circumference. So also in the experiments of Du Hamel and of Knight,—if any shoot issued from the new layers that were superinduced by vegetation over a decorticated portion of alburnum that had been left exposed to the action of the atmosphere, so long as to destroy its vitality, then were buds generated and brought to the circumference through a route different from that of the horizontal channel. Yet as no fact of this sort has hitherto been observed or recorded, as far as my reading or recollection goes, and as wounds by decortication or by excision are continually happening and again healing up, I began to think of looking out for examples, which, if they existed, it could not be very difficult to find.

On the 20th of September last I observed a shoot actually issuing from the lip formed over the section of a lopped branch of a Lime-tree. The tree grew in the garden of the Vicar of Ashford in Kent. In what did the bud originate? In the lip, or in the truncated branch? On the 25th I caused a portion of the trunk to be sawed off, so as to expose the origin of the bud as much as possible. The inspection of it was not decisive, as the lip was the growth of one year only, and the bud seemed rather to have come from the interior of the wood.

On the 30th of the same month, I observed in my walks an Elm-tree of about eight or nine inches in diameter, and twenty feet

feet in height, the stem of which had been wounded some years ago, by a portion of its bark having been stripped off to the extent of about ten inches in length by five or six in breadth, and at about a foot and a half from the ground. On the edges of this wound was formed a lip of new bark and wood, narrowing its extent, and forming a margin of between two and three inches in breadth. The surface of the lip was marked with ridges and furrows indicating a growth of at least three years; and from the last and innermost ridge there had issued two shoots of several inches in length in the course of the preceding summer. Now it was to be inferred, that these shoots could not have originated in, nor proceeded from, the pith or central layers of wood, because the vitality of the outer layer had been destroyed by means of its exposure to the atmosphere, in consequence of the decortication of part of the trunk; so that it could no longer afford a passage for a centrifugal bud. Nor could these shoots have made their way to the place of their protrusion, from any given point in the sound part of the layer that was partially decorticated; because in that case the buds would have had to travel across the divergent layers, which there is no proof of their being able to do, or example of their having ever done.

On the 13th of October I caused a horizontal section, penetrating to a sufficient depth, to be made both above and below the shoots, and the portion between the sections to be extracted. The inspection of the extracted portion corroborated my inferences in every particular. The buds had no radiant nor radical connexion with the centre of the stem, as was evident from the intervening layer of dead wood, to which the bark and wood of the lip were indeed vegetably agglutinated, but not connected by a continuity of living growth. Beyond that layer the medullary rays began anew, and took a totally different direction. Hence it follows irresistibly, that the shoots in question originated merely in in the lip, and sprung from buds, which, if not formed by, were yet conveyed to, and deposited in, the alburnum through the medium or agency of the proper juice, without having ever been connected with the pith or central layers of the incipient stem, and without having been annually protruded towards the circumference through each successive layer of wood.

Thus the doctrine of Du Hamel and of Knight is established indisputably, at least to a certain degree, and corroborated by a new and irrefragable proof; whilst the deductions of the writer who combats it have been shown to possess less of the character of universality than we find to be claimed for them, and to rest upon an induction of particulars rather too limited in its extent. Particularly it has been shown by the above facts, that "an adventitious bud, or bud appearing on an old stem or branch," does not always "originate in a germ generated at the development of the stem or branch on which it appears," and that a plant may contain latent germs besides those which are annually carried outwards in a horizontal direction.

If it be said that the central origin of the bud, together with its horizontal protrusion, is the rule, the position will readily be admitted, at least with regard to the subjects already examined, and perhaps with regard to others also. Yet it is quite as important to know the exception, as to know the rule itself; because exceptions are the means which Nature has recourse to in extraordinary cases. It may be but seldom that buds are protruded in the way I have now stated, or that the shoots issuing from them are augmented into branches of any great importance. But the same thing may be said of buds issuing from the surface of a large trunk, even after having finished their horizontal course. They seldom attain to any great size, unless the stem is truncated, when the others would doubtless do the same; and it is those shoots only that are protruded in the first year

year of the stem's growth, before it has acquired anything of horizontal extent, that constitute the leading branches.

Still it may be said that the origin of the bud is not yet fully accounted for, as it is its path that has been traced and rendered visible rather than its source. If we are to trace buds to their earliest indications of existence, it will be necessary to go back to the seed. In many seeds the rudiments of buds may be discovered in the protuberance that is usually formed at the collar of the embryo plant*, at first a simple vesicle; afterwards, as germination advances, an enlarged globule; at last, in the matured shoot, a distinctly visible body; one or more buds crowning the shoot, some protruding from its surface, and many, as it appears, imbedded in the alburnum. How have they been generated? and how dispersed or distributed through the plant? Either we must suppose that the embryo plant contains already in miniature all the buds to which it can ever possibly give development, arranged, as we must also suppose, in a determinate order, and waiting only the occurrence of such conditions as shall afford the nutriment necessary to vegetable growth, and give dispersion or distribution to the buds by the general expansion of the whole. Or we must suppose that the bud or buds already existing in the embryo plant have the power of generating new buds, which the plant has the power of propelling to their appointed stations.

The first hypothesis, which is that of Leibnitz, is encumbered with many difficulties, as embracing the doctrine of the involution of all future generations in the first individual of the species;—thus, baffling the powers of the most acute imagination, and explaining nothing after all. It is indeed so thoroughly enigmatical as to stand but very little chance of being ever generally adopted. Yet if we embrace, without modification, the

* Keith's *Phys. Bot.* ii. 389.

doctrine

doctrine of the writer, who discards the hypothesis of Du Hamel and of Knight, I cannot see how we are to do without it; as he seems to acknowledge no movement of any individual bud beyond that which must arise from the general expansion of the whole shoot, excepting a horizontal movement. But if it has been shown that buds do occasionally issue from points on the surface of the stem, to which they could not possibly have come by any horizontal channel, then we shall be compelled to account for their appearance in some other way.

The second hypothesis is not without its difficulties, any more than the first; but it accounts much better for the anomaly in question. The impenetrable veil which overhangs the subject of generation, whether animal or vegetable, whether seminal or by a bud, conceals for ever from the observation of man the commencement of those recondite and mysterious processes by which the operation is effected, and leaves us no resource beyond that of watching its future results, and forming our opinions by inference. Hence the hypotheses of Du Hamel and of Knight, by both of which we have the means of conveying buds to every new layer of wood in all imaginable cases, not excepting even the case that I have now presented to the notice of this Society; and yet we need not confine ourselves to the precise terms or principle of either the one or the other. Du Hamel gives to the plant a profusion of what he calls pre-organized germs, but I do not recollect that he specifies their origin. Mr. Knight gives to the proper juice an unlimited capacity of forming and of dispersing buds,—which may be thought to be rather too gratuitous, particularly as his experiments do not so much prove that buds are formed by the proper juice, as that they are nourished by it. But if it is admitted that one bud has the capacity of generating others like itself, the difficulty is surmounted. Say that this process is effected by the bud or

 buds

buds lodged in the embryo plant, or protruding from the surface of the shoot, and the new formed bud, or rudiment of a bud, a minute, and insulated, and imperceptible globule or filament; there is nothing incredible in the supposition of its being carried upwards with the current of the ascending sap in its passage through the alburnum; or, of its entering even the plexus of the vessels of the inner bark, being again carried downwards with the current of the descending and proper juice, as well as ultimately deposited in a situation favourable to its future evolution. The necessity of accounting for the appearance of the bud and shoot that originated in the lip of the closing wound of the Elm-tree,—that is, in a new layer of alburnum that was spreading over the surface of an old and dead layer,—renders the adoption of this or of some such hypothesis indispensable. Not that the horizontal progression of the bud as a general rule is to be denied. The fact is established beyond a doubt. But that the exception to the rule must be accounted for also; and even upon the principle of the rule itself, I am not sure that the longitudinal progression of the bud may not be occasionally wanted, if it were but to bring buds up to the point of their horizontal protrusion.

If we admit the above process in the shoot of the first year, we shall have no difficulty in extending it to the shoots of future and succeeding years. The buds crowning the primary shoot or distributed over its surface, will evolve and develope their parts in the manner of the bud of the embryo plant; and the buds of future shoots, in the manner of those of the primary shoot; so that the growth of the primary shoot is an epitome of the growth of the whole plant; and that which illustrates the one will illustrate also the other. There may be error in our inferences: but if the microscopic observations, to which I have already alluded, are good for anything, we must believe that buds do actually ascend

ascend the stem either through the tubes of the medullary sheath, or through the tubes of the alburnum, or through both; and although botanists have hitherto had their doubts with regard to the accuracy of the observations in question, yet, after the novel and extraordinary views of Nature which have been opened up to us of late by a microscopical observer of undoubted ability and veracity, we must not be surprised at the wonders seen by others, nor discard their alleged facts without due examination.

XXII. *Observations on the Vicia angustifolia of the English Flora of Sir James Edward Smith, P.L.S. By Edward Forster, Esq., F.R.S. V.P.L.S.*

Read December 15, 1829.

Encouraged by the readiness always shown by our late revered President to listen to any suggestions made by me, though they were contrary to his own preconceived opinions, I venture to offer to the Linnean Society some remarks on the *Vicia angustifolia* of the *English Flora*, to which I have been led by perceiving a *Vicia* lately figured under that name in the *Supplement* to *English Botany*, for the continuation of which useful work the public are greatly indebted to the sons of the able coadjutor of Sir James Edward Smith. I trust the eminent botanists who have furnished and described the *Vicia*, n. 2614. of that publication, will receive the freedom of my statements with the same candour with which they would have been met by my late friend.

When, fortunately for the botany of Great Britain, the herbarium of Linnæus came into the possession of our founder, he very soon perceived that some few plants had been erroneously referred to the *Species Plantarum* of Linnæus, by Hudson in his *Flora Anglica*,—a book which is less consulted by authors of the present time than it ought to be,—for it is certainly a work of great merit, and it may fairly excite wonder that more misapplication of the Linnæan nomenclature does not occur in it.

It

It was ascertained by the examination of the herbarium, that the *Vicia lathyroides* of Hudson was not the plant intended by Linnæus, which in the first edition of the *Flora Anglica*, published in 1762, is referred to *Ervum soloniense*, and in the second edition of 1778 is placed as a variety of *Vicia lathyroides:* this was not improperly referred to *Ervum soloniense*, for it seems that *Vicia lathyroides* and *Ervum soloniense* are the same plant, (vide *English Flora*, vol. 3. p. 283.) Hudson's error consisted in calling the *Vicia sylvestris, sive Cracca major* of Ray, *Vicia lathyroides*, and in his second edition placing the *Vicia minima* of Rivinus, the true Linnæan *V. lathyroides*, as a variety. This being the case, Smith in his *Flora Britannica* and in *English Botany* published the *Vicia minima* of Rivinus, *Vicia minima præcox Parisiensium* of Dillenius in Ray's *Synopsis*, as the *V. lathyroides* of Linnæus. So far he did well: but finding that Linnæus in his *Species Plantarum* had placed the *Vicia semine rotundo nigro* of Bauhin's *Pinax*, which is the *Vicia sylvestris, sive Cracca major* of Ray, together with *Vicia folio angustiore, flore rubro* of Dillenius, as one variety of *V. sativa*, accompanied with an observation, "Varietas β. foliis angustioribus sublinearibus;" and also finding that the first of these is in the herbarium pinned to the *sativa*, marked H. U. (*Hortus Upsaliensis*), he followed his great master in continuing both these plants as varieties of that species. Subsequently, however, he was induced by the observations of the late Thomas Furly Forster "to re-examine the matter;" and accordingly in the *English Flora* he has adopted the *Vicia sylvestris, flore ruberrimo, siliqua longa nigra* of Ray, or the *Vicia folio angustiore, flore rubro* of Dillenius, as a species, under the name of *Vicia angustifolia*, stating it to be the *V. angustifolia* of Sibthorp, but not of Roth, or Willdenow, or Rivinus; to this he was led by a specimen in his own herbarium, received from Sibthorp, which specimen evidently is the *Vicia sylvestris*,

sylvestris, flore ruberrimo, siliqua longa nigra; but it may be doubted whether Sibthorp distinguished the two plants; for his specific character, as well as his reference to Roth and Rivinus, belong to one, and the synonyms of Ray and Hudson to the other. We still, however, unfortunately find the *Vicia sylvestris, sive Cracca major* remaining in the *English Flora* as a variety of *V. sativa*.

Having continued to pay attention to this subject ever since the separation of the true Linnæan *V. lathyroides* from that of Hudson, I have remained steady in my opinion, that the *V. sativa β.* of Linnæus and Smith is specifically distinct from the cultivated Vetch, though I allow their great affinity.

Having an opportunity of examining the truly invaluable herbarium now deposited in the Museum of this Society, I conceive with Professor Hooker, that it must be satisfactory to the British botanist to know what is the *Vicia angustifolia* of the *English Flora*, and therefore I have been induced to make these observations and to submit the following arrangement, though in so doing I stand opposed to Linnæus, Smith, and Hooker; yet I feel confident, supported as I am by the accurate Ray, the laborious Hudson, together with Roth, and a host of authors ancient and modern: indeed, I have in some measure the sanction of my friend Borrer, who, by presenting the *Vicia*, n. 2614. of *English Botany* to be figured as *V. angustifolia*, clearly takes it away from *V. sativa*, though he was not aware that it is not the *V. angustifolia* of the *English Flora*, but the *V. sativa β.* of that work, and the *V. angustifolia* of Roth and Willdenow.

It being an invariable maxim with me never to swerve from the good practice of keeping the trivial name of the first author who established the species, since the reformation of the botanical nomenclature by Linnæus, I am reluctantly obliged to adopt that of *angustifolia* from Roth, and therefore to give some other

other to the *V. angustifolia* of Smith*. I do not call it *nigra*, though so designated by Linnæus as a variety, because he included two plants of the old botanists under his *β. nigra;* and as the rule has never been considered absolute when the name was only that of a variety, I conceive it right to follow Roth, who has taken a much older, and certainly a much better name, though perhaps it is one which is still more applicable to the species to which it is given by Smith.

1. Vicia sativa.

V. leguminibus subsessilibus binatis erectiusculis, foliolis elliptico-oblongis; inferioribus retusis, stipulis dentatis notatis, seminibus globosis lævibus.

V. sativa. *Linn. Sp. Pl.* 1037. *Huds. Fl. Angl. ed.* 1. 278. *ed.* 2. 318. *Sm. Fl. Brit.* 769. *Engl. Bot. v.* 5. *t.* 334. *Engl. Fl. v.* 3. 281. *Willd. v.* 3. 1104. *Hook. Fl. Scot.* 215. *Pers. Syn. v.* 3. 307. *DeCand. Prod. v.* 2. 360.

Vicia. *R. Syn. ed.* 1. 129. *ed.* 2. 188. *ed.* 3. 320. *Hist. v.* 1. 900. *Dod. Frum.* 134. *Pempt.* 530. *Riv. Tetrap. Irr. f.* 54. *Ger.* 1052. *f.* 1. *Ger. Em.* 1227. *f.* 1. *Lob. Ic. v.* 2. 75. *Camer. Epit.* 320. *Trag. Hist.* 624. *Lyte Herb.* 483.

V. vulgaris sativa. *Bauh. Hist. v.* 2. 310. *Park.* 1072.

V. vulgaris, semino nigro. *Bauh. Pin.* 344.

V. major sativa vulgaris. *Mor. Ox. v.* 2. 62. *sect.* 2. *t.* 4. *f.* 12.

β. "V. sativa vulgaris semine albo. *Bauh. Pin.* 344." *Huds.*

Anglis Vetch or Tare.

Habitat. On the margins of cultivated fields, self-sown, but not a native.

It does not appear that this is a native of Europe. In the

* I am sorry to observe some botanists of the present day totally regardless of this act of justice, adopting without scruple and without reason, the name given by any modern author who happens to be in fashion.

Smithian

Smithian herbarium there is a specimen marked "Tangier, M. Durand, 1503," but no note whether cultivated or indigenous. I do not understand the variety β. which I have inserted from Hudson; it cannot be the Summer Tare, for the seeds of that as well as of the Winter Tare are black: these differ in habit, the summer variety coming up erect, whereas the winter variety is more procumbent, a circumstance deserving the attention of botanists.

2. Vicia angustifolia.

V. leguminibus subsessilibus subbinatis, foliolis lineari-lanceolatis; inferioribus obcordatis, stipulis dentatis notatis, seminibus globosis lævibus.

V. angustifolia. *Riv. Tetrap. Irr. t.* 55. *Roth. Germ. v.* 1. 310. *v.* 2. 186. *Willd. v.* 3. 1105. *Ehrh. Herb.* 57. *Engl. Bot. Suppl. f.* 2614. *Pers. Syn. v.* 2. 307.

V. lathyroides. *Huds. Fl. Angl. ed.* 1. 279. *ed.* 2. 318. (excluding the synonym of *Herm. Parad.* 242, which belongs to *V. lathyroides* Linn.). *Relh. Cant. ed.* 1. 274.

V. sativa β. nigra. *Linn. Sp. Pl.* 1. 1037.

V. sativa β. *Sm. Fl. Brit.* 770. *Engl. Fl. v.* 3. 281. *Relh. Cant. ed.* 2. 281.

V. sativa δ. angustifolia. *DeCand. Prod. v.* 2. 361.

Vicia. *Matth. Valg. v.* 1. 501.

V. sylvestris, sive Cracca major. *Raii Syn. ed.* 1. 129. *ed.* 2. 188. *ed.* 3. 321. *Hist. v.* 1. 902. *Lob. Ic. v.* 2. 75. *Ger. Em.* 1227. *f.* 4; and Johnson's additional remarks, excluding Gerarde's own description, and his English name of Strangle Tare or Tine.

V. vulgaris sylvestris, semine parvo et nigro, frugum. *Bauh. Hist. v.* 2. 312.

V. semine rotundo nigro. *Bauh. Pin.* 345.

V. sylvestris, semine nigro et variegato. *Moris. Ox. v.* 2. 63. *sect.* 2. *t.* 4. *f.* 11.
Aphaca vera, Vicia Matthiolo. *Dalech. Hist.* 478.
Arachus. *Lyte's Herb.* 483.
Arachus, seu Cracca major. *Park.* 1071.
Craccæ primum genus. *Dod. Frum.* 161. *Pempt.* 542.
Anglis Wild Vetch.

Habitat. In dry pastures and cornfields, common.

Confusion seems to have taken place very early in regard to this species; for in Gerarde's own edition of his *Herball*, the *Vicia sylvestris*, Strangle Tare, Tine or Wild Fetch, can scarcely be intended for it, the figure being totally unlike it, resembling *Ervum hirsutum*, to which his description is more applicable. "Strangle Tare, called in some countries Tine, and of others Wilde Vetch, is a ramping herbe like unto the common Tare, ramping and climing among corne where it chanceth, that it plucketh it downe to the ground, and overgroweth the same in such sort, that it spoileth and killeth not onely Wheate, but all other graine whatsoever: the herbe is better knowne than desired, therefore these few lines may serve for the description." This is probably taken from Dodoens, who in his *Historia Frumentorum Leguminum Palustrium et Aquatilium Herbarum ac eorum quæ eo pertinent*, printed in 1569 under *Craccæ alterum genus*, has an excellent figure of *Ervum hirsutum*, with the following observation: "Provenit utrumque vicium una cum segetibus, quibus cœli statu humido admodum perniciosum est, tunc enim cito incrementum sumens confestim segetem præoccupat, teneramque pertinaci vinctu crebrisque circumvolutionibus, deorsim trahit, delapsamque erigi non patitur ac calamitosam ipsam efficit." Johnson in his edition of the *Herball* has erroneously changed the figure of *Vicia sylvestris*, adding,

"*sive*

"*sive Cracca major*" to the name, and substituting the very block of Dodoens's *Craccæ primum genus*, which is generally supposed to be *Vicia angustifolia*; and from the breadth of the leaflets I have been induced to refer to it as such, notwithstanding that the pods are solitary.

Lyte in his *Niewe Herball, or Historie of Plants*, 1578, which is a translation of a French version of the *Cruydeboeck* of Dodoens, has this plant: the figure it is true is not very good, and is the same as Turner in his *Herball*, 1568, puts for the cultivated Vetch; yet his description leaves no doubt on the subject: "Arachus is much lyke to the Common Vetche, in stalkes, leaves, and coddes, but in all these much lesse. The stalkes be tender, weake and slender, with cornered trayles or square crested edges. The leaves are spread abroade like the other Vetche, but cloven and parted above at the endes, into two or three clasping tendrelles. The flowers be smal, of a light purple, or incarnate colour, and do growe uppon the stalke selfe, as the flowers of beanes or common Vetches do, without any foote stalkes. The coddes be small, long and narrowe, wherein is couched sixe or seven seedes of a blackishe colour, harde and smaller than Vetches."

John Bauhin observes: "A Viciâ sativâ semine potissimùm differre videtur, quòd admodùm parvum et rotundum, copiosum (ad octona eximere memini) in siliquis angustioribus, longioribus, magisque teretibus, quàm viciæ sepium, minus hirsutis et ferè glabris, quæ siccæ nigrescunt."

Ray says: "Hujus speciem seu varietatem majorem observavimus (ego et D. Dale) in marginibus agrorum quorundam supra molam fullonicam Bockingæ in Essexia." What this is I know not. Then follows in another paragraph, copied from his edition of 1690, in which the discovery of the large variety is not noticed: "Viciæ sativæ similis est; flores habet pulchrè

 purpureos,

purpureos, umbilico albo, ad singulas foliorum alas plerumque binos raró ternos, in solo steriliore singulos duntaxat; siliquas longas, teretiusculas, rectas, semina octo aut decem continentes, ex fusco- et luteo-viridi varia, non penitus nigra, prout ea describit J. Bauhinus. Variat ergo seminum colore." The difference from *Vicia sativa* is also pointed out in Ray's *Historia Plantarum*.

Hudson, who it must be remembered includes *Vicia angustifolia* Roth, *V. angustifolia* Smith, and *V. lathyroides* Linn., remarks: "variat foliis imis obcordatis, retusis et obovatis, superioribus linearibus et lanceolatis, quaternis, senis, octonis, et subinde denis; floribus solitariis et geminis; stipulis maculatis, nimis affinis Viciæ sativæ.

3. Vicia Bobartii.

V. leguminibus subsessilibus solitariis, foliolis linearibus; inferioribus obcordatis, stipulis dentatis notatis, seminibus globosis lævibus.

V. angustifolia. *Sm. Eng. Fl. v.* 3. 282. *Spreng. Syst. v.* 3. 264 (excluding the reference to *Roth*). *Sibth. Ox.* 224 (excluding the synonyms of *Roth* and *Rivinus*).

V. angustifolia β acuta. *Pers. Syn. v.* 2. 307.

V. lathyroides. *Dicks. Hort. Sicc. fasc.* 4. 12.

V. lathyroides β. *Huds. Fl. Angl. ed.* 1. 279. *ed.* 2. 319.

V. sativa γ. *Sm. Fl. Brit.* 770.

V. sylvestris, flore ruberrimo, siliquâ longâ nigrâ *D. Bobart. Raii Syn. ed.* 2. 188. *ed.* 3. 321.

V. folio angustiore, flore rubro. *Dill. Giss. App.* 47.

V. vulgaris, acutiore folio, semine parvo nigro. *Bauh. Pin.* 345.

Habitat. On heaths and in pastures, on a gravelly or chalky soil.

I apprehend the following remark of John Bauhin applies to this plant: "Huic" (*V. angustifolia* Roth) "affinis, si non eadem,

eadem, angustissimis foliis ac tenuissimis, longiusculis, flore pulchro, purpureo, à me reperta, cum essem Monspelii, inter saxa."

So also Ray: "An eadem præcedentis speciei? Varietatis secundæ."

I have arranged this as a species in deference to the great authority of Smith rather than from my own judgement, being, with John Bauhin and Ray, inclined to doubt whether it be right to do so. As the name of *angustifolia* is already applied, I have called it *Bobartii*, in honour of Bobart, whose name Ray has taken, and who was probably the discoverer of it in Oxfordshire *.

Whether it be considered as a species, or only a variety of *V. angustifolia*, I hope the Editors of the *Supplement to English Botany* will give a figure of it in a future number, the *V. sativa* and *V. angustifolia* being now well represented in that work.

4. Vicia lathyroides.

Of this species I have nothing to remark, except that *Vicia lathyroides purpureo-cœruleis floribus*, *Herm. Parad.* 242. *t.* 242. *Raii Hist. v.* 3448. ought to be added to the synonyms, and not referred to *V. angustifolia*. Hermann, whose figure and description are excellent, received it from Scotland, sent to him by Sutherland. Ray inserts it in his *Historia Plantarum*, *v.* 3. copying the description from the *Paradisus*.

I cannot close these remarks without expressing my regret, that in the *English Flora* the synonym of Ray, *V. luteo flore sylvestris* is removed from *Vicia lutea* to *Vicia hybrida*. Having, with many other botanists, gathered *V. lutea* on Glastonbury

* As the elder Bobart, the first supervisor of the Oxford Garden, died in 1679, and this plant is not mentioned in the first edition of Ray's *Synopsis*, it was probably his son and successor in the care of the garden whose name Ray has adopted.

Tor-hill,

Tor-hill, it seems probable that it was this species which Ray intended, though we have the evidence of a specimen in the Smithian herbarium, marked "from Glastonbury Tor, Somerset, A. B. Lambert, Esq.", that *Vicia hybrida* has also been discovered there. *V. lævigata* is likewise well authenticated by specimens from the same gentleman, found near Weymouth. I have never seen the latter growing; but from the specimens in the above-mentioned herbarium it appears to me that *V. lutea*, *V. hybrida*, and *V. lævigata* agree in general habit, differing only in the vexillum and legumen, both of which in *V. hybrida* are hairy, and in *V. lævigata* smooth, whereas in *V. lutea* the vexillum is smooth and the legumen hairy. The *V. lævigata* appears to be unknown to foreigners, though discovered in this country many years since, and mistaken by Hudson for *V. hybrida*. There are native specimens in the Banksian herbarium, from Portland Island, gathered by Lightfoot in 1774.

XXIII. *On*

XXIII. *On a new Species of Wild Swan, taken in England, and hitherto confounded with the Hooper. By William Yarrell, Esq. F.L.S.*

Read January 19, 1830.

It is now about six years since I prepared and preserved the trachea and part of the bones of a young Wild Swan, shot in this country, which, possessing peculiarities I had never observed in the bones of the Hooper at any age, induced me to believe it would prove to belong to a distinct species.

At the sale of part of the valuable Museum of Joshua Brookes, Esq., I became possessed of the sternum and trachea of a Wild Swan which had been prepared by Dr. Leach, and presented by that distinguished naturalist to Mr. Brookes; this also, from its anatomical structure, appeared to be distinct from that of the Hooper, and is now ascertained to belong to an adult bird of the same species as the bones of the young one just mentioned.

I was presented in December last, by I. B. Baker, Esq., with the sternum and trachea of a third example of this new species, shot at Yarmouth during the winter of 1827-28, and of which I had an opportunity of examining the skin while under preparation for mounting for that gentleman's collection at Hardwicke Court.

In age and consequent developement of structure, this third example was intermediate between the two I at that time possessed, and proved a valuable addition.

During the late severe weather, Wild Swans were unusually numerous.

numerous. More than fifty were counted in one flock at Wittlesey-mere. Among a considerable number which have been forwarded to the London markets for sale, I have been most unexpectedly fortunate in securing five examples of this new species, of different ages; and possessing thus a series of gradations in structure, which it is the object of this memoir to describe, I have no doubt of proving them to belong to a species entirely distinct, though hitherto confounded with our more common winter visitor the Hooper; ornithologists having as yet admitted but one species of Wild Swan in their systematic catalogues of European Birds.

In size the new species is one-third smaller than the Hooper at the same age. The plumage is first grey, afterwards white, tinged with rust-colour over the head and on the under surface of the belly, and ultimately pure white. The beak is black at the point, and orange-yellow at the base; this last colour appears first on the sides of the upper mandible, and afterwards covers the upper surface in front of the forehead, to the extent of three quarters of an inch, receding from thence by a convex line to the lower edge of the mandible at the gape; the nostrils are oblong and open; the irides orange-yellow; the wings have the second and third primaries the longest and equal, the first and fourth half an inch shorter than the second and third, and also equal; the tail consists of eighteen feathers, graduated, cuneiform; the legs, toes, and claws, black.

In anatomical structure the new species differs much more decidedly from the Hooper than in its external characters. The principal difference is in the trachea, which forms one of the best distinctions in the separation of nearly allied species throughout this numerous family.

The tube of the wind-pipe is of equal diameter throughout, and descending in front of the neck enters the keel of the sternum, which is hollow as in the Hooper, traversing its whole length.

length. Having arrived at the end of the keel, the tube then gradually inclining upwards and outwards passes into a cavity in the sternum destined to receive it, caused by the separation of the parallel horizontal plates of bone forming the posterior flattened portion of the breast bone, and producing a convex protuberance on the inner surface. The tube also changing its position from vertical to horizontal, and reaching within half an inch of the posterior edge, is reflected back after making a considerable curve, till it once more reaches the keel (Tab. XXV. Fig. 3.), again traversing which, in a line immediately over the first portion of the tube, it passes out under the arch of the *os furcatorium*; where turning upwards and afterwards backwards, it enters the body of the bird to be attached to the lungs in the usual manner (Tab. XXIV. Fig. 1.). This is the state of developement in the most perfect bird I have yet met with. The degree next in order below, differs in having the horizontal loop of the trachea confined to one side only of the cavity of the sternum, both sides of which cavity are at this time formed, but the loop of the tube is not yet sufficiently elongated to occupy the whole space (Tab. XXV. Fig. 2.); and the third in order, being that of a still younger bird, possesses only the vertical insertion of the fold of the trachea (Tab. XXV. Fig. 1.); yet even in this specimen the cavity in the posterior portion of the sternum already exists to a considerable extent, and will be observed to be more capacious on that side to which, judging by the preceding example, the loop of the trachea is first to be determined.

These are the peculiarities of structure which belong to the tube and sternum. The bronchiæ are very short; but the flexible part intervening between the bone of divarication and the bronchial rings is considerable, producing an effect to be hereafter noticed. This elongated, flexible, and delicate portion,

 being

being defended on each outer side by a distinct membrane, attached to the whole edge of the bone of divarication; and posteriorly to a slender semicircular bone on each side, by which it is supported. The muscles of voice with which this bird is provided, pass down, as usual, one on each side of the trachea till the tube is about to enter the cavity in the keel, they then quit that part of the tube to be attached to the ascending portion of the curve, which they follow, ultimately branching off a little short of the bone of divarication to be inserted upon each side of the sternum (Tab. XXIV. Fig. 1. & 2. Letters *d. d. d*).

The stomach, a true gizzard, is only half as large as the same part in the Mute Swan, and one-third less than that of the Hooper; the intestinal canal is uniform in calibre, coiled up in seven oblong folds, measuring from the pylorus to the end of the rectum ten feet two inches, with two cæca of ten inches each.

In their general external appearance, the Hooper and this new species are similar; and that they have been so long confounded together is probably owing to the circumstance that the Hooper, when first gaining its white plumage, is but little larger than the adult bird of the new one. The head of the new species is however shorter, and the elevation of the cranium greater, in proportion to the size of the head; the beak narrow at the middle, and dilated towards the point. The wings when closed do not extend quite so far beyond the roots of the tail feathers; the tail itself is somewhat more cuneiform; and the toes appear shorter in proportion to the length of the tarsi. In the Hooper, the sides of the beak are parallel, the bright yellow colour at the base of the upper mandible extends along each outside edge even beyond the line of the nostrils, and occupies a much larger space comparatively than in the new species. But the following relative measurements of the

the oldest and most perfect specimen of each sort I have been able to procure during the present winter, exhibit the real distinctions in a manner not to be easily mistaken.

	New species.		Hooper.	
Weight	$13\frac{3}{4}$ lbs.		24 lbs.	
	Ft.	Inch.	Ft.	Inch.
Point of the beak to the end of the tail	3	9	5	0
Width with wings extended	6	1	7	10
Point of beak to the edge of the forehead	0	$3\frac{1}{2}$	0	$4\frac{3}{8}$
——————— eye	0	$4\frac{3}{8}$	0	$5\frac{1}{4}$
——————— occiput	0	$6\frac{1}{4}$	0	$7\frac{1}{4}$
Carpus to the end of the primaries . .	0	$20\frac{1}{2}$	0	$25\frac{1}{2}$
Tail feathers in number	18		20	
Length of tarsus	0	$3\frac{3}{4}$	0	4
——— middle toe	0	$5\frac{1}{4}$	0	$6\frac{1}{2}$
——— intestines	10	2	12	0
——— cæca	0	10	0	11
——— breast bone	0	$6\frac{3}{8}$	0	$8\frac{1}{2}$
Depth of insertion of the trachea within	0	$5\frac{3}{4}$	0	3
Length of bronchial tubes	0	$1\frac{1}{2}$	0	$3\frac{1}{2}$

The anatomy of the Hooper is too well known to require further notice, except on some points of comparison. The fold of the trachea confined within the keel, never departs from the vertical position in this species at any age; nor have I ever seen, in the oldest examples, the slightest appearance of excavation in the sternum itself. In the new species, on the contrary, the trachea will always be found to have assumed the horizontal direction in old birds; and even when young, the sternum is excavated to a greater depth ready to receive the fold of the trachea, to be developed at a subsequent period. The depth of the insertion of the fold of the trachea in the old

 Hooper

Hooper is but 3 inches in a breast bone of $8\frac{1}{2}$ inches in length; while the depth of insertion in the new species is $5\frac{3}{4}$ inches in a breast-bone of only $6\frac{3}{8}$ inches. The bone of divarication, placed perpendicular to the base of the sternum, is in the adult birds of both these species of the same height, that is, $1\frac{1}{8}$ of an inch from top to bottom, and is therefore much larger in proportion in the new species; in this bird also it is considerably convex on each outside. The bone of divarication in the Hooper is compressed, and the membrane connecting this bone with the bronchial rings is not provided with the semicircular bone and membrane which so remarkably assists in sustaining and protecting the same delicate structure in the new one.

The bronchial tubes in the Hooper are invariably long; those of the new bird are as invariably short; but the arrangement of the muscles of voice, and the beautiful manner in which the inner ascending curve of the trachea is supported by a tendinous fascia (as shown at TAB. XXIV. Fig. 2.), are the same in both birds.

By a paper in the *Philosophical Transactions*, vol. 56. p. 204. it appears, that a wild Swan of this new species, brought alive from Philadelphia, but which died soon after, had been dissected by Dr. Parsons, but without considering it to be distinct from the Hooper.

Hearne met with both species of our Wild Swans at Hudson's Bay, and the following two short extracts from the published account of his "Journey to the Northern Ocean" refer particularly to this subject.

"Swans.—There are two species of this bird that visit Hudson's Bay in summer; and only differ in size, as the plumage of both are perfectly white, with black bill and legs. The smaller sort are more frequent near the coast, but by no means plentiful, and are most frequently seen in pairs, but sometimes single, probably

probably owing to their mates having been killed on their passage north."

"The windpipes of both these species are found to be exactly alike, though their note is quite different. In serene evenings, after sun-set, I have heard them make a noise not very unlike that of a French-horn, but entirely divested of every note that constituted melody. The voice of the larger is much harsher and louder than that of the smaller."

If we consider these Swans to be identical with our birds, of which there can be but little doubt, it is difficult to account for the statement here made, that the windpipes of the two species were found to be exactly alike; except by supposing, either, that the object of the Indians in obtaining these Swans being a lucrative traffic in the feathers and skins, only external examination of the denuded bodies of the birds took place, when the tracheæ of both would be seen to enter the hollow keel in the same manner; or, as the birds of the new species attain their white plumage before the trachea assumes the horizontal direction and insertion, and as old birds are known to be most difficult of approach by the hunter, such Swans only of the rarer sort were examined, as exhibited when the breast-bone was cut into, merely the vertical insertion of the trachea common to the Hooper.

The difference in the voices of the two species will be accounted for on the principles assumed in the description of the organs of voice in birds. The large and irregular calibre of the tube in the Hooper produces the loud and harsh sound; the superior quality of tone, and increased power of modulation in the new species, are owing to the smaller and more uniform tube, and greater flexibility of the bronchiæ. The new bird appears to frequent all the localities common to the Hooper.

From an article on the Hooper in the Supplement to the

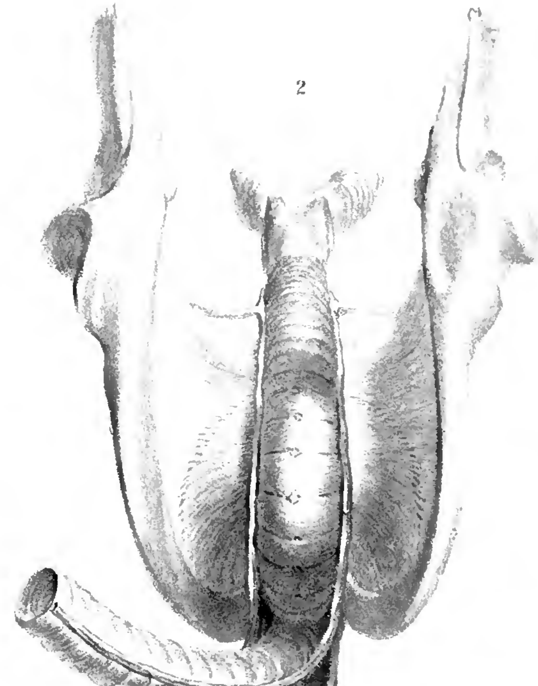
Ornithological

Ornithological Dictionary, it appears Mr. Montagu considered the structure of the trachea in the new species, which he has accurately described, as the sexual distinction of the male Hooper, and the figure in Dr. Latham's paper, as representing the form common to the female; but this assuredly is not the case. Dr. Latham, M. Temminck, and others who have described the tracheal structure of the Hooper, have stated it as common to both sexes of that bird, and my own multiplied observations confirm the fact. I have examined males and females of both species.

Several examples of this new species are now ascertained to be in British collections. The Museum of the Cambridge Philosophical Society contains one. There is one in the possession of Edward Lombe, Esq. of Great Melton, who has an excellent collection of British birds. A third was shot in the winter of 1827-28 by Colonel Hawker. These three were preserved by Mr. Leadbeater. A specimen was also killed in February 1829 near Haydon Bridge, upon which bird some remarks have been lately made before the Natural History Society of Newcastle, by Mr. Richard Wingate of that town. I have also had the pleasure of presenting three specimens, which furnished part of the materials for this paper, to the collections of the British Museum and the Linnean and Zoological Societies.

It is my intention, and on this occasion I anticipate the accordance of every British naturalist, to devote this species, which, I trust, I have proved to be distinct and unnamed before, to the memory of our late unrivalled engraver on wood, the justly celebrated Bewick. The instruction and gratification which thousands have derived from the beautiful and animated delineations of this most faithful illustrator of Nature, in all her varied scenes and objects, entitle him to this tribute; and I rejoice in the opportunity this new species affords me of attaching

2



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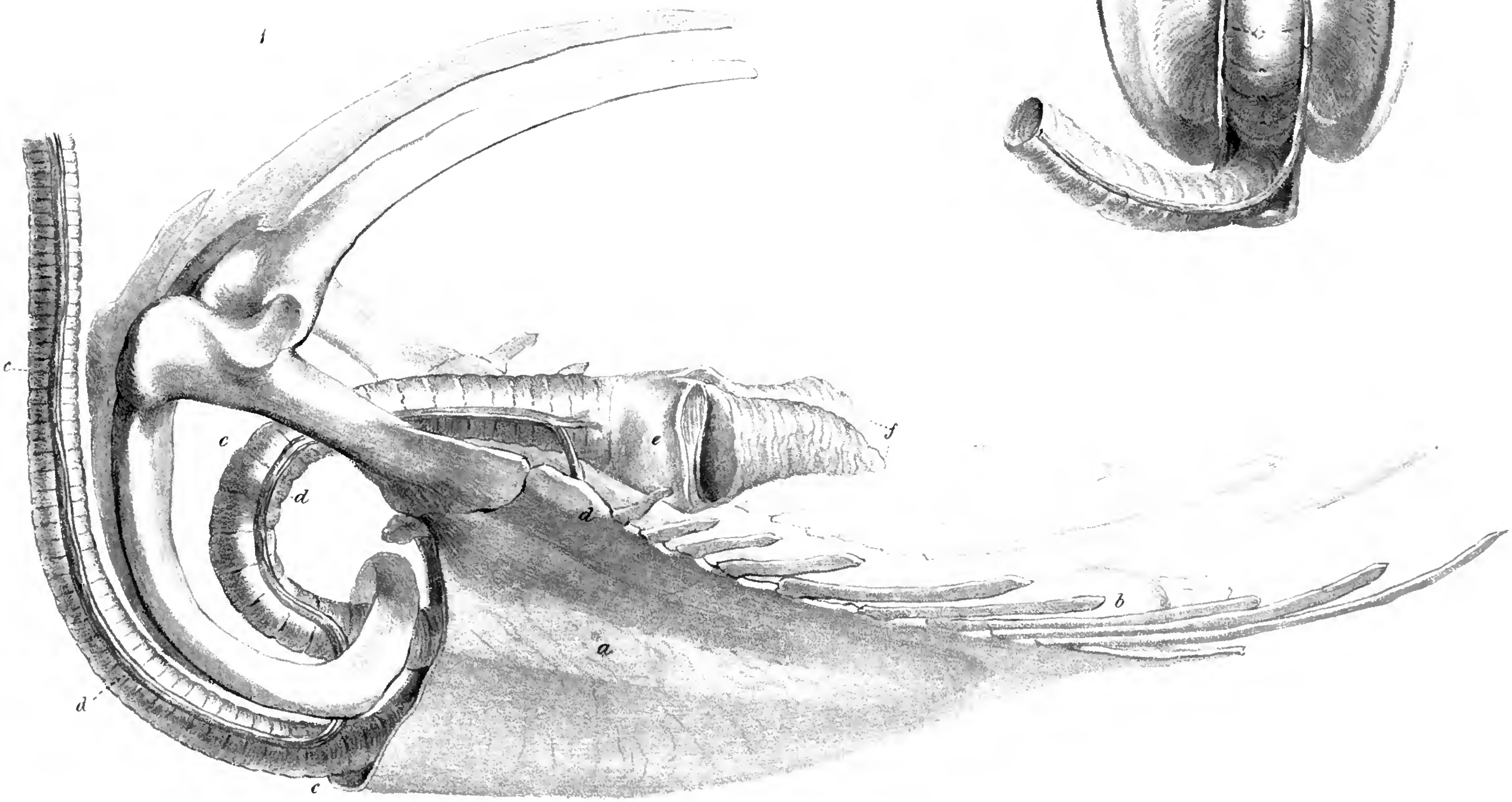

J. H. Newton del.t G. Scharf lith

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ing his imperishable name to so valuable and interesting an example among his own most admired and favourite subjects.

Ordo. NATATORES. *Illiger.*

Fam. ANATIDÆ. *Leach.*

Genus. CYGNUS. *Meyer.*

Bewickii. C. rostro semicylindrico atro, basi aurantiacâ, corpore albo, caudâ rectricibus 18, pedibus nigris.

And the better to distinguish the *Anas Cygnus* (*ferus*) of Linnæus, I venture to propose the following specific character:

——*ferus.* C. rostro semicylindrico atro, basi lateribusque (his ultra nares) flavis, corpore albo, caudâ rectricibus 20, pedibus nigris.

EXPLANATION OF THE PLATES.

TAB. XXIV.

Fig. 1. Side view of the sternum and trachea of Bewick's Swan. *a.* The keel; *b.* sternum; *c, c.* trachea; *d, d.* muscles of voice; *e.* bone of divarication; *f.* bronchiæ.

2. Front view of the same part, the anterior portion of the trachea turned aside to show the inner ascending part of it, the muscles of voice, and the tendinous fascia by which both are supported.

TAB. XXV.

Fig. 1. Upper surface of the sternum of a young bird.

Fig. 2.

Fig. 2. Upper surface of the sternum of an older bird, showing the loop of the trachea occupying one side of the cavity only. Part of the slender plate of bone being cut away.

3. Upper surface of the sternum of an adult bird, the cavity wholly occupied by the loop of the trachea. Part of the plate of bone being also cut away.

All the representations are one-fourth less than the natural size.

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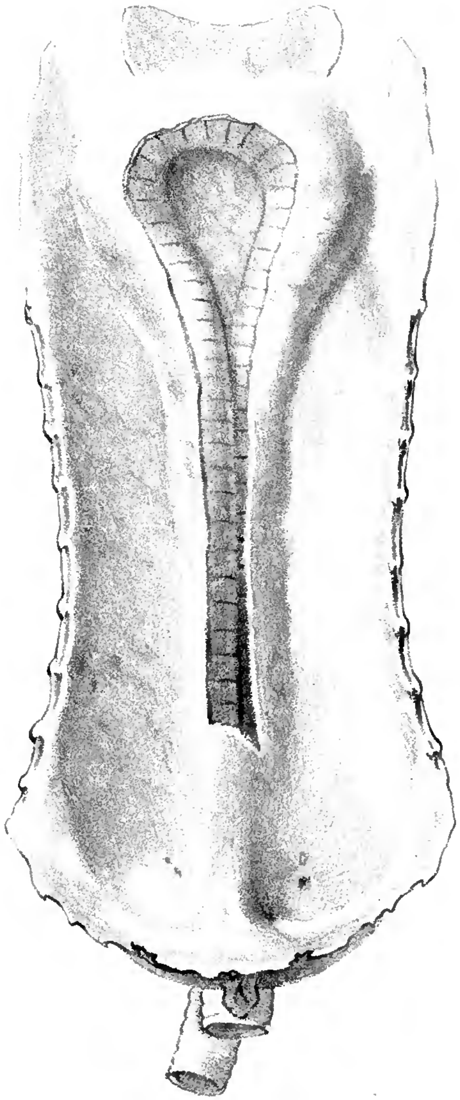

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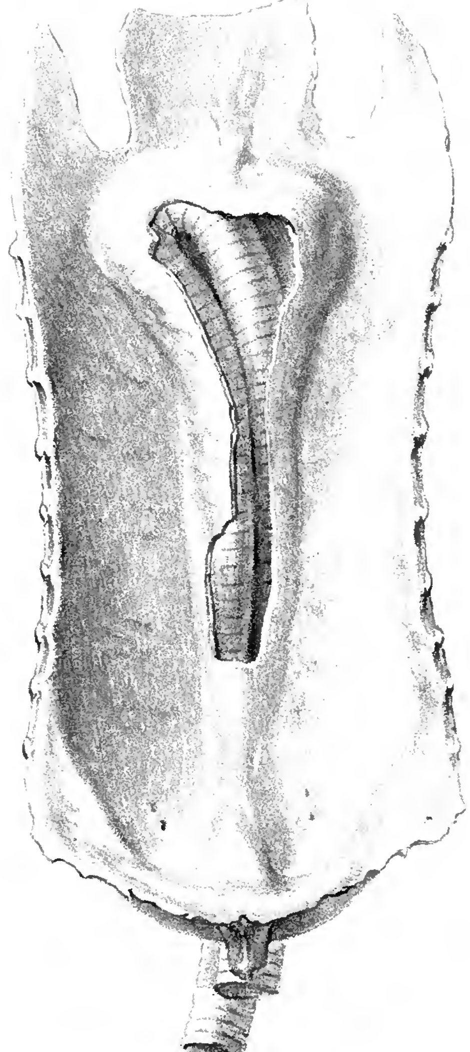

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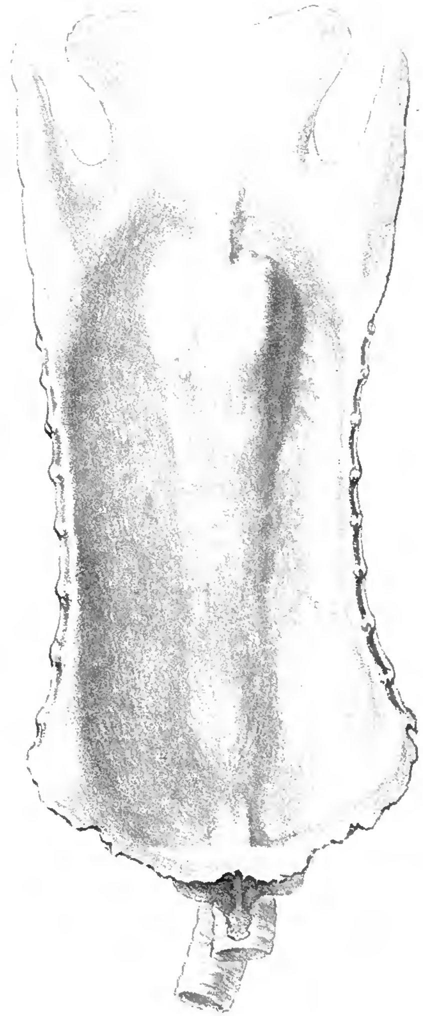

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XXIV. *A further Description of the Anatomy of the Mammary Organs of the Kangaroo.* *By John Morgan, Esq., F.L.S.*

Read April 6, 1830.

HAVING upon a former occasion presented the Society with a description of certain changes which take place in the structure and functions of the mammary organs of the Kangaroo, during the period of approaching puberty, as well as during several different periods of gestation ; I now beg leave to offer a few additional facts relative to the anatomy of these parts, which I have recently been made acquainted with, by a dissection of a much younger animal than any that I had previously examined.

It will be recollected, that in my former communication I described the anatomical peculiarities which I had met with in the mammæ of the adult, and in those of the half-grown animal. I then stated that in the pouch of the adult and impregnated kangaroo, we always find four distinct and perfectly formed teats, two being placed on either side, one above the other ; and that each of the four teats is attached to its respective mammary gland : whilst in the younger and unimpregnated animal (when nearly approaching the age of puberty) only two of the four adult teats can be discovered ; these being the upper on each side. I pointed out the mode in which the two lower ones became developed : viz. by the protrusion and eversion of membranous cylindrical canals imbedded in the interior of the lower mammary glands. Each of these canals was described as terminating at one extremity by an open mouth upon the surface of the skin, the opposite end of the tube being closed by a papillary projection (the future nipple). The lining membrane of that tube was represented as forming a sort of pouch from its reflection over this papillary termination. Thus in the development of the inferior teats on each side, the membranous tube or canal becoming everted from the protrusion of the imbedded nipple through its external opening, its lining membrane must necessarily be turned inside-out to form a cutaneous covering for the protruded teat. This process of eversion, which is somewhat similar to the replacement of an inverted finger of a glove, is peculiar to marsupial animals.

In the paper to which I refer, I have also stated that the inferior mammary glands on each side are very much larger than the upper ones; that the young of the animal when first received into the pouch is invariably found attached to one of the two lower teats; and that the milk during the whole period of suckling is furnished by the inferior mammæ. The upper teats, which I had found perfectly developed in the half-grown subject, were compared to those supernumerary organs of the same kind which are so frequently met with in other mammiferous quadrupeds. I have thought it necessary to refer thus far to my first paper on this subject, in order to render the details of my present communication more clearly understood. In the month of October, 1828, I obtained a living female kangaroo, the pouch of which contained a young one still adhering to the marsupial teat, the size of the young at the time being about equal to that of a small rat; its skin was entirely destitute of hair, of a light flesh colour, and constantly lubricated by a viscid moist secretion of a brownish red colour, which secretion was spread also over the whole of the interior of the pouch.

Since

Since I became possessed of this animal it has been my endeavour to overcome by domestication its natural timidity and shyness, with a view of being thus enabled to ascertain, by a very frequent examination of the interior of the pouch, some additional facts relative to the changes which are known to take place in the economy of its contents during different periods of gestation; since we can expect by such a mode of investigation alone to obtain any satisfactory information respecting the obscure process of parturition in marsupial animals. My attempts to domesticate the kangaroo have been completely successful, the principal obstacle with which I had to contend being the extreme timidity of the animal. I found, however, after it had been in my possession a few weeks, perfectly excluded from any object of alarm, and accustomed to feed from my own hand, that I was permitted, without any effort on the part of the animal to prevent me, to introduce my hand into the pouch, and to make, for as long a period as I could wish, and as frequently as I thought proper, the most complete examination of the young one within, and of the teat to which it was adherent.

After about six weeks the animal became completely familiarised, and would follow either myself or my servant about the lower part of my house like a dog.

As the young one had been already delivered into the pouch, my observations were of course confined to the condition of the pouch and teats during its growth: these may perhaps appear of a nature too trivial for the subject of a communication to the Society; yet, as we are at present so completely in the dark respecting the ultimate object of our researches,—namely a knowledge of the mode in which the fœtus is passed from the uterus to the teat,—and as it is therefore impossible to determine how far a few insulated facts my assist in bringing our

 inquiries

inquiries to a satisfactory termination, I am induced to state briefly the result of my observations, before I describe the anatomical peculiarities in the mammary organs, to which I have already referred, and which were made known to me by a dissection of the young animal in question.

In speaking of the reddish brown secretion of the pouch upon a former occasion, I stated that it was very much diminished, or altogether suspended, at the time the young animal is lodged within the part. I have now ascertained from repeated examinations, that in the unimpregnated state this secretion is always darker in colour, and more viscid in consistence than during gestation; that after the young has been brought into the pouch it becomes of a lighter red and more fluid, and that when the young has dropped from the teat and is perfectly covered with hair the secretion cannot be detected by its colour, although, from a slight moisture of the interior of the bag, it is probable that it still exists in an altered condition. Its use in lubricating the imperfectly formed animal and the cavity in which it is contained, as a means of preventing friction between the two, must be obvious to every one. After I was enabled to examine the pouch as freely as I wished, my first endeavour was to ascertain whether a marsupial animal so imperfectly formed, and in such an immature state, could be considered as existing in a condition analogous to that of the suckling young of other mammiferous quadrupeds. There can be no doubt that such is not the case when it is first attached to the teat; for then I have already shown, that in its state of imperfect organization its nourishment is injected by the mother through the teat into its adhering mouth, instead of being extracted by the young itself, as in the case of other mammiferous quadrupeds. I may also state, that when, in the very early periods of extra-uterine existence, the marsupial fœtus has been separated from the teat,

teat, its life has been destroyed in every instance which I have hitherto met with. It seems therefore fair to infer in such cases, that the organization and general condition of the marsupial young is intermediate between the state in which we find other classes of mammalia whilst inclosed in the uterus and after they have been brought forth; for it must be manifest, that in such cases the re-union of the lips of the immature animal to the separated teat is prevented by an absence of those powers of volition with which other newly born quadrupeds are invariably endowed. Numerous other arguments, which I need not now instance, might be brought forward in proof of the fact, that the first period of extra-uterine existence in marsupial animals is intermediate between the two states which I have just mentioned.

Now, as somewhat more than a mere matter of curiosity, it may be interesting to future inquirers to know at what period the re-union of a separated marsupial young one from the teat can be effected; since at that period it may be presumed that the immature animal is no longer receiving involuntarily the nourishment of the mother; and since we have reason to believe that it is at this time that the intermediate state of existence to which I have alluded will have ceased.

This can only be known by repeated experimental examinations, made by others whose opportunity must be much more extensive than my own; and for their information therefore I have to state, that I have repeatedly separated from its adherent teat the young of the kangaroo whilst perfectly naked and apparently blind, and at a time when its size was not equal to that of a large Norway rat; and that I have in more than one instance prevented a re-union for nearly two hours, with a view of ascertaining how far a *constant* supply of milk under such circum-

circumstances was necessary to the existence of this animal. The result of such experiments has proved to me, that in this advanced state it is decidedly a voluntary agent, and must be considered as having outlived any intermediate state of existence between fœtal and perfect life; for in all my experiments I found that the young one, at the age I have mentioned, was respiring, and capable of applying its mouth to the teat of the mother. At what earlier period the same artificial separation may be effected without destruction of its life, I must leave as a question for others to decide. In the beginning of February the young one was completely covered with hair; and at this time the red secretion from the interior of the pouch, which had for many weeks been gradually diminishing, was no longer perceptible. In the following June it left the pouch for the first time, and being somewhat awkward in finding its way back again, an assistance was afforded by the mother in the following way. The parent bent down until her belly nearly touched the ground; she then introduced her fore paws into the opening of the pouch, and thus pulling the aperture wide open at the same time that it was lowered nearly to a level with the ground, a very easy access was afforded for its tenant. This was frequently repeated for the first month after the young had left the bag.

Having dissected a suckling kangaroo in which two elongated and perfect marsupial teats were apparently found to have conveyed nourishment to a single young one, I was surprised to find that, in the animal to which I am now referring, only one and the same teat was affording a supply of milk throughout the whole period of suckling, this being the one to which the fœtus was adherent when first received into the pouch.

The

The different degrees of development met with in the mammary organs of the two animals have been since partly explained to me in the following way.

Where a number of female kangaroos have been confined in the same inclosure, and have borne in their pouches their respective young of nearly the same age and size,—under such circumstances it has now and then happened that two of the little ones, having escaped from their pouches, have formed an association and returned to the common pouch of one or other of the mothers; the animal therefore which is thus destined to carry double, must of course be called upon to furnish a double supply of nutriment for the tenants of her pouch: it appears to me, then, that whenever such is the case, the additional supply is afforded by a sympathetic and increased action of the vessels of the opposite mamma, in consequence of which a corresponding secretion of milk is produced, and of course an equal enlargement of the mammæ and teats on both sides. That such might have been the cause which gave rise to the development of two mammæ and teats in the kangaroo which I had formerly examined, is rendered probable from the circumstance of her having been confined in company with others which were also bearing young. I am unable however to prove the truth of the position which I have advanced by other than circumstantial evidence and analogical deductions; since I have never had an opportunity of examining the pouch of any of these animals under the circumstances mentioned. I may however remark, that I have never met with a single instance in which two teats had been developed in the same animal for the supply of a single young one.

With this brief notice of the changes which I have lately observed in the condition of the pouch and its contents, I have now to describe the appearances presented on dissection of the mammary

mammary organs of the young animal, which died about two months after it had entirely quitted the pouch, and at an earlier age than any I had previously examined. On opening the pouch after death, I found that not one of the four future teats was to be discovered (Fig. 1.), but that four distinct follicular apertures occupied the situation in which the nipples are afterwards found to protrude: from this circumstance I had no doubt that not only the lower, but the upper teats also, of the kangaroo were originally formed from the eversion of follicular canals, of which the external apertures were thus exposed, and that consequently the analogy which I had drawn between the superior teats of this animal and the supernumerary nipples of other quadrupeds, was applicable to their functions only, and not to any similarity in their structure and development.

The fact that all the four teats in the kangaroo are formed in precisely the same way, was clearly proved by a dissection of the mammary glands in the young animal before me; for on tracing the course of the upper follicular openings, I found in them an exact correspondence with that peculiarity of structure which I have already described as existing in the lower mammæ previous to the appearance of their nipples (Fig. 2.). At this early period of life, however, it will be seen that the four glands are of nearly the same size, and that they have not yet acquired sufficient magnitude to envelop completely their membranous canals.

It appears then from this dissection and from my former one, that the young of the kangaroo at a very early period of life is devoid of any external mammary organs; that their first appearance is shown in the development of the two superior and apparently supernumerary and useless teats; that subsequently the inferior teats are protruded from their respective glands, and

that

Fig. 1.

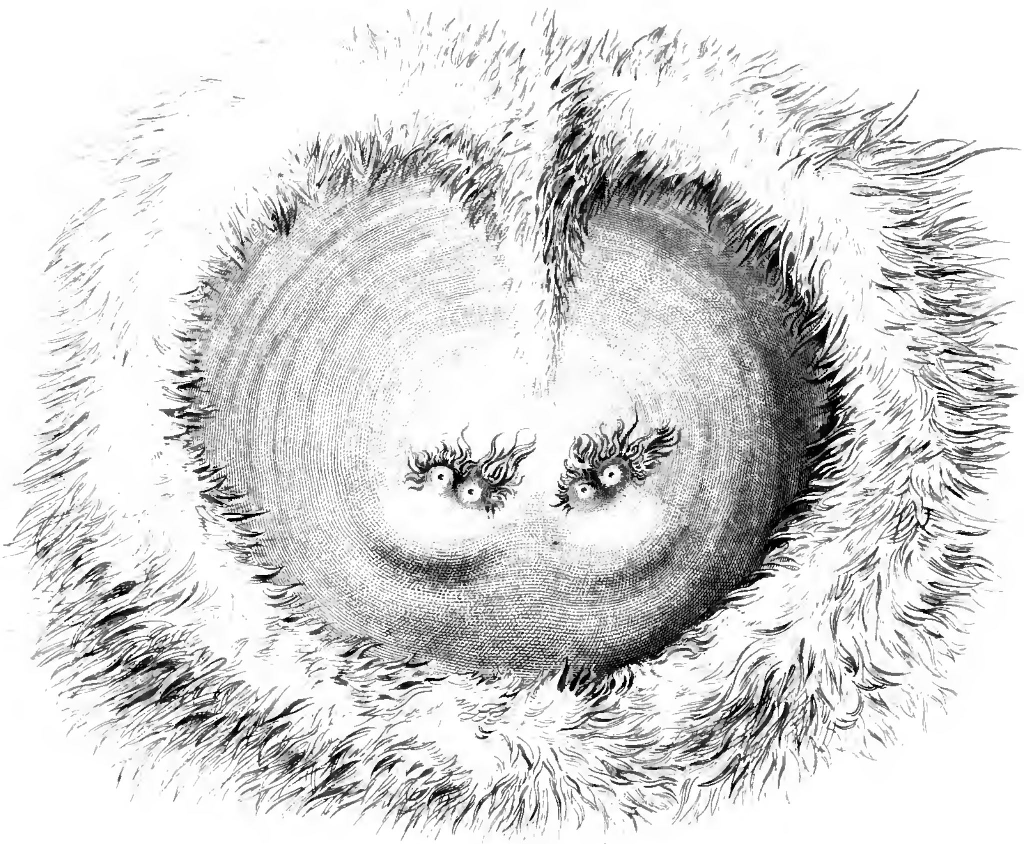
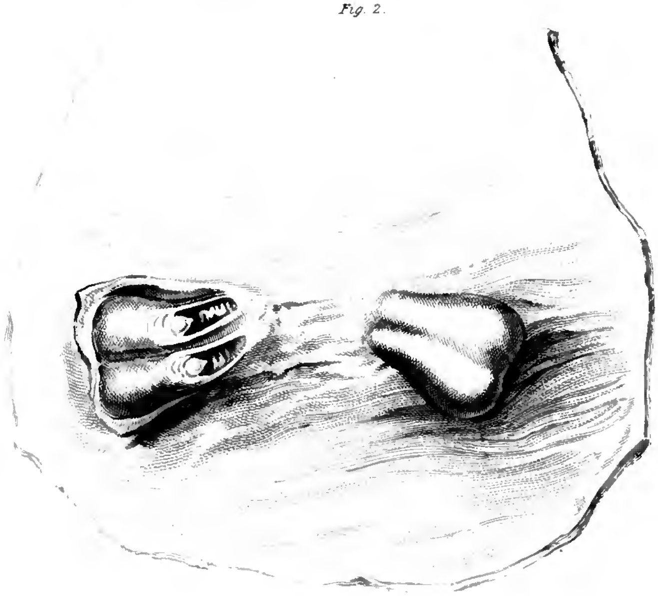


Fig. 2.



that from these alone does the future young receive nourishment; that each of the four teats exists prior to its external appearance in the form of a follicular membranous canal, terminated by a projecting nipple, which becomes everted and protruded from its imbedded situation in the mammary gland, to form a permanent medium of communication between the mouth of the young and the secreting gland from which its nutriment is derived.

EXPLANATION OF TAB. XXVI.

Fig. 1. A view of the interior of the pouch of a young kangaroo, showing the four follicular apertures through which the future teats are protruded.

Fig. 2. Dissection of the mammary organs of the same, showing the glands, membranous canals, and imbedded and undeveloped nipples.

XXV. *On the Anatomy of some of the Organs of Deglutition in the Capybara (Hydrochærus Capybara). By John Morgan, Esq. F.L.S.*

Read June 15, 1830.

The very great advantage which a zoologist derives from the study of comparative anatomy, in the systematic arrangement of the different genera and species composing the animal kingdom, must be acknowledged by every one who has turned his attention to this branch of natural science; and it will therefore be unnecessary that I should offer any apology for presenting the Linnæan Society with a paper upon a subject almost exclusively anatomical.

The details of my present communication may perhaps appear of trivial importance; but as the dissections I have to describe are, I believe, entirely new, and as it is probable that the publication of new anatomical facts (although insulated and apparently of little interest in themselves) may eventually form a groundwork for the more important discoveries of our successors, I am induced to lay before this Society a short account of some anatomical peculiarities hitherto undescribed, which I have met with in dissecting certain organs connected with the process of digestion in several species of the order Rodentia. It is now more than a twelvemonth since I examined the body of a Capybara, one of the largest animals of the order to which it belongs, and in which therefore I conclude that the prominent distin-

 guishing

guishing characters are more strongly marked than in most other species of the rodent animals.

The stomach is formed by a single membranous bag (Tab. XXVII. Fig. 1.), and as in the case of other mammiferous vegetable feeders, in which we find this simple form of stomach, it will be seen by reference to the plate (Tab. XXVII. Fig. 2.) that the cæcum is large and complicated in proportion.

Having met with nothing requiring particular notice in the remaining part of the alimentary canal, I proceeded to examine more particularly the structure of the mouth and throat. The grinding surfaces of the molar teeth are of very considerable extent, as will be seen in Tab. XXVIII.; and it must be obvious how necessary such an arrangement of parts must be to the health of the animal, when we consider the nature of its food, and the simple structure and limited functions of its most important digestive organ, a provision being thus made for the proper mastication of the hard vegetable substances upon which the animal must occasionally subsist. I found however, upon further examination, that there was another structure hitherto undescribed, by which the process of perfect mastication is rendered indispensable to the passage of food from the mouth to the stomach. The structure to which I allude, and by which the possibility of swallowing any portion of unmasticated nutriment is prevented, was shown in an extraordinary formation of the velum palati mollis, or soft palate: this membrane, which in other animals generally forms an imperfect floating septum, suspended from the back part of the roof of the palate, and interposed between the cavity of the mouth and pharynx, I found in the Capybara (and in some of its congeners) to be much more extensive in its attachments and different in its form and uses.

On separating the jaws and examining the fauces, the mouth appears

appears to terminate in a nearly blind pouch; for the communication with the pharynx seems as if shut by a strong membrane of a funnel shape, of which the concavity recedes towards the throat. (Tab. XXVIII. *a.*)

This membrane is an extended velum palati, attached to the whole circumference of the fauces and root of the tonguc, and is prevented from forming a *complete* septum by the existence of a small, central, circular aperture, by which a communication between the mouth and the pharynx is established for passage of food; so that through this small membranous funnel, or strainer (if I may be allowed the expression), it is physically impossible that any considerable portion of unmasticated nutriment should find its way by natural means, from the mouth into the alimentary canal: and from this circumstance the first process towards digestion must be rendered certain and complete; for the *grosser* particles of food must remain in the mouth from the interposition of the membranous sieve or strainer, which is thus placed between the organs of mastication and those of digestion.

The same provision for the complete mastication of all solid substances, previous to their being swallowed, will be found in others of the same group. I shall, however, confine my description of the anatomy of these parts to the dissections I have made of the Capybara, as the parts are more fully developed, and more clearly seen in that animal than in any other I have met with. On removing the mucous membranes of the mouth and pharynx from the anterior and posterior surfaces of the whole of the velum palati, the muscles which support and lie between the two membranes were exposed, and were as follows.

The circumference of the funnel is supported on each side anteriorly by a strong muscular column, which arising from a projecting point in the middle of the os hyoides, passes through a deep groove in the fore part of the bone, to be continued upwards

wards behind the tongue, with the muscular structure of which its fibres at the lower part intermix. Each muscle ascending from behind the root of the tongue passes on the side of the funnel between the two layers of mucous membrane, forming the anterior and posterior surfaces of the velum, its fibres becoming more diffused and spreading over the upper part of the velum to join above the funnel with those of its fellow on the opposite side; the superior termination of the two muscular columns thus intermixing appears to be insensibly lost upon the palative membrane.

The two muscles are connected with a thin circular band of muscular fibre, which forms an anterior sphincter to the circumference of the funnel. On the posterior part of the velum a lateral support is afforded in the same way by a band of muscle on each side, which having an attachment above to the palate is continued downwards, to terminate by intermixing with the muscular structure of the pharynx. These two posterior slips of muscle are connected above and below the aperture in the velum by transverse fibres.

To the four supporting muscles which I have now described, and which may perhaps be considered as analogous to the pillars of the fauces in other animals, the circumference of the funnel will be found attached by the connection of its muscular fibres with those already described: these are arranged in a circular order, and form a complete sphincter over the whole cone, by the contraction and dilatation of which the passage of any substance through its central aperture must be assisted or prevented.

It will be seen by the drawing in which these parts are represented (TAB. XXX.), that when any substance is passing from the mouth to the pharynx, the conical projection of the velum must necessarily pass over the epiglottis, and thus prevent the

Fig. 1

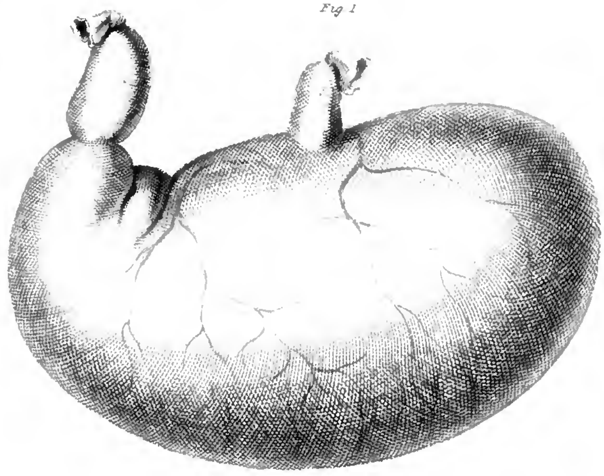
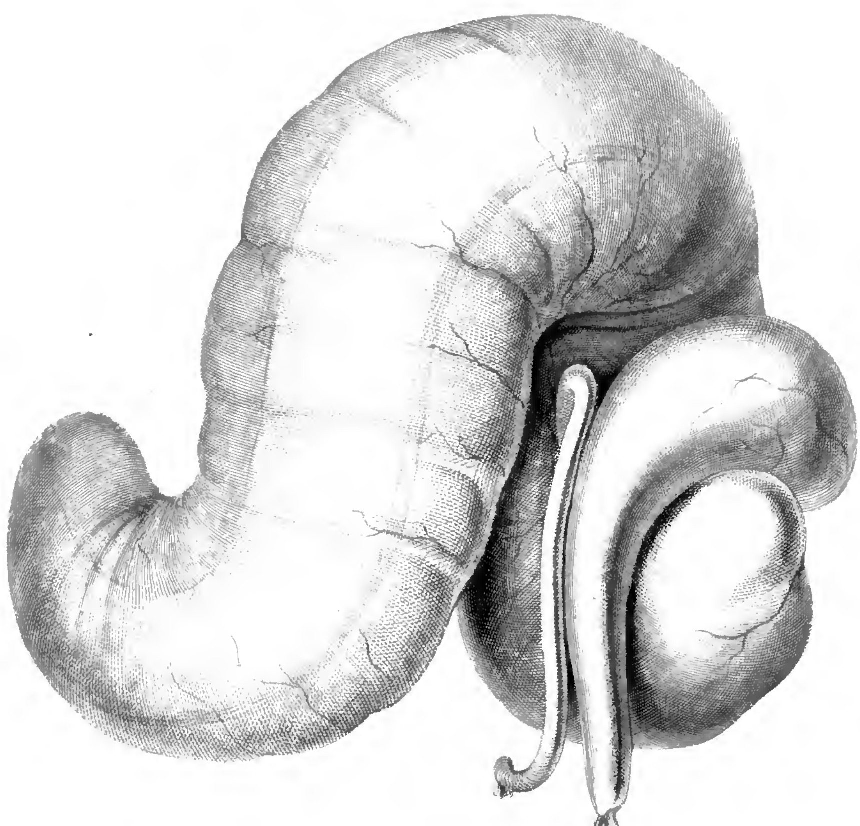
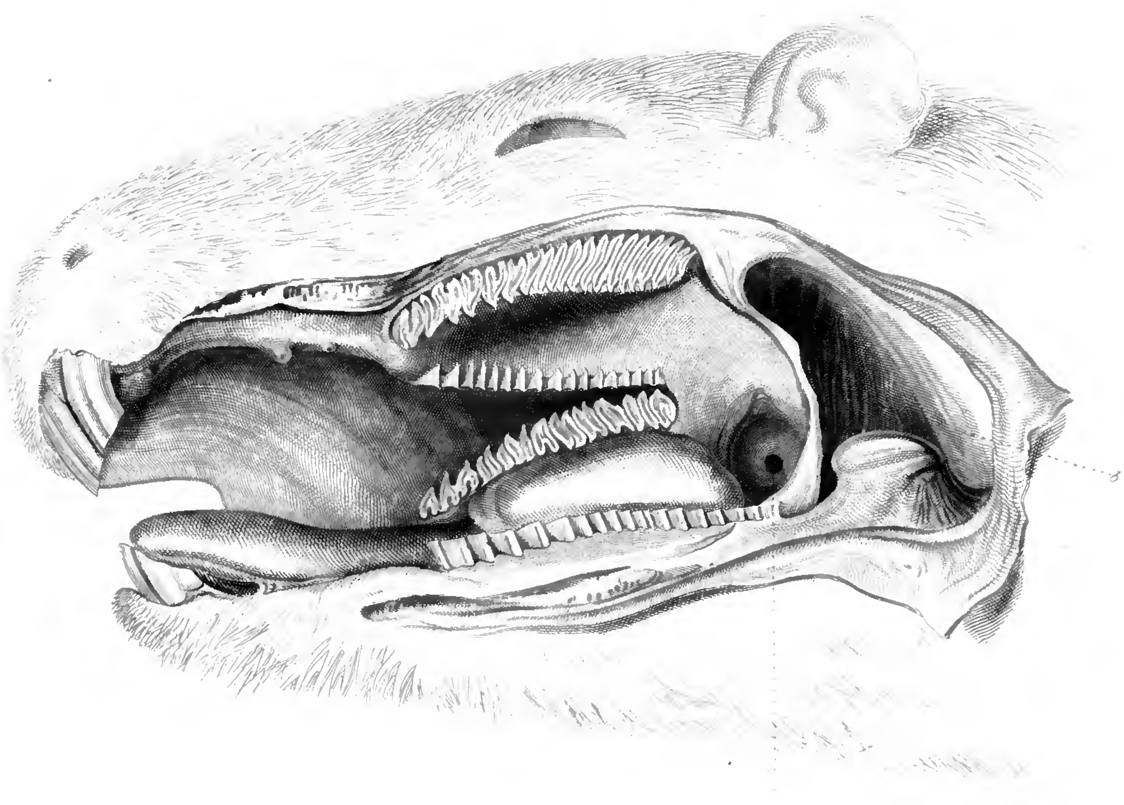


Fig. 2.




b
a


b
a

Fig. 2

Fig. 1

Fig. 3

the entrance of any part of the food into the larynx and trachea. It will be further seen that the membrane of the velum is so closely united with the epiglottis as to render it impossible to admit the projection backwards of the one, without the complete closure of the rima glottidis from the depression of the other, thus affording an additional protection for the entrance to the air passages.

The principal use, however, in the peculiar form of the velum palati, which I have described, appears to me to have reference to the digestive organs, and to be confined almost entirely to the process of deglutition.

EXPLANATION OF THE PLATES.

Tab. XXVII.

Fig. 1. Stomach. Fig. 2. Cæcum.

Tab. XXVIII.

Head;—the lower jaw, dislocated on one side, to show a section of the mouth; *b*, pharynx, and *a*, funnel-shaped velum palati.

Tab. XXIX.

a. Root of the tongue, cut through to show the anterior muscular pillars of the velum palati, *b*.

Tab. XXX.

Fig. 1. Posterior view of the muscles of the velum palati; *a*, sphincter muscle of the funnel; *b*, posterior muscular pillars.

2. Os hyoides.

3. Connection of the epiglottis with the membrane of the velum palati; *a*, epiglottis.

XXVI. *Notice of several recent Discoveries in the Structure and Economy of Spiders.* *By John Blackwall, Esq. F.L.S.*

Read January 18, *and February* 15, 1831.

Among the various species of Spiders which capture their prey by means of snares composed of the animal secretion emitted from their spinners, it would be difficult to select any, the Geometricians alone excepted, whose structure and economy are better deserving of investigation than those of *Clubiona atrox*. Whoever inspects closely the web of this very common species, cannot fail to be struck with the singularity of its appearance, and will naturally feel a desire to be made acquainted with the process employed in its formation. Such, at least, has been the case with myself; and I have experienced no small degree of disappointment, in not being able to obtain any information on the subject from those authors whose works I have had an opportunity of consulting. This unsuccessful examination of the labours of naturalists, many of them distinguished for the extent of their learning, the minuteness of their researches, and the comprehensiveness of their views, induces me to believe it probable that the inquiry may not have had that attention bestowed upon it which it undoubtedly merits. As it is one, however, which for some time past has occasionally occupied a portion of my leisure hours, I shall proceed to detail the results of my observations; trusting that if they should not possess that novelty which, notwithstanding my limited knowledge of the writings of foreign zoologists, I am disposed to claim for them, still they will not be found wholly devoid of interest.

The favourite haunts of *Clubiona atrox* are the branches of trees and shrubs growing against buildings; crevices in old walls; and the corners of windows. In these and similar localities it fixes its residence and fabricates its snare. On the objects surrounding the spot selected for its retreat, it extends to a considerable distance, but without any apparent regularity of design, a number of fine shining lines intersecting each other at various angles, to which it attaches other lines, or rather fasciculi of threads, of a more complicated structure, and of a pale blue tint, nearly approaching the colour of skimmed milk. These compound threads, or flocculi, which in exposed situations retain their delicate hue for a short period only, (old webs being generally of a dull or sullied white, not at all advantageous to their appearance,) are arranged on the first-spun glossy lines both in longitudinal and transverse directions. When recently produced, they adhere strongly to such insects as come in contact with them, and, though perfectly inelastic, may be drawn out into fibres of extreme tenuity. A communication between the snare of this spider and its retreat is established by means of a funnel-shaped tube of a slight texture, whose smaller extremity is in immediate connection with the latter, and, indeed, sometimes constitutes the animal's abode. Not unfrequently two or more tubes occur in the same web, by one or other of which the spider usually effects its retreat when disturbed.

If a newly formed flocculus be minutely examined under the microscope, with a pretty high magnifying power, it will be found to consist of six lines, presenting an appearance similar to that represented by Tab. XXXI. Fig. 1. Two of these filaments are straight

straight and exceedingly attenuated; and upon each of them is disposed a tortuous white line inflected into short curves and loops like a ravelled thread of fine silk. A pale blue band, thickly distributed on each of the inflected lines in numerous irregular curvatures, completes the flocculus. The flexures of the pale blue bands are more widely extended than those of the white tortuous lines on which they occur, and to them the adhesive property of the snare is chiefly to be ascribed. In attempting to determine by experiment the cause of adhesion in the blue bands, I ascertained that bodies with highly polished surfaces, such as the bulbs of thermometers and burnished metallic rods, if carefully applied to them, may be withdrawn without deranging their structure, though the viscid globules in the nets of Geometric Spiders adhere to the same bodies as soon as they are brought into contact with them. From this circumstance I was led to infer that the blue bands are fibrous, although their structure is so exceedingly fine that I cannot detect it even with the assistance of the microscope; and that the imperceptible filaments of which they are composed adhere to objects, not in consequence of being glutinous, but solely by attaching themselves to inequalities on their surfaces. The following brief description of the manner in which the flocculi are fabricated, and of the curious apparatus employed in the process, gives additional weight to this opinion.

There are on the upper joint of the tarsi of the posterior legs of *Clubiona atrox* two parallel rows of spines, moveable at the pleasure of the animal, which may readily be discerned by means of a lens having a magnifying power of ten or twelve. They are situated upon a prominent ridge on the abdominal side of the superior region of the joint, commencing just below its articulation with the tibia, and terminating in a strong spur near its lower extremity. The spines composing the upper row have a considerable degree of curvature, and taper gradually to a fine point; those of the lower row being stronger, more closely set, and less curved. Inclined towards each other, the two sets, in the performance of their functions, describe a series of acute angles whose vertices are directed down the joint. This important appendage constitutes a striking specific character, which ought on no account to be omitted in descriptions of *Clubiona atrox*.

When the spider purposes to form a flocculus, it presses its spinners against one of the glossy lines composing the foundation of its snare, and emitting from them a small quantity of liquid gum, attaches to it several fine threads, drawn out by advancing the abdomen a little, and kept distinct by extending the mammulæ laterally. The foot of one of the hind-legs is then applied to the superior part of the upper tarsal joint of the other hind-leg, a little above its articulation with the lower joint of the tarsus, and the curious apparatus of spines, above described, is brought immediately beneath the spinners at right angles with the line of the abdomen. By a slight extension of the joints of the hind-legs the apparatus is forced backwards across the mammulæ, the diverging extremities of which it touches in its transit, and is restored to its former position by a corresponding degree of contraction in the joints. In proportion to the continuation of this process, (and it is not at all unusual for the spider to pass its spiny apparatus across the points of the mammulæ several hundred times in rapid succession,) the inflected lines of the flocculus are found to be produced, the spider making room for them as they accumulate, by elevating and at the same time advancing the abdomen in a small degree, which it effects by slightly extending the joints of the third pair of legs, and contracting those of the two anterior pair. As this operation is generally accomplished in the night, it it can seldom be seen to advantage, unless artificial light be employed, some skill in the management of which is required in order to avoid disturbing the spider. The *modus operandi*, as nearly as I can ascertain it by the most diligent observation, appears to be this. The points of the lower row of spines are protruded between those of the upper row, and in passing across the extremities of the mammulæ comb out the tortuous lines, which run into numerous flexures in consequence of not being kept fully extended. The purpose subserved by the upper row of spines seems to be the extrication of the tortuous lines from the spines of the lower row, by a slight motion outwards, which disengages their points. Now, were the blue bands glutinous, this mode of proceeding would be quite unavailing; it is only on the supposition, therefore, that they have a fibrous structure, that their adhesive property can be satisfactorily explained. When a sufficient quantity of the inflected filaments is produced, the spider again applies its spinners to one of the glossy lines, and attaches the flocculus to it. In this manner it proceeds with its labours, occasionally employing the combing apparatus of both hind-legs, till the web is completed. Should any of the flocculi be destroyed, or rendered almost useless by having their adhesive property impaired, new ones are constantly added to the snare.

A more exact idea of the mechanism of the combing apparatus than can be conveyed in words, will be obtained by inspecting the accompanying plate (Tab. XXXI.).

Naturalists appear to concur in the opinion, that the tarsi of spiders are armed at their extremities with three claws, which occupy the upper and anterior portion of the foot. That this is the case with some species cannot be denied; other species, however, belonging to various genera, *Mygale avicularia*, *Drassus melanogaster*,

lanogaster, and *Salticus scenicus*, for example, have only *two claws* on each foot; and if the tarsi of the larger Geometric Spiders indigenous to Great Britain, such as *Epeira cicatricosa*, *Epeira Diadema*, and *Epeira apoclisa*, be examined under the microscope with a high magnifying power, it will be distinctly perceived that the inferior part of their feet is provided with several claws, which have a considerable degree of curvature, are finely pointed, and are furnished with tooth-like processes on the under side (Tab. XXXI. Fig. 4.); and should the investigation be extended to other retiary spiders, the feet of many species which construct complicated snares will likewise be found to exhibit a similar organization. As the best means of guarding against errors, to which the inspection of limbs defective in structure might conduce, it is advisable to select the legs of vigorous individuals which have recently moulted, whenever such can be procured.

The supernumerary claws were first observed by me in examining the feet of *Epeira apoclisa;* and in every instance I counted as many as five, which, with the three upper ones previously known, give a total of *eight claws* on the same foot, distinguishable at a glance from the coarse setaceous bristles in their vicinity. There is also a strong moveable spine inserted near the termination of the tarsus of each posterior leg on the under side, which curves upwards at its extremity, and exhibits a slight irregularity of outline at its superior surface. The function performed by these spines is an important one. By the contraction of their flexor muscles they are drawn towards the foot, and are thus brought in immediate opposition to the claws, by which means the animal is enabled to hold with a firm grasp such lines as it designs to attach itself to. Now, as the spines and the spinning apparatus are the most efficient instruments

instruments employed by the Geometric Spiders for the purpose of suspension, it is obvious why they usually direct their heads downwards when they occupy the centre of their nets.

As several difficulties present themselves in the prosecution of these researches, occasioned chiefly by the impracticability of comprising all the claws in one distinct view; and as I have not yet succeeded in procuring instruments of sufficient delicacy to enable me to accomplish the dissection of exceedingly minute objects under the microscope, I cannot completely satisfy myself at present whether the number and arrangement of the additional claws are uniformly the same on the feet of such spiders as I have ascertained to be supplied with them; though as regards the larger species I am thoroughly convinced that this is the case, and I have reason to think that it will ultimately prove to be so with the rest. In pursuing the inquiry, these particulars, of course, will claim my especial attention.

It is not at all surprising that the Geometricians, which employ their feet in the fabrication of complicated nets, should have them more amply provided with claws than those species which use theirs principally as instruments of progression. An estimate of the number of viscid globules distributed on the elastic spiral line in a net of *Epeira apoclisa* of a medium size, will convey some idea of the elaborate operations performed by the Geometric Spiders in the construction of their snares*. The mean distance between two contiguous radii in a net of this species, is about seven tenths of an inch; if, therefore, the number 7 be multiplied by 20, the mean number of viscid globules which occur on one tenth of an inch of the elastic spiral line at the ordinary degree of tension, the product will be 140,

*For a circumstantial account of the manner in which the Geometric Spiders construct their nets, see the *Zoological Journal*, vol. v. p. 181. et seq.

the

the mean number of globules deposited on seven tenths of an inch of the elastic spiral line; this product multiplied by 24, the mean number of circumvolutions formed by the elastic spiral line, gives 3,360, the mean number of globules contained between two radii; which multiplied by 26, the mean number of radii, produces 87,360, the total number of viscid globules in a finished net of average dimensions. A large net, fourteen or sixteen inches in diameter, I have found, by a similar calculation, to contain upward of 120,000 viscid globules, and yet *Epeira apoclisa* will complete its snare in about forty minutes, on an average, if it meet with no interruption. Astonishingly great as this number of globules is, each is separated from those adjacent to it by a sensible space; indeed the material of which they are composed is so fluid, that they run together the moment they are brought into contact. The globules and the intervals between them may be distinctly seen with the assistance of a magnifier of the power of ten; and it would appear from the following passage extracted from *Micrographia*, p.202, that they did not escape the notice of Dr. Hooke. "I observed further," he informs us, "that the radiating chords of the web were much bigger and smoother than those that were woven round, which seemed smaller, and all over knotted or pearled with small transparent globules, not unlike small crystal beads or seed pearls, thin strung on a clew of silk; which, whether they were so spun by the spider, or by the adventitious moisture of a fog (which I have observed to cover all these filaments with such crystalline beads), I will not now dispute."

Messrs. Kirby and Spence, in their *Introduction to Entomology*, vol. i. Letter xiii. state that "the net of the garden spider is composed of two distinct kinds of silk; that of the radii not adhesive, that of the circles extremely viscid:" and this difference, they remark, "when it is considered that both sorts

sorts proceed from the same instrument, is truly wonderful." The fact, however, is even more extraordinary than it is represented to be by those distinguished naturalists; for not only the garden spider, but every geometric species with which I am acquainted, employs *three* distinct kinds of silk, if a liquid gum can with propriety be termed silk, in the construction of its net. The boundary lines, radii, and first formed spiral line being unadhesive, and possessing only a moderate share of elasticity, are evidently composed of a different material from the last formed spiral line, which is exceedingly viscid, and elastic in a remarkable degree. Now, the viscidity of the elastic spiral line may be shown to depend entirely upon the globules with which it is studded; for if they be removed by careful applications of the finger, a fine glossy line remains, which is highly elastic, but perfectly unadhesive. As the globules, therefore, and the line on which they are disposed differ so essentially from each other, and from the rest of the snare, it is reasonable to infer that the physical constitution of these several portions of the net must be dissimilar.

When exposed to the desiccating influence of the sun, and of air briskly agitated, the nets of geometric spiders speedily lose their adhesive property; but when formed in situations from which light is excluded, and where the atmosphere is not liable to be perceptibly disturbed, I have known them retain their viscidity for a long period. In a net of *Epeira Diadema* constructed in a glass jar, which was placed in a dark closet where the temperature was not subject to great or sudden fluctuations, the globules preserved their adhesive power almost unimpaired, and the last-formed spiral line its elasticity for more than seven months.

The belief that spiders are incapable of ascending the perpendicular surfaces of polished bodies without the assistance of

 lines

lines emitted from their spinners is so widely extended, that an attempt to prove its fallacy in particular cases will, in all probability, be received with some distrust: nevertheless, the fact that several species have the power of traversing vertical panes of window-glass in any direction whatever, unsupported by a single filament, may be easily confirmed by experiment. Among the British spiders observed to ascend with facility well cleansed windows, and the sides of glass jars in which they have been confined, I may name *Drassus melanogaster* and *Salticus scenicus.* The latter species is extensively known, and may be readily procured in warm sunny weather in summer, on the walls of old buildings having a southern aspect.

On examining the legs of these animals under the microscope, with a view to discover the means by which they support themselves against gravity, I perceived that the tarsi are provided on the underside with numerous appendages curving downwards, which are slender at their bases and dilated towards their extremities. The idea immediately occurred to me that these appendages may perform the office of suckers, and that the spiders are probably enabled to adhere to the upright sides of smooth objects by atmospherical pressure; but being sensible that mere conjecture, however plausible it may appear, is the bane of Natural History, I resolved to investigate the subject experimentally. Having obtained spiders of the above-named species, in various stages of growth, I found that the larger individuals experienced greater difficulty in ascending glass than the smaller ones, which in numerous instances were capable of moving slowly on an ordinary window-pane, even in an inverted position, or with the back downwards. It was evident also that physical strength (other conditions being the same) gave its possessor a decided advantage in this respect. When highly polished glass of a superior quality was employed, the difficulty was considerably

siderably increased; and in all cases, those spiders effected an ascent with the greatest effort, which, in proportion to their bulk, had the inferior surface of their tarsi most sparingly furnished with the requisite apparatus. These results, some of which are in direct opposition to the hypothesis I had previously entertained, determined me to inspect the tarsal appendages more minutely than I had hitherto done; and a peculiarly favourable opportunity unexpectedly presented itself. Three living specimens of *Mygale avicularia* having been brought accidentally to Manchester in dye-woods imported from the West India Islands during the present year (1830), I availed myself of the circumstance to examine under the microscope the appendages with which the tarsi of this gigantic species are so abundantly supplied; conceiving that their structure would be exhibited to greater advantage in a recent subject than in individuals which have long occupied a place in the cabinet. In this expectation I was not disappointed; and I shall now proceed to describe the organism of the appendages, which is much more complex than I had anticipated.—Each consists of a slender bristle fringed on the sides with exceedingly fine hairs gradually diminishing in length as they approach its extremity, where they occur in such profusion as to form a thick brush on its inferior surface, giving the part that dilated appearance already alluded to. This structure, as far as my researches extend, is common to the tarsal appendages of those spiders which are able to ascend the perpendicular sides of smooth bodies without supervenient aid; and the minute bristles with which the tarsal cushions of many insects, remarkable for their ability to walk up glass, are furnished, appear to possess an organization closely analogous.

The hold upon objects which the setaceous bristles give to the spiders provided with them seems to be purely mechanical, depending, in a great measure, on the numerous points of con-

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tact they present. At a very low estimate, there are on the slender bristles which form the brushes occurring on the inferior part of the tarsi, and the terminal joint of the pediform palpi of adult females of the species *Mygale avicularia*, more than 6,000,000 hairs of extreme delicacy, a large proportion of which can be applied by the spider to bodies with plain surfaces. If the finger be drawn gently along the underside of the tarsi, from their extremities towards the tibiæ, they will be found to adhere powerfully to the cuticle; the sensation occasioned by this proceeding exciting in the mind the idea that they are smeared with some viscous matter. There can be no doubt, therefore, that the influence they exercise is in the direction indicated by this observation. A setaceous bristle from one of the tarsi of *Mygale avicularia*, very highly magnified, is represented by Fig. 5; and care must be taken not to confound these tarsal appendages with the compound hairs which clothe the limbs of some spiders (*Aranea domestica* in particular), one of which is represented by Fig. 6, on a large scale.

Dr. Leach, in treating upon spiders in the article *Annulosa*, published in the *Supplement to the Encyclopædia Britannica*, p. 435, remarks that "when about to cast their covering, they suspend themselves in some corner, and creep out of a crack which takes place on their back, gradually withdrawing their legs from the skin, as if from a glove." With deference to so accomplished a zoologist, I may be allowed to observe that this statement is not in strict accordance with my own experience; and as I do not remember to have met with a satisfactory account of the moulting of spiders in the course of my reading, I shall endeavour to elucidate this curious subject, by giving such particulars relative to it as have fallen under my notice.

Considering the apparent uniformity of the process by which this important change in the external condition of spiders is effected,

effected, it will suffice to detail the proceedings of a single species; and as *Epeira calophylla* is of frequent occurrence about retired buildings situated in the country, and, consequently, may be procured without difficulty, I shall select it for the purpose. Preparatory to casting its integuments, this spider spins several strong lines in the vicinity of its snare, from which it suspends itself by the feet and a filament proceeding from the spinners. After remaining for a short time in this situation, the corneous covering of the thorax gives way,—not in the medial line of the dorsal region, as Dr. Leach's statement would seem to imply, but laterally, disuniting immediately above the insertion of the mandibles and legs, so that the head and thorax are the first parts liberated. The line of separation pursues the same direction till it extends to the abdomen, which is next disengaged; the extrication of the legs being the last and greatest difficulty which the spider has to overcome. As the suspensory filament connected with the spinners of the exuviæ is considerably shorter than the legs, and does not undergo any sensible alteration in length, the abdomen, during the process of moulting, becomes gradually deflected from its original horizontal direction, till it assumes a vertical position nearly at right angles with the thorax. By this change of posture, attended with numerous contortions of the body and alternate contractions and extensions of the limbs, the spider is ultimately enabled to accomplish its purpose. The spines with which the legs are provided no doubt contribute to facilitate the operation greatly; for as they are directed down the limbs, and are moveable at the will of the animal, when it has partially withdrawn the legs from their sheaths by contracting them, it can prevent them from re-entering by slightly erecting the spines and thus bringing their extremities in contact with the inner surface of the integuments. When the spider has completely disengaged itself from

from the slough, it remains for a short period in a state of great exhaustion, suspended solely by a thread from the spinners connected with the interior of the abdominal portion of the cast skin, which is much corrugated and drawn together. The entire process, as above described, occupies the space of about twenty minutes. After reposing a little, the spider further attaches itself to the suspensory lines by the claws of the feet; and when its strength is sufficiently restored, and its limbs have acquired the requisite degree of firmness, it ascends its filaments and seeks its retreat.

Having frequently witnessed the moulting of spiders in their natural haunts, and also in a state of captivity, and having carefully examined the cast skins of numerous species belonging to the genera *Epeira*, *Theridion*, *Aranea*, *Clubiona*, *Drassus*, *Salticus*, *&c.*, in the precise situations and under the same circumstances, apparently, in which they have been left by their former occupiers, I am thoroughly persuaded that the process is a very uniform one.

Intimately connected with the renovation of the integuments is the reproduction of the limbs of spiders. For this interesting discovery we are indebted to the late Dr. C. Heineken, whose investigations relative to the subject are published in the *Zoological Journal*, vol. iv. p. 284 & 422; and I am happy to bear testimony to the general accuracy of his conclusions.

The reproduction of the palpi does not appear to have been noticed by Dr. Heineken; but that these members, after suffering mutilation, are restored in the same manner as the legs, I have clearly proved by repeated experiments. That mutilated members are not always reproduced at a subsequent moulting, even when it takes place at a period considerably after the infliction of the injury, is rendered evident by the following remarkable fact. On the 13th of July, 1830, a male specimen

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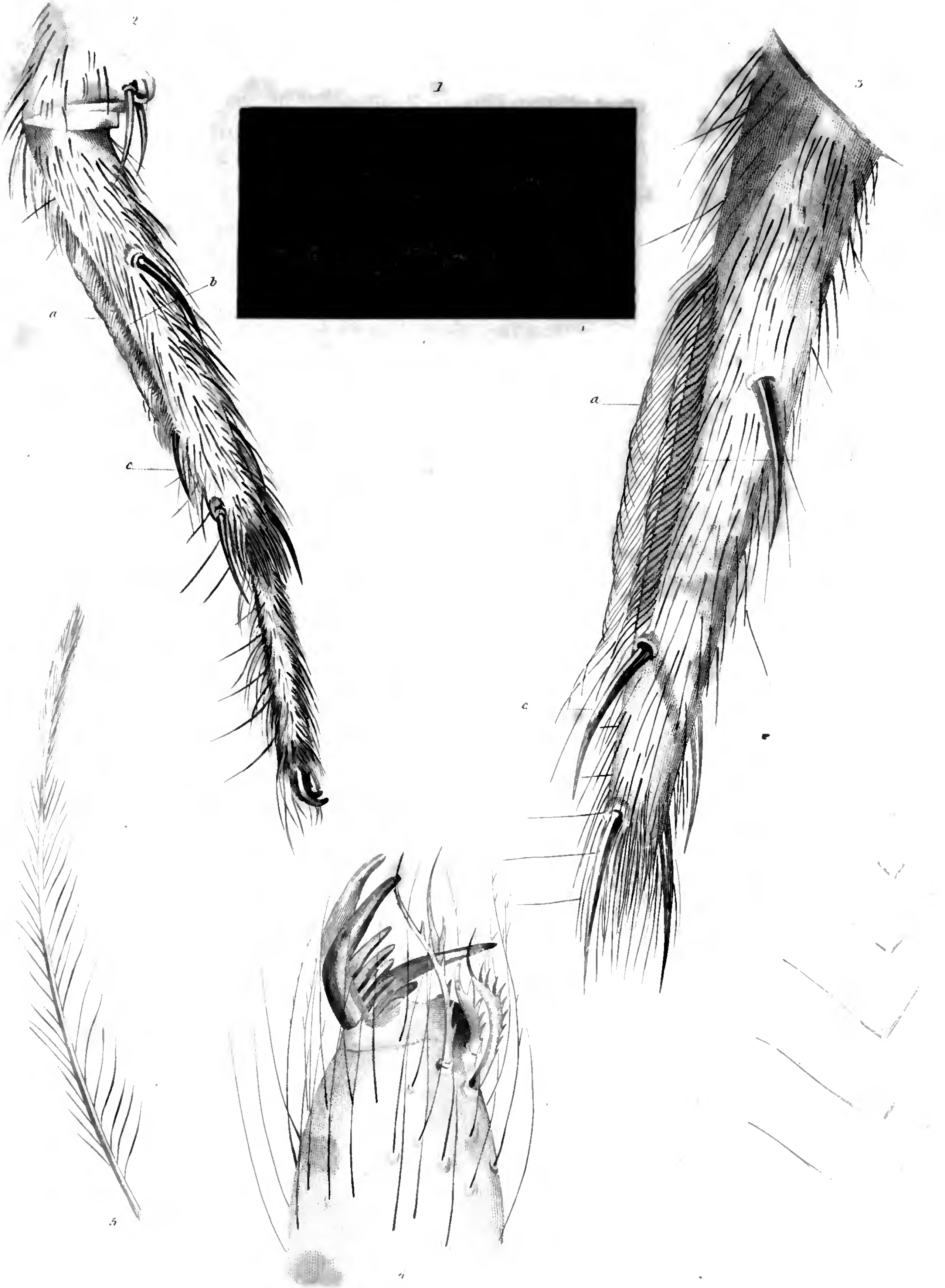
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of *Clubiona atrox* had the palpus and the second leg on the right side divided, the former near its base, the latter about the middle of the femur, and on the 15th of the succeeding month it cast its skin; yet, though all the other limbs were renewed, the stumps only of the mutilated members were reproduced. In cases where spiders spontaneously throw off their legs at the suture, or have them partially removed by amputation, it would be desirable to ascertain in what state the rudiments of the limbs to be reproduced exist just previously to the act of moulting, as there is something mysterious in their extraordinary development during that process.

For the drawings which accompany this communication, I am indebted to Mr. John Parry, of Manchester; and it gives me much pleasure that I am enabled to employ his skilful and accurate pencil in a manner so congenial to his taste, as in illustrating new and interesting facts in natural history.

EXPLANATION OF TAB. XXXI.

Fig. 1. A newly formed flocculus highly magnified.

Fig. 2. A representation of the tarsus of one of the hind-legs of *Clubiona atrox*, highly magnified; *a*, the upper row of spines; *b*, the lower row of spines; *c*, the spur at the lower extremity of the apparatus.

Fig. 3. A view of the superior joint of the tarsus, highly magnified; *a*, the upper row of spines; *b*, the lower row of spines; *c*, the spur.

Fig. 4. The foot of the right anterior leg of *Epeira Diadema*, highly magnified.

Fig. 5. A setaceous bristle from one of the *tarsi*, magnified, of *Mygale avicularia*.

Fig. 6. A compound hair from the *Aranea domestica*, magnified.

XXVII. *Remarks*

XXVII. *Remarks on the Pulvilli of Insects. By John Blackwall, Esq., F.L.S.*

Read, February 1, 1831.

In the *Physico-Theology* of Dr. Derham, p. 363, note b, it is stated that " diverse Flies, and other Insects, besides their sharp hook'd Nails, have also skinny Palms to their Feet, to enable them to stick on Glass, and other smooth Bodies, by means of the Pressure of the Atmosphere." This opinion, which appears to be almost universally adopted by the entomologists of the present day, has derived additional weight from the investigations of Sir Everard Home, whose papers relative to this curious subject, illustrated by figures of the parts employed in climbing, engraved principally from drawings made by Mr. Bauer, are published in the *Transactions of the Royal Society* for 1816. These researches are regarded by Messrs. Kirby and Spence (see their *Introduction to Entomology*, vol. ii., Letter XXIII.) as having "proved most satisfactorily, that it is by producing a vacuum between certain organs destined for that purpose and the plane of position, sufficient to cause atmospheric pressure upon the exterior surface, that the animals in question are enabled to walk up a polished perpendicular, like the glass in our windows, or with their backs downward on a ceiling, without being brought to the ground by the weight of their bodies." To dissent from a theory so generally received, including among its advocates numerous illustrious names, may, perhaps, be deemed

 presumptuous;

presumptuous; nevertheless, as facts absolutely irreconcileable with this supposition have been forced upon my attention, while engaged in examining the evidence by which it is supported, I shall, with every sentiment of respect for the high authorities to whom I stand opposed, submit my views to the consideration of candid and intelligent naturalists.

Concerning the structure of the instruments by means of which flies ascend the vertical sides of smooth bodies, various opinions have been promulgated. Some authors compare them to sponges, and conjecture that they are designed to contain a glutinous secretion capable of adhering to well cleaned glass. Dr. Hooke describes them as palms or soles beset underneath with small bristles or tenters, like the wire teeth of a card for working wool, which he conceived give them a strong hold upon objects having irregular, or yielding surfaces; and he imagined that there is upon glass a kind of smoky substance penetrable by the points of these bristles*. According to the observations of Sir Everard Home, they are expanded membranes, having their inferior surface granulated, and their edges beautifully serrated†; while Messrs. Kirby and Spence, on the contrary, remark that they are downy on the underside and granulated above‡.

The want of accordance so conspicuous in the preceding accounts induced me to inspect the parts minutely under a good compound microscope, when it was immediately perceived that the function ascribed to them by Dr. Derham and Sir E. Home is quite incompatible with their organization. Minute hairs, very closely set and directed downward, so completely cover the inferior surface of the expanded membranes, improperly deno-

* *Micrographia*, p. 170–171.

† *Transactions of the Royal Society* for 1816, p. 323.

‡ *Introduction to Entomology*, vol. ii., Letter XXIII.

minated

minated suckers, with which the terminal joint of the tarsi of flies is provided, that it cannot possibly be brought into contact with the objects on which those insects move, by any muscular force they are capable of exerting: the production of a vacuum between each membrane and the plane of position is therefore clearly impracticable, unless the numerous hairs on the under-side of these organs individually perform the office of suckers, and there does not appear to be anything in their mechanism which in the slightest degree countenances such a hypothesis. When highly magnified, their extremities, it is true, are seen to be somewhat enlarged; but, whether they be viewed in action or in repose, they never assume a figure at all adapted to the formation of a vacuum.

Satisfied that this difficult problem must admit of a solution more consistent with the various phenomena it comprehends than the popular one here controverted, I determined to institute an experimental investigation of it. Accordingly, having procured living specimens of the House-fly, *Musca domestica*, and of the large Flesh-fly, *Musca vomitoria*, I inclosed them in clean jars and phials of transparent glass, the interior surface of which they traversed in every direction with the greatest facility, walking upon it even with their backs downward, while they remained in full vigour; but when enfeebled by exposure to cold, or when fatigued by over exertion, the identical individuals ascended the sides of the same jars and phials with considerable difficulty, falling from them in numerous instances, and they were entirely incapacitated for adhering to them in an inverted position; yet when their physical energy was restored by repose, or an increase of temperature, they again repeated their most extraordinary feats with all their original promptness and dexterity.

Flies which are unable to maintain an inverted position on highly polished bodies will frequently adhere firmly, with their backs downward, to glass rather defective in polish, or slightly soiled; indeed, I may remark generally, that the results of experiments, similar to those detailed above, will always be modified by the vigour of the insects and the state of the glass vessels with regard to cleanness and polish.

These facts plainly indicate that flies are not supported on the vertical sides of smooth bodies by the pressure of the atmosphere, nor by the aid of a glutinous secretion, but by means strictly mechanical, as Dr. Hooke has suggested: he erred, however, in supposing that the hairs on the underside of the tarsal membranes are pointed, and that there is a smoky substance on glass which they penetrate. One other link in the chain of evidence was wanting to place the matter beyond all dispute, and that, the kindness of Mr. W. Hadfield of Cornbrook has enabled me to supply. With his assistance, and the help of his air-pump, it was demonstrated to the entire satisfaction of several intelligent gentlemen present, that the House-fly, while it retains its vital powers unimpaired, can not only traverse the upright sides, but even the interior of the dome of an exhausted receiver; and that the cause of its relaxing its hold and ultimately falling from the station it occupies, is a diminution of muscular force attributable to impeded respiration.

Having thus established the mechanical theory of the movements of flies on polished perpendicular surfaces, I shall offer a few remarks on the apparatus by whose instrumentality they accomplish their purpose. In structure and function it bears the closest analogy to the pulvilli of insects, which, if named with reference to the most important office they perform, should be termed holders or supporters. It consists of expanded membranes, varying in size, figure, and number in different species, the edges of which are plain, not serrated, as Sir E. Home asserts,

asserts, though when placed in such a situation relative to the eye of the observer that the hairs connected with them are foreshortened, they certainly present an appearance which, on a superficial view, might lead to the latter conclusion. If the slender bristles on the inferior surface of the pulvilli of some of the larger *Coleoptera*, *Prionus cervicornis* for example, be very highly magnified, each, beside the numerous short hairs which project from its sides, will be found to have a small dense brush of exceedingly minute hairs at its extremity; and as the hairs on the pulvilli of flies, and many other insects belonging to various orders and genera, with which I have experimented, perform a function similar to that exercised by the bristles, and also exhibit a striking resemblance to them in external appearance, it is extremely probable that they are analogous in structure; though from the smallness of their dimensions, I have not yet been able to satisfy myself that this is the case by direct observation, notwithstanding I have employed the highest magnifying power at my command. The hold which insects are enabled to take of any roughness or irregularity of surface by means of the fine hairs composing the brushes must be very considerable; and whoever examines the most carefully polished glass in a favourable light with a powerful lens, will speedily be convinced that it is not free from flaws and imperfections.

That some species of spiders can support themselves against gravity on the sides of polished bodies by the assistance of a mechanical apparatus similar in principle to that employed by insects in like circumstances, I have announced in a communication recently made to the Linnean Society *; and the fact affords a strong collateral proof of the truth of my theory.

I am aware that the males of several aquatic beetles have the tarsi of the first and second pair of legs supplied on the under-

* See preceding paper, "On the Structure and Economy of Spiders."

side

side with numerous cup-shaped suckers of various sizes, which have their edges (the larger ones at least) beautifully fringed with delicate hairs. These suckers, which probably serve to facilitate the intercourse of the sexes, are remarkably conspicuous on the tarsi of the males of a very common species, *Dyticus marginalis,* and unquestionably give them a firm hold of smooth objects occurring in water, a liquid whose specific gravity rather exceeds their own ; but that they are inadequate to the support of this insect, the average weight of which is about twenty-eight grains, on the vertical sides of dry, polished bodies, in so rare a medium as air, I have had frequent opportunities of remarking. My chief object in adverting to these singular organs on the present occasion, is to guard entomologists against the error of supposing that they correspond to the pulvilli of insects, which, as I have endeavoured to show, differ from them essentially both in structure and function.

XXVIII. *An*

XXVIII. *An Account of the Mode of Growth of young Corals of the Genus Fungia. By Mr. Samuel Stutchbury, A.L.S.*

Read January 19, 1830.

As I trust that the Linnean Society will receive favourably any new observations upon natural history, I beg permission to lay before them the following facts in regard to the young state of corals of the genus *Fungia*, which I met with in the Society Islands and the Paumotu's or Low Islands forming part of the Dangerous Archipelago.

Having a strong wish to travel and see the productions of nature in tropical climates, I agreed to accompany a voyage undertaken by a company formed in the year 1825, for the purpose of fishing for pearls in the Pacific Ocean. My engagement was as a collector in natural history.

On our arrival at Tahiti a number of natives of that island were (as is generally the practice in such voyages) engaged as divers, and we proceeded to the Dangerous Archipelago, which is one of the best grounds for the pearl fishery in the Pacific.

The specimens of *Fungia* which I have seen, generally lie in hollows of the reefs, where they are in some degree protected from the more violent agitation of the sea by the surrounding portions of branching coral, which inclose the hollows and, at the same time, allow sea water free access through their interstices.

It appears, that although the older and larger individuals are quite unattached and present no mark of former attachment, yet that

that in the young state they are fixed sometimes to rocks, and frequently to the dead remains of one of their own species. In this state they grow upon a footstalk, and generally remain attached till they acquire the size of nearly an inch in diameter, when they separate at the top of the peduncle*.

At this time the coral, when divested of the fleshy part, shows a circular opening beneath, through which the radiating plates of the upper surface are visible. In a short time a deposit of coral matter takes place, which cicatrizes the opening, the marks of which however can be traced for a considerable time; at length the increase of this deposit, which continues with the growth of the animal, entirely obliterates all appearance of it. It will not appear surprising that this circumstance should hitherto have been unnoticed, when it is recollected that it has very rarely occurred to naturalists to visit the places of their growth, and that to general collectors the smaller specimens would appear hardly worth the trouble of preserving and bringing home.

The sheltered situations in which the *Fungiæ* are found are peculiarly well adapted to their nature, as they would be liable to injury if they were exposed to the full force of a stormy sea; and the circumstance of their being attached in the young state is a beautiful provision of Nature for their preservation at that period, as from their light weight when first developed they

* The following is extracted from my Journal written at the time.

"Thursday, January 4, 1827.—This day went to the reefs with two natives to collect some specimens of the Madrepora fungites. Succeeded in obtaining one specimen, which illustrates a fact respecting their growth. This is a dead coral having a number of young living corals attached to it by a pedicle: thus it appears that, when very young, they are attached until about the size of a shilling; you may then perceive a line of demarcation, at which mark the larger ones are easily separable, the lower portion being dead. Thus it would appear that an action takes place similar to sloughing, the larger corals of this genus having no trace left of attachment. These corals appear to inhabit very shallow water."

would,

would, if unattached, be exposed to great injury even by a slight agitation of the water.

I have also to remark upon this fact, that the *Fungiæ* while attached agree in every respect with Lamarck's genus *Caryophyllia*, more especially in their early state, when the radiating plates are first developed. At this time their upper discs are scarcely larger than the stem, but they soon begin to spread and show indications of their characteristic form.

There are not unfrequently instances of smaller individuals remaining fixed to large ones in a living state, and such specimens are not unfrequent in collections of corals; but in all such cases that I have seen, the younger ones are attached to the under side of the old one, and I believe them to be cases of accidental attachment.

I consider the specimens found at Tahiti, which are figured in the accompanying plate, to belong to Lamarck's species of *Fungia agariciformis*, of which there appear to be many varieties. These have closer plates than those from Sincapore, and smaller serratures along their edges.

In the Paumotus, which are principally coral reef islands inclosing a lagoon studded with smaller reefs, I met with a species which I have not observed elsewhere, and do not remember to have seen figured in any work on natural history. One is represented in Tab. xxxii. Fig. 6. *a*, *b*. The coral is of an ovate form, flatter in proportion than *F. agariciformis*, and thicker in substance, but the lamellæ are much thinner and more numerous. As I believe that these characters will prove sufficient to constitute a distinct species, I propose to call it *Fungia Paumotensis*. The *Fungia limacina* occurred frequently among the Society Islands, but I did not find it in its young and attached state. The figures represented in the accompanying plate are all taken from specimens collected in the voyage above mentioned.

In Ellis's *Zoophytes* (page 146.) is the following passage, quoted

quoted from Rumphius, in regard to the animal of *F. agariciformis.* "The more elevated folds or plaits have borders like the denticulated edges of needlework lace; these are covered with innumerable oblong vesicles formed of a gelatinous substance, which appear alive under water, and may be observed to move like an insect."

I observed these radiating folds of the animal, which secrete the lamellæ, and which shrink between them when the animal contracts itself on being disturbed. They are constantly moving in tremulous undulations; but the vesicles above described appeared to me to be air-vessels, placed along the edges of the folds; and it is some confirmation of this opinion, that the vesicles disappeared when the animal was touched.

This arrangement of air-vessels would very materially assist in keeping uppermost the convex disc of the coral, and be of vital importance to the young polype at the time of separation, and subsequently, in keeping it upon the surface of its sandy bed: or if they were moved by a sudden roll of the sea, which would lift even the most ponderous, and possibly convey them a considerable distance, they would be again deposited in their natural position.

That they have no power of turning themselves I proved during a sojourn of six weeks at Tahiti, by placing a healthy specimen with its upper surface downwards, during which time it remained in the position placed, and the vitality of the points of contact with the rock upon which it was laid, was destroyed.

In *Fungia limacina* I have seen instances where the coral, having been accidentally placed, and permanently fixed in such unusual positions, has adapted itself to its new situation, by increasing upon its edges and forming a new convex surface.

Since writing the preceding, it has been pointed out to me that in April 1828, some months after my arrival in England with

with the specimens above mentioned, a slight notice of this subject appeared under the article *Fungia* in the "Encyclopedia Metropolitana"; and I regret that when I communicated to the author of that account some remarks on the corals which I had collected, I was not aware that he intended to publish a notice of this discovery; as I could have given him more particulars upon the subject.

That writer states, "that they seem, when young, to be conical, and attached to some marine body, often their parent, by the base, which is contracted into a kind of stem;" and "when young, the coral has the appearance of a solitary *Caryophyllia ;* in this state the animal only occupies the upper surface, but when it is full grown and free it completely incloses the coral."

As long as the young *Fungia* retains the form of a *Caryophyllia* it is entirely enveloped by the soft parts of the animal; but as the upper disc of the coral spreads, and it assumes its characteristic form, the pedicle is left naked, and the soft part extends only to the line where the separation afterwards takes place. I consider the cases in which young *Fungiæ* are found fixed to the underside of others of the same species, to arise from the accidental attachment of the young polype, when detached from the ovarium of the parent, and by the motion of the water floated underneath a larger one of its own species, the edges of which were not so even as to touch the rock or coral on which it rested, at every part of its circumference. In such cases the soft parts of the older specimen would continue to cover the short stem of the younger individual, and hence its separation from its pedicle would be prevented.

EXPLANATION OF TAB. XXXII.

Fig. 1. represents part of a large dead specimen of *F. agariciformis*, upon which a great number of young ones have grown. Many remain still attached; and at *a.* are seen the footstalks from which others have been separated. This specimen, which is the finest that has been found, is now in the collection of Dr. Bright. A part only is represented, but enough is shown to illustrate the subject. A complete drawing of this very rich specimen would be a most laborious work.

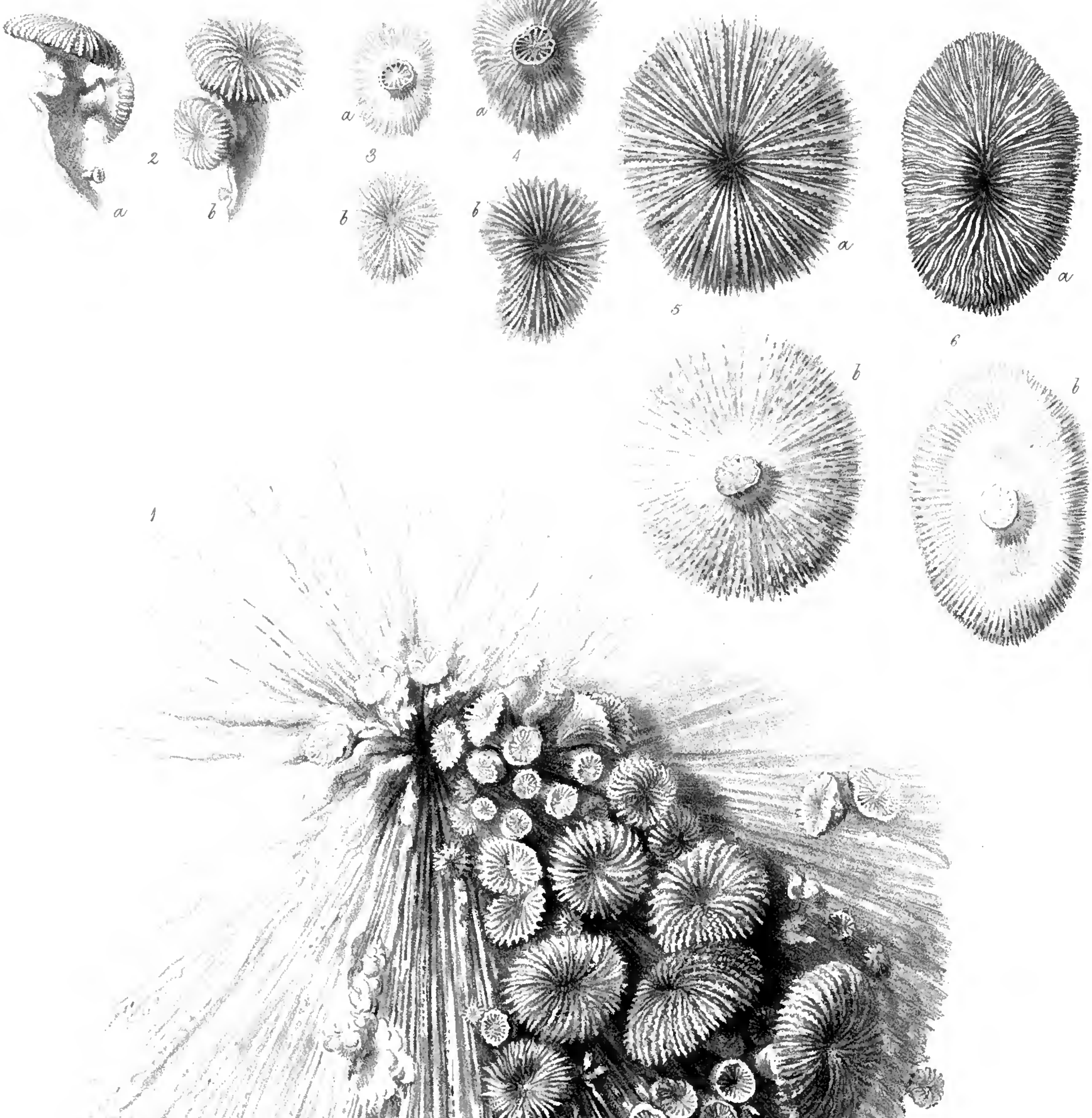
Fig. 2. *a*, *b*, represents two of the young of *F. agariciformis* growing attached to one of the lamellæ of a dead coral of its own species.

Fig. 3 and 4 are upper and under views of two specimens of the same species, taken soon after they had separated from their peduncles, in which the lamellæ are distinctly seen on the under surface.

Fig. 5. A larger individual of the same. In the under view the place where it was formerly attached can be clearly traced, but the part has been covered with a deposit of calcareous matter similar to the rest of the coral, and the lamellæ are no longer distinctly seen.

Fig. 6. Two views of *Fungia Paumotensis* in a similar state to the preceding.

XXIX. *On*



G. Scharf, del. et lithog.

Printed by C. Hullmandel.

XXIX. *On the remarkable Formation of the Trachea in the Egyptian Tantalus. By Joshua Brookes, Esq., F.R.S. & L.S.*

Read March 16, 1830.

OF all the organs with which animals are furnished, the vital organs justly excite our highest admiration; and in contemplating the great variety of conformation in the thoracic viscera in various species, the physiologist is frequently at a loss to account for the function of their striking peculiarities of structure.

The subject of the present observations is the trachea of the *Tantalus Ibis*, or Egyptian Tantalus*, a bird rarely imported in a living state, and probably the present specimen of that organ is the only one of the kind in Europe. I am not aware that there is any record of a similarly constructed trachea having been found in any other genus of the feathered tribe. This bird died shortly after its arrival in England; and being sent to Mr. Leadbeater for preservation, he kindly presented me with the body in a recent state.

As there is not any unusual occurrence in the upper part of the trachea, I shall proceed immediately to describe that portion of the organ which is contained within the thorax. Here a lateral compression takes place of about three inches in lenght, and an inch in breadth; the part thus compressed is larger and rounder at one margin than it is at the other, where it

* The preparation of this organ was presented to the Zoological Society, and may now be seen in the Museum of that Institution.

it is almost acute, but having a small indentation inferiorly. It is formed of flattened minute rings (connected by intervening membranes) firmly ossified at their rounded edge. From the lower extremity the bronchi separate; these decussate each other in a very extraordinary manner, as may be seen in the specimen. The membranous spaces between the rings of the bronchi are very distinct; and I must confess myself at a loss to account for this singular arrangement. The trachea occupies the anterior surface of the œsophagus at the entrance into the thorax. This proceeds to its destination between the bronchi.

Probably one reason for the compressed figure of the inferior part of the trachea may be for the purpose of allowing large erpetalous animals to descend in deglutition with greater facility than could otherwise happen without impediment to respiration; for in consequence of the ossified structure of this singular portion of the *aspera arteria*, neither the pressure of the individual by its volume, nor by its struggles *in articulo mortis*, would cause obstruction.

Perhaps it is not possible for the naturalist to investigate any subject more fraught with interest than the pulmonary organ in birds, the more striking peculiarities of which exist in some of the genera of the order *Grallatores;* for instance, in the *Gruidæ*, the *Platalea*, and, as it now seems, in the *Tantalus*. They are found also in the *Anatidæ* almost universally; and although the genus *Anser* is an exception, nevertheless the *Anser semipalmatus*, an Australian goose, is singularly furnished with the most contorted trachea of the whole aquatic tribe.

The species of the genus *Cygnus* are remarkable for the contortions of the trachea within the carina of the sternum, but the domestic swan is altogether an exception, and presents another discrepancy in the number of the ribs. The form of the trachea in the *Fuligula nigra* (Black Scoter) is the most simple among the

the ducks, having only a trifling enlargement of that organ and of the bronchi.

The *Cracidæ* and *Capricalcæ* (*Urogallus*) exhibit also manifestations of similar conformation, as well as an individual of the Cassican family, described by M. Lesson in his "Manuel d'Ornithologie," under the title *Phonygama Keraudrenii*, and probably in other birds whose larynges and tracheæ have not as yet fallen under my notice.

The very remarkable circumstance of the tracheæ in many birds, especially those of the order *Natatores*, being ossified and composed of various pieces, and each ring being entire (not as in man and mammalia, having a muscular membrane occupying the posterior third part of the canal), which possibly can only be accounted for from the apparent necessity of the air being required to remain in the body of the animal, rarefied in readiness for the purpose of raising itself, whenever it may be induced to wing its flight through the atmosphere; and assuredly aquatic birds must be rendered very buoyant in consequence when swimming.

The bodies of the pelican (*Onocrotalus*), gannet (*Sula*), and chaja (*Palamedea Chavaria*) may be inflated almost like a bladder between the skin and muscles; so also, but partially, that of the powting pigeon, the adjutant, marabou, and tachypetes, but particularly the emeu, whose trachea, somewhat below the middle of the neck, being there deficient in cartilaginous rings, is formed into a membranous sac, which can be distended at pleasure: and everybody has seen the male turkey, in the pride of dominion, enlarge its breast and even menace the spectator; faculties clearly tending to accelerate progression when required.

With few exceptions, birds, having a crop, are not furnished with inflexions, or obvious deviations from the apparent ordinary

nary structure of the trachea: quans, curassows, the caperkally, and *Phonygama Keraudrenii*, are instances of those exceptions.

Nothing striking in this respect occurs in individuals of the order *Raptores*, all of which have an ingluvies, with an *os furciforme* very strong, and bent concavely for its support; whereas in the *Rasores* the same bone is of so delicate a nature, that in one of the largest species, the turkey, it is even of a slighter texture, in proportion to the size of the bird, than in all the other genera. This circumstance arises probably from the species of this order being constructed more for walking than flying; the turkey especially, whose migrations are sometimes of considerable extent, performing them chiefly on foot. The *Struthionidæ* have no perfect *os furciforme*.

I hope to be understood as not implying that there is no peculiarity of the larynges and tracheæ, except in some genera; for I believe all have the admirable mechanism of the organ of voice differently constructed, with corresponding muscles, and distribution of nerves, producing those various modulations of sound so familiar to us, and destined for the excitement of love, as well as for other purposes.

It would seem superfluous in me to offer further observations on this head, after the luminous representations which are to be found in different authors, demonstrating these facts, but more particularly by Mr. Yarrell, who favoured the Society with highly interesting details of this curious subject, illustrated by preparations, and drawings of the remarkable forms of the labyrinths, larynges, divaricating septa, and extensive contortions of the tracheæ in various species, as well as of the appropriate muscles, some of which were before altogether undescribed.

It may be thought worthy of remark, that the *Tantalus* affords the only instance, I am acquainted with, except the spoonbill, of of a bird that feeds on large living animals, having a very obvious augmentation of the trachea. As in the spoonbill also, in which the formation of the lower portion of the trachea is the same, the inferior larynx of our bird is deficient, as are likewise the muscles, and consequently it is found to produce few variations of sound.

Neither the adjutant, the largest of the *Grallatores*, nor the stork, heron, pelican, gannet, corvorant, or loon, has any such structure. Of the jabiru and albatross I cannot speak with any certainty.

XXX. *A Supplement to the "Synopsis of Testaceous Pneumonobranchous Mollusca of Great Britain." By John Gwyn Jeffreys, Esq., F.L.S.*

Read June 21, 1831.

More extensive opportunities and the assistance of scientific friends enable me to offer a few remarks, by way of addition and correction to the list of Mollusca which the Society lately did me the honour of publishing in their Transactions. Except in a very few instances I shall, as before, only notice such habitats for the species as have fallen under my own observation, or been communicated to me by others.

Succinea.

S. putris var. *α. Linn. Trans. Soc. vol.* xvi. *p.* 325.

Mr. Alder, in a valuable paper on the land and freshwater shells of Newcastle-upon-Tyne, which is to be found in the first volume of the Transactions of the Natural History Society of that place, describes this variety under the specific name of *oblonga*. Dr. Leach fell into the same mistake; and has moreover, in his inedited work on the British Mollusca, referred it to the *S. oblonga* of Draparnaud. It is a very variable species.

S. oblonga, *p.* 325.

Sparingly in ditches on Braunton Burrows, North Devon. I observed specimens in the Hon. Lady Elizabeth Finch's collec-

tion

tion of British shells, and also in Dr. Turton's cabinet; in both cases mixed with the other sort.

Vitrina.

V. Mülleri, *p.* 326.

V. beryllina. *Pfeiffer, Sand-und-wasser Schnecken &c.* i. *p.* 47. *Taf.* iii. *fig.* 1.

V. pellucida. *Mr. Alder, Catal.*

The distribution of this species over our island appears to be very extensive. It is also mentioned in the Appendix to Welsh and Whitelaw's History of Dublin, under Captain Brown's name of *Helix elliptica*, as found at Ferbane and other parts of that neighbourhood. The animal has the same carnivorous propensities as the smaller Limacidæ and Testacelli; and I once detected no less than seven individuals busily engaged in feeding on a scarcely dead earthworm, which was faintly writhing about, and endeavoured in vain to get rid of its assailants.

V. Draparnaldi, *p.* 326.

Helicolimax Audebardi. *Férussac, Prodr. p.* 21.

In addition to the locality before mentioned, I have to add that I lately found a single specimen on Mount Edgecumbe near Plymouth. It is an intermediate species between the last and the *Helix diaphana* of Draparnaud.

V. elongata, *p.* 327, *lege* Dillwynii, *Jeffreys.*

This being a different species from the *V. elongata* of Draparnaud, I have ventured to dedicate it to my much esteemed friend, L. W. Dillwyn, Esq. of Penllergare, the well known author of several standard works on natural history.

Helix.

H. pomatia, *p.* 329.

This species appears to be most attached to chalky soils and those

those of an oolite formation, perhaps on account of the quantity of lime which is necessary for the secretion of its shell and winter epiphragm.

H. fusca, *p.* 330.

Common in moist woods of the North of Devon. It frequently exceeds the size mentioned in the former part of my Synopsis.

H. trochiformis, *p.* 331.

In the same situations as the last, Wiltshire and Devonshire. Rathgael House, County Down, Ireland (*Mr. Cleland*); Eton, and Tenby; *Rev. Dr. Goodall.*

H. Mortoni, *p.* 332.

Box, near Bath, rare.

H. aculeata, *p.* 332.

In moist woods of Devon and Wiltshire

H. lamellata, *p.* 333.

"Animal pale grey," *Mr. Alder;* who very obligingly furnished me with specimens of this and other rare species of the North of England.

H. sericea, *p.* 333, *lege* globularis, *Jeffreys.*

> *Animal* albidum, anteriùs griseum. *Sustentaculum* brevius crassum.

Abundantly in the South of Devon: also at Tenby (*Rev. Dr. Goodall*); and Salisbury. Neighbourhood of Dublin: *Appendix to Welsh and Whitelaw's Hist. of Dublin.*

The *H. sericea* of Draparnaud is a very different species from this. The name of *granulata*, given to the present by Dr. Turton and adopted by Mr. Alder, is objectionable, as indicating an imperfect appearance of the specimens; but I rather doubt its being distinct from the *H. hispida*. It is not uncommon in

many

many parts of Switzerland and on the French side of the Jura; but has not I believe been found in more southern districts.

H. cingenda, *p*. 333.

Whitsand Bay, Cornwall. "Balbriggan Strand": *App. to Welsh & Whitelaw's Hist. of Dublin.*

H. virgata, *p*. 334.

The variety *α* is very plentiful on Braunton Burrows, North Devon; and Mr. Alder has sent me a charming thin milk-white variety with a band of the same colour.

The *H. neglecta* of Draparnaud may, I think, be referred to another variety.

Pfeiffer's var. *α* and both his figures for this species (*variabilis*, P.) belong to the *H. cingenda.*

H. caperata, *p*. 335.

H. Thymorum. *Pfeiffer*, i. 37. *Taf.* ii. *fig.* 21, 22.

Var. *α.* candida, zonâ submarginali fusca, duabusque approximatis inferioribus.

H. candidula. *Fér.?*

Of this very beautiful variety I found a few specimens on the downs which overhang Whitsand Bay near Plymouth. Pfeiffer at first called it a variety of his *H. Thymorum;* but he seems afterwards to have considered it as a distinct species in the Systematic Table at the end of his work. The point of difference between it and the *caperata* seems to be the same as that which is made to distinguish the *Pecten opercularis* and *lineatus* of British conchologists.

H. pallida, *p*. 335.

Common in many parts of Surry and Kent. Neighbourhood of Dublin: *App. to Welsh & Whitelaw's Hist. of Dublin.*

Young shells are hispid, a character common to this and many of its continental congeners.

15 bis. rufilabris. *Jeffreys.*

Animal testaceum aut griseum, supernè croceo-verrucosum. *Tentacula* longa flexilia.

Testa subdepressa, subglobosa, glabra, nitidiuscula, croceo-pallescens. *Anfractus* 5—6. *Apertura* subrotundo-lunata, margine rufo, limboque sæpè eburneo instructa.

Long. 0.25.—Diam. 0.5.

H. Carthusiana. *Müller.*

H. Carthusianella. *Drap. p.* 101. *pl.* vi. *f.* 31, 32. *Fér.* 47.

Var. *α.* minor, convexior.

H. (Helicella) Olivieri. *Fér. p.* 47.

Mr. J. F. Stephens (who presented me with specimens) says he found it many years ago in great abundance about Dover; and subsequently at Brighton and other parts of that line of coast. Little Hampton, Sussex: *Mr. J. E. Gray.*

Dr. Leach, in his admirable (though as yet inedited) work on the British Mollusca, says that "Mr. Gibbs discovered this species to be an inhabitant of Britain in 1814, and communicated it to Montagu, who named it in his MSS. *H. Gibbsii.*"

It was, I believe, first publicly recorded as British by Baron de Férussac in his *Concordance Systematique pour les Mollusques terrestres et fluviatiles de la Grande Bretagne.*

I did not notice this species in the former part of my Synopsis, from a supposition (perhaps not altogether unfounded) that it had been naturalized in this country by an importation from the opposite coast of France. Certain it is that on a late visit to Dover, I could not, after a long and strict search, find any traces of its having inhabited that neighbourhood. The above description of the animal has been taken, *faute de mieux*, from specimens collected by myself in Normandy.

H. concinna,

H. concinna, *p.* 336.

H. depilata. *Pfeiffer*, i. 35. *t.* ii. *f.* 18?

By a careful examination of many hundred specimens from different localities, I am inclined to think that the above-named species must be eventually referred to the *H. hispida.* It is the *H. rufescens* of Swiss authors. The variety *α* abounds in the environs of Dover and the opposite coast of Calais.

The *H. plebeium* of Draparnaud is sometimes found in company with this species, and is probably another of the numerous varieties of the *H. hispida.*

H. rufescens, *p.* 337.

Var. *α* alba. Neighbourhood of Salisbury; and rejectamenta of the Thames at Battersea.

H. hispida, *p.* 338.

The *H. conspurcata* of Draparnaud is different from this species, being allied to our *H. caperata.*

Dr. James Lindsay, in a letter addressed to Roderick Impey Murchison, Esq., F.R.S., and lately read before the Society, states his having found the *H. obvoluta* alive and in considerable plenty in Ditcham Wood near Buriton, Hants. Mr. G. B. Sowerby had previously favoured me with a specimen from the same place. But its confined locality and the circumstance of its having remained so long unnoticed by British authors might warrant a suspicion that it may be of the same recent and precarious indigenousness in this country with the *H. Carthusianella.*

H. ericetorum, *p.* 338.

I am quite satisfied of this being the *H. cespitum* of Draparnaud.

A more produced variety was obligingly favoured me by the Rev. R. T. Lowe, who tells me he found it many years ago in great abundance at Iona.

H. nitida,

H. nitida, *p.* 339.

Devonshire; Somersetshire; and the neighbourhood of London.

The *H. excavata* of Messrs. Bean and Alder appears to be the variety *α* of my Synopsis.

H. nitidula, var. *α*. *p.* 340.

H. pura. *Mr. Alder, Catal.*

21 bis. radiatula.

Animal nigrescens. *Tentacula* breviuscula.

Testa depressior, nitida, cornea, subtiliter et elegantissimè striata. *Anfractus* 3—4; suturâ distinctâ. *Apertura* suborbiculato-ovata; *peristomio* simplici. *Umbilicus* valdè patens.

Long. 0.05.—Diam. 0.125.

H. radiatula. *Mr. Alder, Catal.*

The striæ are fainter on the under side and do not quite reach to the umbilicus.—Among decaying leaves and moss in woods of the North of Devon, Kent, and Wiltshire.

For the discovery and publication of this elegant little species we are indebted to Mr. J. Alder.

H. alliacea, *p.* 341.

Var. *α* paulò major; spirâ productiore.

Under stones and logs of wood on Mount Edgecumbe near Plymouth.

H. rotundata, *p.* 342.

Var. *α* sparingly among the rejectamenta of the Thames at Battersea. Dinton Hall, Bucks: *Rev. Dr. Goodall.*

By the kind permission of Dr. Turton, I have examined his specimen of the *Helix rotundata* Conch. Dict. It is, as I suspected, only a distortion of the above variety, and answers to the var. *β* of Pfeiffer, who refers it to the *H. perspectiva* of Mühlfield.

field. The upper volutions are nearly flat, and the umbilicus very patent. I possess a specimen from the neighbourhood of Dover, which seems to connect the two species.

H. umbilicata, *p.* 342.

Torquay; *Dr. Turton.* Cloonoomy Barracks and at Cove, plentiful; *App. to Welsh & Whitelaw's Hist. of Dublin.*

My friend M. D'Orbigny of Rochelle was good enough to set me right as to the identity of Draparnaud's *H. pygmæa* with this species; and from his intimate acquaintance with that author during his lifetime, and having been for many years a contemporary and fellow-labourer in the same pursuits, I have no doubt of his correctness. Mr. Sheppard's name of *Kirbii* should therefore be retained for the following species.

H. pygmæa, *p.* 343, *lege* Kirbii.

Woods of the North of Devon. Neighbourhood of Bristol; *Mr. J. S. Miller.* Tor Abbey Wood (Gen. Bingham); *Rev. Dr. Goodall.*

H. acuta, *p.* 344.

Kent; and South of Devon.—"Near Belfast (*Dr. MacDonnel*): and by Mrs. Travers at Belgrove;" *App. to Welsh & Whitelaw's Hist. of Dublin.*

Bulimus.

B. Montacuti, *p.* 345.

Occasionally found on the Kentish Downs.— Neighbourhood of Dublin: *App. to Welsh & Whitelaw's Hist. of Dublin.*

Dr. Turton has described in the Zoological Journal, No. VII. p. 363. a well known Sicilian species under the name of *Bul. tuberculatus;* but I can hardly think the information he received as to its habitat can have been correct.

B. acutus, *p.* 346.

I was

I was wrong in saying the *B. ventricosus* of Draparnaud is a variety of this species; though the transition to our species through the variety *α* is certainly very slight. This last variety Mr. Lowe tells me he found in great abundance on Iona island in the summer of 1824.

CIONELLA.

C. lubrica, *p*. 347.

Var. *α* virescenti-alba, hyalina.

Pentifully in the grounds of Tawstock (Sir Bourchier Wrey's) House, near Barnstaple, North Devon.

CLAUSILIA.

C. nigricans, *p*. 351.

Var. *α*. alba. Dinton Hall, Bucks: *Rev. Dr. Goodall.*

C. parvula, *p*. 352.

There is a specimen of this shell in Dr. Leach's Cabinet, British Museum.

C. plicatula, *p*. 354, *lege* Rolphii.

Animal nigrescens, supernè valde corrugatum. *Sustentaculum* angustius.

C. pumila. *Pfeiffer*, iii. 41. *Taf*. vii. *fig*. 16?

I believe this to be a distinct species from the *C. plicatula* of Draparnaud; and Leach's name of *Rolphii* (which has been published by Mr. Gray in one of the Numbers of the London Medical Review for 1821) should perhaps be adopted.

C. labiata, *p*. 353.

Not an uncommon species in Sicily and the Ionian Archipelago. Mr. G. B. Sowerby furnished me with specimens from the late Mr. G. Humphrey's collection; and he supposes that it was through the same channel introduced into Montagu's British Catalogue. Mr. Lyons informs me that his specimen was presented to him by Miss Pocock.

 C. ven-

C. ventricosa, *p.* 354.

Animal nigrescens, pede dilutiore. *Tentacula* breviuscula.

Not uncommon at the roots of willows, and among the rejectamenta at Battersea Fields. Eton; rejectamenta at Weymouth, and parts of South Devon; *Rev. Dr. Goodall.*

C. derugata, *p.* 354.

Var. *a.* alba, hyalina.

Neighbourhood of Bath, rare. Darnwood: Kent; *Mr. J. F. Stephens.*

Dr. Turton favoured me with the *C. papillaris* of Draparnaud as British. It is rather narrower in girth, with the peristome not so thick and reflected as in South-European specimens; but as the Doctor could not give me the exact locality of his shells, and Baron Férussac has pronounced this, with (deservedly) the *Helix octona* and *Bulla rivalis* of British authors, as exotic to this country, I cannot for the present give it a place in my catalogue.

PUPA.

P. Secale, *p.* 355.

Jaminia Secale. *Risso, Prod. de l'Eur. Mér.* iv. 88.

Devizes, *Dr. Turton:* and my friend Doctor Gibbon of Swansea showed me some specimens which he had received from the neighbourhood of Brecon, South Wales.

Mr. J. E. Gray tells me that he once found a specimen of the *Pupa cinerea* (Draparnaud) among the rejectamenta of the Thames at Battersea; and I have since myself detected an imperfect specimen at the same place.

P. ringens, *p.* 356.

"Animal dark lead colour above and white below." *Mr. Alder, Catal.*

P. bidentata. *Pfeiffer*, i. 59. *Taf.* iii. *fig.* 21, 22.

P. Muscorum *c. Id.* iii. 61.?

P. um-

P. umbilicata, *p.* 356.

P. unidentata. *Pfeiffer*, i. 58. *Taf.* iii. *fig.* 19, 20. ?

P. Muscorum *b. Id.* iii. 61.

Var. *α.*

P. Muscorum. *Pfeiffer?*

P. Muscorum *a. Id.?*

Jaminia (*Leach?*) Muscorum. *Risso, Prod. de l'Eur. Mér* iv. 88.

ALÆA.

A. marginata, *p.* 357.

Pupa Muscorum *d. Pfeiffer*, iii. 61 ?

Jaminia marginata. *Risso*, iv. 88.

A. nitida, *p.* 358.

Animal griseum. *Tentacula superiora* breviuscula, clavata; *inferiora* vix (etiam cum lente) discernenda.

Vertigo edentula. *Pfeiffer?*

Pupa edentula. *Mr. Alder, Catal.*

Jaminia edentula. *Russo*, iv. 88.

North Devon, and Surry. The *Alæa revoluta* of my Synopsis is an old and bleached specimen, with the aperture placed more extrinsically than usual.

A. cylindrica, *p.* 359.

Animal rufo-nigricans, nitidum. *Tentacula superiora* paululùm arcuata.

Pupa minutissima. *Pf.?*

I have added a description of the animal from specimens taken in the South-west of France, where it is not uncommon in situations similar to that of the British specimen before noticed.

4 bis. SUBSTRIATA, *Jeffreys.*

Animal nigricanti-griseum. *Tentacula superiora* longiuscula, gracilia; *inferiora* bulbiformia. *Sustentaculum* angustius.

Testa

Testa subdolioliformis, ventricosior, nitidula et (præsertim ad apicem) argutè striata, fulvo-cornea. *Anfractus* 4—5, globosi. *Apertura* suborbiculato-lunata, extùs parùm marginata, subsinuata; intùs 5—6 lamellis, nempè 2—3 columellaribus et 3 labralibus instructa: *peristomio* tenui, subreflexo. *Umbilicus* angustatus.

Long. 0.06.—Diam. 0.04.

Vertigo 4—5-dentata. *Studer, Catal.*
V. pygmæa. *Pf.?*
V. similis. *Férussac, Prodr.* 64.
Pupa sexdentata. *Mr. Alder, Catal.*

In a marshy piece of ground near Rawleigh House (Mrs. Barbor's), Barnstaple, together with the last and following species, rare.

The first intimation I had of this very desirable shell having been found in Britain, was through the Baron de Férussac, in whose cabinet at Paris I observed specimens which Mr. Bean had sent him from Scarborough as the *Turbo sexdentatus* of Montagu. And Mr. Alder (who was aware of its distinctness from Montagu's species) has since obligingly presented me with a fine series from the neighbourhood of Newcastle-upon-Tyne.

A. vulgaris, *p.* 360.
Jaminia 5-dentata *Risso,* iv. 88?
A. palustris, *p.* 360.
Jaminia 7-dentata. *Risso,* iv. 88?

Under ash-boughs which had lain long on the ground; not uncommon in several places about Bath; rejectamenta at Battersea, rare; and with the last species.

Vertigo.

V. pusilla, *p.* 361.

Jaminia

Jaminia heterostropha. *Risso*, 88.

Moist woods of the North of Devon, rare. *Dr. Turton.*

V. angustior, *p*. 361.

V. Venetzia (*Charpentier*). *Férussac, Prodr. p*. 65 ?

In the Honourable Lady E. Finch's collection of British shells. Mr. Stephens also possesses a young specimen from Battersea Fields.

Cyclostoma.

We are indebted to the Rev. M. J. Berkeley for an elaborate paper in the Zoological Journal, on the Animal of the *C. elegans*, which, together with its neighbouring genera the *Helicina* and that comprising the *Cyclostoma maculatum*, &c. of Draparnaud, might conveniently form a new order by itself intermediate be tween the *Pulmonobranchia* and *Pectinibranchia* of Cuvier.

Carychium.

C. fuscum, *p*. 364.

Two specimens in a moist wood near Barnstaple, Devonshire, *Miss Hill*. And Mrs. Griffiths of Torquay, who also some time ago found this species in considerable abundance near Ilfracombe in the same county, has confirmed to me Férussac's description of the animal.

C. politum, *p*. 365, *lege* Goodalli.

Animal fuscescenti-nigrum, nitidum, lubricum. *Tentacula* superiora cylindrico-clavata.

Carychium Menkeanum. *Pfeiffer.*

Pupa Menkeana. *Pfeiffer.*

Azeca tridens. *Fleming, B. A.p*. 269. *Mr. Alder, Catal.*

Warley-wood near Bath: *Mr. Miller*. Amersham, Bucks: *Rev. Dr. Goodall.*

Having also myself lately discovered this species in great abundance in woods of the North of Devon, I am fully assured that

that it is not a *Carychium*, the animal having four tentacula, the two upper ones ocellated at their extremity. Indeed the appearance of the animal and its shell (the latter being slightly channelled at its base when young) bears so close a resemblance to the *Cionella lubrica* of my Synopsis, that I have no hesitation in assigning it a place near that species. As the character indicated by the word *politus* is common to all the hitherto known species of *Cionella*, I cannot do better than adopt for this the name of *Goodalli*, which Baron Férussac has proposed in honour of my kind and much respected friend the Provost of Eton.

Pfeiffer is, I believe, the first author who has noticed it out of this country.

AURICULA.

A. alba, *p*. 369.

Animal album. *Sustentaculum* latius, hyalinum.

Alive in crevices of the rocks at Ilfracombe and Linton, North Devon.

4 bis. A. multivolvis. *Jeffreys.*

Animal ———

Testa ovato-fusiformis, ventricosa, solidior, glabra, nitida, castaneo-albescens. *Anfractus* 12 connexi, supernè parùm crenati: spirâ obtusè acuminatâ. *Apertura* oblonga, angusta; plicâ unicâ ad inferiorem partem columellæ discernendâ: *peristomio* simplice.

Long. 0.3.—Diam. 0.15.

Voluta bullaoides. *Montagu, Suppl. p.* 102. *t.* 30. *f.* 4.

Tornatella bullaoides. *Fér.* 108.

Baron de Férussac favoured me with the specimen above described, which he had received with two others from Mr. Bean of Scarborough, as found on that coast. It has the habit and aperture

aperture of a true *Auricula;* but I have not ventured to break my solitary specimen to examine the internal structure of the spire, which I consider the main test of distinction between that genus and *Tornatella* conchologically considered. The upper whorls are very small in proportion; and the last, as usual in the genus, occupies more than two thirds of the entire shell.

Mr. Clark of Bath, whose well known zeal and industry as a British conchologist is more than equalled by his accuracy, has since informed me that he discovered a specimen some years ago among a parcel of West Indian shells of no great value. This is an interesting fact, and must leave the indigenousness of this species (at present at least) in some doubt.

The section of *Auricula* (*Conovulus* Lam.), to which this belongs, are all natives of tropical climates.

Limneus.

L. glutinosus, *p.* 371.

Dr. Goodall possesses specimens in his cabinet marked as from "Scarborough; Swaffham; Windermere; Oxford; Eton; and Deal marshes." Wittleseamere; *Mr. Stephens.* From this latter place I have seen specimens which measure full three quarters of an inch in length. Stanmore, Middlesex; *Mr. G. B. Sowerby.*

L. pereger, *p.* 374.

Var. γ. Gulnaria lacustris. *Leach's British Mollusca (inedited)? Ead. Brit. Mus.*

The *Limnei ovatus, vulgaris* and *pereger* of Pfeiffer, all appear to belong to this species.

L. major, *p.* 375.

Var. β. Surry and Croydon canal, not uncommon.

The *Physa scaturiginum* of Draparnaud, which Dr. Turton has noticed as British in one of the Numbers of the Zoological Journal, is the fry of this species.

 This

This section of *Limneus* belongs to M. Risso's genus *Leachia*, and the *Stagnicola* of Dr. Leach.

L. communis, *p.* 376.

Var. *α.* magìs elongata, labro intùs vix reflexo. Dorking, Surry: *Mr. Stutchbury.*

Var. *β.* minor, testacei coloris, *truncatulo* affinis.

L. fuscus. *Pfeiffer* i. 92. *Taf.* iv. *fig.* 25?

Common in marshes along the banks of the Thames from Battersea to Woolwich. The gradation from one to another of the different species of European *Limnei* is so very slight, that unless, as M. Blainville once expressed to me, the *stagnalis*, *palustris* and *pereger* are excepted, there would properly be no species at all.

L. elongatus, *p.* 376.

Ireland (Rev. James Bulwer); Scarborough (Mr. Bean); and Norfolk (Dr. Leach); *Rev. Dr. Goodall.*

L. Grayanus, *p.* 378.

does not belong to the *Pulmonobranchia*; but (on account of its animal) would form a curious anomaly in Férussac's subgenus *Paludina* of the genus of the same name. In the form of the shell it approaches to some of the smaller *Melaniæ*.

L. detritus, *p.* 378.

I have seen Dr. Turton's specimens of his *Helix detrita*, which are a true *Bulimus*, and very different from the above species. Dr. Pulteney's cabinet in the Linnean Society's museum contains several; but I did not observe any appearance of bands. It is, however, a very doubtful species both as to its habitat and locality. Férussac refers it without a doubt to a variety of the *Bulimus radiatus* of Draparnaud.

Physa.

Physa.

1 bis. P. alba.

Phyza. *Risso.*

Animal ———

Testa sphærico-ovata, ventricosa, fragilis, diaphana, striatula, alba. *Anfractus* 3—4, globosi; suturâ excavatâ; spirâ brevissimâ, acutiore. *Apertura* larga, ovata.

Long. 0.275.—Diam. 0.175.

Physa alba. *Turton in Zool. Journ. No.* vii. *p.* 363. *t.* xiii. *f.* 3.

Dr. Turton says, this rare and eminently beautiful species was sent him by Mr. Blomer as from the river Towin, North Wales. Lady Elizabeth Finch did me the honour of presenting me with a specimen, which I believe was procured through the same channel. Mr. Sowerby has this species from Sicily; and I fear Dr. Turton has been deceived or mistaken in its British locality.

P. hypnorum, *p.* 382.

Var. *α.* minor, magìs oblonga.

In pools on Crymlyn Burrows near Swansea, rare. Colour a deep and bright bronze.

Planorbis.

P. Vortex, *p.* 382.

The variety *α* of my Synopsis is abundant at Battersea; and the other below the Thames about Woolwich.

P. corneus, *p.* 383.

Neighbourhood of Dublin: *App. to Welsh & Whitelaw's Hist. of Dublin.*

P. lutescens, *p.* 385, *lege* disciformis.

Not the *Planorbis lutescens* of Lamarck, as I had supposed.

P. Draparnaldi, *p.* 386.

P. albus *α*. *Pfeiffer*, 3. 64?

In the Honourable Lady E. Finch's collection of British shells, mixed with the *P. albus*.

The *Helix rhombea* of Turton's Conchological Dictionary should be referred to a variety of the *Planorbis umbilicatus*, and not this species. My error arose from having seen in the late Mr. Miller's cabinet, specimens of the above, which Dr. Turton had named "*Pl. rhombeus*."

P. albus, *p.* 387.

P. reticulatus. *Risso.*

P. nitidus, *p.* 388.

Abundantly in a pool on Wandsworth Common near London; and more sparingly in Battersea marshes and other parts of the neighbourhood. The shells are frequently infested by the ova of a small aquatic insect.

Var. *α*. duplò minor, subtùs latè umbilicata.

This was given to me by the Provost of Eton, who received it from Mr. Bean of Scarborough, and may possibly be a distinct species. Its form is intermediate between the *Pl. nitidus* and *lineatus*.

P. lineatus, *p.* 389.

P. clausulatus. *Férussac, Concordance &c.*

Ancylus.

This genus, as M. Rauq remarks, has not ceased from being bandied about from one family to another; and even now, its proper position among the *Scutibranchous* (for it is quite certain they do not belong to the *Pulmonobranchous*) *Mollusca*, is far from

from being determined. In this, as well as the genus *Patella*, to which it is most probably allied, I have frequently observed individuals out of their natural element, and only occasionally in the enjoyment of a few spray drops of water which fell from the sides of the rock to which they were attached.

XXXI. *On*

XXXI. *On the Osteological Symmetry of the Camel; Camelus Bactrianus of Aristotle, Linnæus, and Cuvier. By Walter Adam, Fellow of the College of Physicians of Edinburgh. Communicated by R. Brown, Esq., V.P.L.S.*

Read April 19, 1831.

The objects in this paper are, to state correctly the dimensions of the several bones of a large quadruped; to trace the mutual relations of these dimensions; and thus to exemplify the general osteological form in animals of similar configuration.

The dimensions are arranged in tables, so as to show not only the symmetry of the Camel, but also the aberrations from the apparent normal proportions of a species, and the inequalities of the right and the left sides in an individual animal. The Camel has been selected to illustrate the general type of its class on account of the stature of that animal rendering these slighter differences more evident than in man and in other animals of inferior size. As such differences must always be limited by the characteristic symmetry of the species to which an animal belongs, none other than the most exact measurements would have been of value. The accuracy that has been attempted will not, it is hoped, be thought needless in a general inquiry.

The bones measured are those of a Baggage-camel from Bengal, and constitute one of many osteological specimens, for whose

whose examination the writer of this paper is indebted to the liberality of Professor Jameson.

The bones are described in accordance with the nomenclature of Dr. Barclay.

The terms 'lateral,' 'mesial,' 'rostral,' 'caudal,' are applied to all the bones, as expressing the aspects of the sides, the mesial plane, the muzzle, and the tip of the tail.

The terms 'basilar' in the head,
'sternal' in the neck and trunk,
signify the aspects of the base of the head and of the breastbone;—in common language,
'downwards' in the head and trunk,
'forwards' in the neck.

The terms 'coronal' in the head,
'dorsal' in the neck and trunk,
signify the aspects of the forehead, and of the back-bone;—in common language,
'upwards' in the head and trunk,
'backwards' in the neck.

In the limbs, besides their more correct denominations of 'atlantal' and 'sacral', for 'fore' and 'hind', two further terms are necessary:

These are, 'proximal' towards the trunk,
'digital' towards the extremity of the limb.

The adverbial termination is *ad.*

Of the Head.

The height, the breadth, and the basilar length of the cranium are very nearly in the proportion

1. 2. 4.

The union of the lower jaws; the height from the angle of the lower jaw to the summit of the occiput; and the length from

from the muzzle to the upper margin of the occipital foramen, are in the proportion

1. 2. 3.

The common difference of the palatal, the coronal, the basilar, and the extreme lengths of the cranium, is the breadth of the cranium at the temporal fossæ: these lengths in the animal examined being respectively

12. 15. 18. 21 inches:

The chief measurements of the coronal breadth of the head are in consecutive proportion as the numbers

3. 2. 4. 5:

Those on the level of the zigomatic arch are also in consecutive proportion nearly as the numbers

8. 9. 8. 4:

While the chief measurements of breadth on the level of the palate are consecutively as the numbers

3. 4. 7.

Of the Vertebræ.—Cervical Vertebræ.

In the accompanying Tables, the dimensions of the bones of the neck are very minutely stated. This minuteness will be deemed the less superfluous, if it be considered that these bones, from their remarkable size, may be viewed as an enlarged representation of the type of the similar bones of the human body and in other mammalia.

The dimensions of the atlas and of the second vertebra of the neck are, on account of their great importance, given apart; and an endeavour has been made to trace the correspondence of their dimensions with the dimensions of the other cervical vertebræ.

The lateral extent of the atlas is equal to the distance between the inner margins of the orbits. The atlas, besides

 its

its articulation with the occipital condyles, affords support to the lower jaw;—whence that graceful carriage of the head, so frequent a theme of the fervid eulogy of the Arabian poets.

The sternal length of the 2nd vertebra of the neck is three times that of the atlas, and half the coronal length of the head. In this bone, the dimensions of length, the distance between its arteries and the breadth of its articulation with the 3rd cervical vertebra, are even numbers of proportional parts. The other dimensions are odd numbers of these parts.

The succeeding bones of the neck diminish in length, while their dimensions of breadth and thickness increase.

The decrements of length are irregular.

Of the breadths, those of the rostral balls of articulation increase uniformly. The extremes, namely, the rostral globular articulations of the 3rd and of the 7th cervical vertebræ, are,

:: 2 : 3.

The other augments of breadth are irregular. But in the extremes, the rostral ends of the plates that shield the gullet and trachea, are, :: 3 : 4.

While the breadths at the roots of the rostral oblique processes of the same bones (the 3rd and 7th cervical vertebræ) are,

:: 1 : 2.

In the cervical vertebræ of the Camel, a depressed rudiment of a process appears on the dorsal ridge of the 5th vertebra. The 6th and 7th have complete spinous processes.

A scabrous elevation on the lateral surfaces of the sternal plates that shield the gullet and trachea, marks the incipient transverse processes that in the lumbar vertebræ attain their full development.

In the cervical vertebræ of the animal examined, a curtailment of the caudal oblique process of the 6th on the right side,

and

and perhaps the defective ossification on the right side of the 3rd and 4th over the nerval canal, show the tendency to exert the muscles of the right side more than those of the left.

Dorsal Vertebræ.

The labours of the animal have much altered the form of the bodies of the dorsal vertebræ.

The sternal length from the 3rd to the 10th inclusively appears to be the sixth part of the basilar length of the head. In this dimension, the sternal length, the 1st dorsal vertebra corresponds with the 11th; as does the 2nd with the 12th.

The greatest elevation of the spine is at the 3rd dorsal vertebra; the extreme length of that bone equalling the greatest extent of the pelvis towards the mesial plane.

The spinal lengths, rostrad and caudad from the 3rd dorsal vertebra, diminish irregularly; but so that the spinal length of the 7th dorsal vertebra is the same as that of the 1st.

The spinal length of the 12th and last dorsal vertebra is equal to the length of the 1st rib, and to the greatest breadth of the head.

The spinal epiphyses that form the nucleus of the hump, are nearly steatomatous in the 1st, 2nd, 3rd, and 4th dorsal vertebræ; as also in the 9th and 10th. In the other dorsal vertebræ the epiphyses are externally osseous.

From the 1st dorsal vertebra to the 10th, the distance between the margins of the roots of the spinous processes diminishes a third. In the same interval, the distance between the extremities of the transverse processes diminishes a fourth.

The natural breadth of the bodies of the dorsal vertebræ seems to be not greater than the wideness of the nostrils: but, owing to the great weights borne by the animal, the enlargement is such that these bones are an instance of exostosis rather than

 of

of normal proportion: though still that enlargement has been controlled by the laws of symmetry.

The greatest breadth is attained at the connection of the 5th with the 6th dorsal vertebra: there the pressure of the burthens has evidently been most severe. The breadth so increased equals the cerebral bulge of the cranium.

As a further exemplification of strength gained under toil, and of disparity in ossification, it may be deserving of notice, that the right sides of the caudal margins of the 6th and 7th dorsal vertebræ project as a socket over the contiguous rostral margins.

Lumbar Vertebræ.

The lumbar vertebræ diminish in length and in height as they approach the sacrum.

The transverse processes occupy somewhat of an oval space. The other dimensions of breadth increase towards the sacrum.

The distance between the extremities of the 1st lumbar vertebra is equal to the spinal extent of the last dorsal vertebra, which has been stated to be also equal to the length of the 1st rib, and to the greatest breadth of the head.

The sum of the differences of the distances between the extremities of the transverse processes of the lumbar vertebræ is equal to the sum of the breadths of these vertebræ at the roots of their rostral oblique processes.

The Sacrum.

The caudal height of the sacrum is the third of its rostral height: while, again, the rostral height is two thirds of the sternal length, and equal to the caudal height of the cranium.

The rostral breadth of the sacrum equals the height of the 1st lumbar vertebra. The caudal breadth is half the length of the bone over the nerval canal.

The

The Tail.

The dimensions of the bones of the tail, relatively to the other bones of the body, are perhaps more curious than interesting.

The sum of their lengths is equal to the greatest spinal extent in the dorsal vertebræ, namely, to that of the 3rd dorsal vertebra.

The sum of their transverse breadths is equal to the greatest transverse extent in the lumbar vertebræ, namely, to that of the 5th lumbar vertebra.

The sum of the breadths at their oblique processes equals the sum of their spinous heights: and both are equal to the greatest transverse aperture of the pelvis.

The sum of their rostral thicknesses is twice the caudal height of the head: and the tip of the tail may be compared with the aperture of the auditory canal.

Of the Ribs.

The longest of the twelve ribs are the 7th and the 8th. The length of each of these equals the length of the spine of the scapula, being the greatest extent of that bone.

The decrements of length in the other ribs, rostrad from the 7th, and caudad from the 8th, are such, that

The 6th rib corresponds with the 10th,
The 5th . . . . . with the 11th,
The 4th . . . . . with the 12th.

The sum of the lengths of the twelve ribs is about ten times that of the longest rib.

At the sternal end of the ribs the breadth is greatest. The broadest are the 4th and the 5th; their breadth equals that of the cranium at the temporal fossæ.

The sum of the breadths of the ribs at their sternal ends is eight

eight times the breadth of the broadest rib, and equal to the length of the cubitus from the summit of the olecranon to the carpal articulation.

The sum of the breadths of the ribs where broadest and the ulnar length of the cubitus, the longest bone in the body of the Camel, exceed the greatest width of the chest by the common difference of the 4 longitudinal dimensions of the cranium. The width of the chest, as stated below, is equal to the greatest length of the head. The costal breadths and the length of the cubitus are therefore 5th proportionals to the 4 longitudinal dimensions of the cranium.

It will be observed in the Tables, that the ribs on the right side have been more ossified than those on the left.

Of the Cavity of the Thorax and of the Sternum.

The cartilages of the ribs being entire in the animal examined, the dimensions of the cavity of the chest are seen to agree with those of the separate bones of the body.

The greatest width of the chest is equal to the greatest length of the head.

The length of the sternum is three fourths of the greatest thickness of the body, namely, from the caudal end of the sternum to the summit of the hump at the 6th dorsal vertebra.

The length of the caudal portion of the sternum is twice the length of the 3rd and of the 5th portions; and is equal to the distance between the inner margins of the orbits.

The rostral breadth of the caudal portion of the sternum is twice its caudal breadth, and also twice its rostral thickness.

The thicknesses of the other portions of the sternum increase by regular augments as they approach the caudal portion.

Of

Of the Scapula.

The scapula bears to the pelvis the relation of similar position in regard to the limbs, and also in some degree that of conformity. But as in the Camel this bone, towards the summits of the dorsal vertebræ, terminates in a thin tendinous expansion, the osseous boundary cannot be very accurately distinguished.

The greatest breadth of this expansion is four times the greatest dimension of the glenoid cavity.

The length of the spine of the scapula, which is also the greatest extent of the bone, is four times the distance of the termination of the process of the spine of the scapula over the glenoid cavity, from the furthest point on the margin of that cavity.

Of the Pelvis.

The breadths of the pelvis rostrad from the acetabula are even numbers of proportional parts. The breadths caudad from the acetabula, including the acetabular breadth itself, are odd numbers of proportional parts.

The difference of the greatest and the smallest breadths of the pelvis caudad from the acetabula is one third of the greatest breadth rostrad from the acetabula: while the difference of the greatest caudal breadth and the acetabular breadth is half the difference of the greatest and the smallest rostral breadths.

Again: The smallest rostral breadth of the pelvis equals its smallest mesial height from the union of the ossa pubis to the floor of the nerval canal of the sacrum.

The chief dimensions of the pelvis are identical with the chief dimensions of the head.

1. The greatest dimension of the pelvis, being through the mesial plane, is equal to the greatest length of the head.

2. The

2. The greatest mesial extent of the pelvis is equal to the coronal length of the head.

3. The length of the union of the ossa pubis is equal to the length of the union of the lower jaws.

4. The lateral length of the pelvis is equal to the distance from the muzzle to the caudal surface of the zigomatic inclosure.

5. The greatest rostral breadth of the pelvis is equal to the zigomatic length of the head.

6. The acetabular breadth of the pelvis is equal to the greatest breadth of the head.

7. The greatest caudal breadth of the pelvis is equal to the distance from the muzzle to the end of the pterygoid processes.

Of the Limbs.

The lengths of the four long bones of the atlantal limbs, independently of processes and elevations, are consecutively as the numbers 22. 28. 20. 6:—Sum 76.

The similar lengths of the four long bones of the sacral limbs are consecutively as the numbers

28. 23. 20. 5:—Sum 76.

The correspondence is obvious:

The second number of the atlantal series is identical with the first number of the sacral series.

The last number in each series expresses the difference of the first and the second numbers of the series.

The penultimates are identical, and the sums are equal.

Osteologically, Notwithstanding the dissimilitude of flexure in the atlantal and the sacral limbs;

The sums of what may be termed their articular lengths are equal.

The

The articular lengths of the metacarpus and of the metatarsus are identical; as appear to be the articular lengths of the cubitus and of the femur.

The difference of the articular length in the first and second bones of each limb is equal to the length of the first pastern of the limb.

In all animals there seems to be a normal locality for the entrance of the arteries that nourish the interior of the bones: but these arteries being liable to the same variations as the tubes that convey the fluids to the less compact substances of the body, the distance of the medullary arteries from the joints is here unnoted.

The bones of the atlantal limbs of the Bactrian Camel are, in their breadth and thickness, more robust and more symmetrical than the bones of the sacral limbs.

The middle breadths of the atlantal limbs are consecutively,

9. 9. 6. 4 proportional parts:—Sum 28.

Their middle thicknesses are consecutively,

8. 6. 4 proportional parts:—Sum 18.

And their middle girths are consecutively,

30. 26. 20. 12 proportional parts:—Sum 88.

The middle breadths of the sacral limbs are consecutively,

7. 8. 5. 3 proportional parts:—Sum 23.

Their middle thicknesses are consecutively,

6. 5. 4 proportional parts:—Sum 13.

And their middle girths are consecutively,

22. 20. 17. 10 proportional parts:—Sum 69.

So that the thickness of the first pasterns being omitted, the sums of the middle breadth, thickness, and girth in the atlantal limbs are even numbers of proportional parts; while the similar dimensions in the sacral limbs are odd numbers of these parts.

 There

There is also an identity in the excesses of the sums of the middle breadths, and of the sums of the middle thicknesses in the atlantal limbs, over the sums of the similar dimensions in the sacral limbs.

It may be further remarked, that if to the four girths of the sacral limbs, that of the calcaneum be added, the sum of the five sacral girths is seven eighths of the sum of the girths of the four atlantal limbs:

The sum of the five sacral girths being 77 proportional parts.

The sum of the four atlantal girths being 88 proportional parts.

It would be tedious to dwell on the proportions of the various processes and elevations of the bones of the limbs. In the accompanying Tables, osteologists will find their dimensions in the Bactrian Camel noted with every possible accuracy.

The proportions of the rudimentary bones of the feet, of the carpus and tarsus, and of the ungual bones, are withheld; as, in an articulated specimen, these bones cannot be exactly measured.

From what has been now stated, it appears that throughout the dimensions of the bones of the Bactrian Camel there is such an agreement, that many of the dimensions are continued proportionals, and that the mutual relations of nearly all admit of a very simple expression.

Corresponding relations have been found to prevail in the bones of every species of animal examined by the writer of this paper. The prosecution of his investigations has been thwarted by unforeseen obstacles. Under more favourable circumstances, should what has been observed in the Camel be fully verified in other animals, it will result,

1. That

1. That though the hardness and durability of bones peculiarly fit them for inquiries similar to that detailed in these pages; yet as the bones always arise from and are moulded by the softer tissues, the whole organic system is determinable in its proportions.
2. That the relation of the forms of extinct animals to the forms of animals now living,—the affinities of species and genera,—the simultaneous growth of the parts of the same animal, and the rates of such growth comparatively in other animals;—the improvement of domestic races,—even the structure and development of the human frame,—are all matters both of physiological and of numerical study.
3. That Zoology is, to an equal extent with the departments of knowledge that regard inanimate things, susceptible of a classification established on the sure basis of number.

EDINBURGH,
November 1830.

TABLES.

In the first columns of the following Tables are the actual measurements of an individual Camel, taken with compasses and callipers, of a radius suited to the extent of the bones; the girths of course otherwise.

The measurements of the first columns are in the next column adjusted to the normal proportion, on the assumption that the aberrations in the form of an individual animal from the perfect form of its species may be at least as great as the inequalities of the right and the left sides of that individual animal. But the numbers assigned for these normal proportions are meant rather as an indication of what they may be, than as an averment that they really are as stated. Several, especially of those given for the vertebral dimensions, must be erroneous: they have been inserted for facility of comparison. Few adjustments exceed a quarter of an inch,—trifling in so large an animal,—and being placed beside the number of the actual measurement they can lead to no mistake.

It is not improbable, that the symmetry of the swift Dromedaries will be found to be much more complete than that of the Baggage-camel.

The proportional parts in the penultimate column are 72nd parts of the basilar length of the cranium. This length being in the animal examined 18 inches, the proportional parts are the numbers in the preceding column multiplied by 4.

The differences occupy the last column.

The relative position of the numbers in the Tables is the same as that of the parts measured.

The Roman numerals over the dimensions of the dorsal and of the succeeding vertebræ, refer to the corresponding dimensions in the cervical vertebræ.

Dimensions of the CRANIUM in the Bactrian Camel.

Dimensions in the Mesial Plane.

Actual Measurements.		Supposed Normal Dimensions.	Dimensions in Proport. Parts.	Difference.
Rostro-caudal Dimensions (Length) in the Mesial Plane.				
Mesial Coronal Length.				
Distance in the mesial plane from the corono-rostral margin of the nose, To the corono-caudal margin of the occipital plate	15·05	15·00	**60**	
Distance in the mesial plane from the extent of the intermaxillary bones rostrad, To the corono-caudal margin of the occipital plate	20·90	21·00	**84**	24
Mesial Zigomatic Length.				
Distance in the mesial plane from the extent of the intermaxillary bones rostrad, To the corono-caudal margin of the occipital foramen	19·45	19·50	**78**	..
Mesial Basilar Length.				
Distance in the mesial plane from the extent of the intermaxillary bones rostrad, To the caudal margin of the palate	11·85	12·00	**48**	
Distance in the mesial plane from the extent of the intermaxillary bones rostrad, To the basilo-caudal margin of the occipital foramen	18·00	18·00	**72**	24
Length of the Union of the Basilar Maxillæ.				
Distance on the mesial plane from the rostral margin of the (basilar) incisors, To the caudal termination of the union of the basilar maxillæ	6·42	6·50	**26**	..
Corono-Basilar Dimensions (Height) of the Cranium in the Mesial Plane.				
Distance in the mesial plane from the surface of the palate at the interval disjoining the rostral from the lateral teeth, To the summit of the nose	3·75	3·75	**15**	
Distance in the mesial plane from the caudal margin of the palate, To the frontal hollow over the orbits, at the corono-orbital arteries	4·65	4·75	**19**	4
Distance in the mesial plane from the basilar surface of the cuneiform process of the occipital bone, To the summit of the sagittal ridge	4·45	4·50	**18**	1
Distance in the mesial plane from the basilar surface of the basilar margin of the occipital foramen, To the summit of the occipital plate	4·40	4·50	**18**	0
Distance in the mesial plane from the basilar surface of the coronal margin of the occipital foramen, To the summit of the occipital plate	2·60	2·75	**11**	7
Caudal and greatest Height of the Head on each side of the Mesial Plane.				
Distance from the caudal termination of the basilar margin of the right basilar maxilla, To the mesio-caudal summit of the occipital plate (on the right side) . . . . 13·05 — Similar dimension (on the left side) . .	13·05	13 00	**52**	..

Dimensions of the CRANIUM

Rostro-caudal Dimensions (Length) on

Actual Measurements.				Supposed Normal Dimensions.	Dimensions in Proport. Parts.	Diff.	Actual Mea	
Lateral Zigomatic Length.							Lateral Ba	
On the Right Side.		On the Left Side.					On the Right Side.	
							Distance from the rostral extremity of the right intermaxillary bone, To the rostral margin of the socket of the large coronal-canine tooth on the right side	2·10
							Distance from the rostral extremity of the right intermaxillary bone, To the caudal margin of the socket of the right coronal subsidiary canine tooth	4·56
Distance from the rostral extremity of the right intermaxillary bone, To the lateral margin of the right rostro-orbital artery .	8·08	Similar dimensions on the left side . .	8·22	8·25	**33**		Distance from the rostral extremity of the right intermaxillary bone, To the rostral margin of the socket of the right corono-rostral molar tooth	6·20
						8		
Distance from the rostral extremity of the right intermaxillary bone, To the inner surface of the right orbit at the orbicular groove	10·30	Similar dimensions on the left side . .	10·36	10·25	**41**			
						9		
Distance from the rostral extremity of the right intermaxillary bone, To the furthest point of the inner surface of the caudo-lateral margin of the right orbit	12·34	Similar dimensions on the left side . .	12·48	12·50	**50**		Distance from the rostral extremity of the right intermaxillary bone, To the extremity of the process on the caudal surface of the socket of the (right corono-caudal) molar tooth	12·50
						12		
Distance from the rostral extremity of the right intermaxillary bone, To the caudal surface of the zigomatic inclosure . . .	15·52	Similar dimensions on the left side . .	15·48	15·50	**62**		Distance from the rostral extremity of the right intermaxillary bone, To the caudo-lateral extremity of the right pterygoid process	14·38
						7		
Distance from the rostral extremity of the right intermaxillary bone, To the rostral margin of the entrance of the auditory canal	17·30	Similar dimension on the left side . .	17·30	17·25	**69**			
						28		
Distance from the caudo-mesial margin of the occipital plate, To the furthest point on the internal surface of the caudo-lateral margin of the right orbit	10·20	Similar dimension on the left side . .	10·10	10·25	**41**		Distance from the rostral margin of the socket of the (right corono-) rostral molar tooth, To the caudal margin of the socket of the (right corono-) caudal molar tooth . . .	5·78
						4		
Distance from the caudo-mesial margin of the occipital plate, To the inner surface of the right orbit at the orbicular groove . .	11·30	Similar dimension on the left side . .	11·43	11·25	**45**			
						31		
Distance from the rostro-coronal margin of the right zigomatic inclosure, To its caudo-coronal margin	3·60	Similar dimension on the left side . .	3·55	3·50	**14**			

in the Bactrian Camel.

each side of the Mesial Plane.

surements.	Supposed Normal Dimen-sions.	Dimen-sions in Proport. Parts.	Diff.	Actual Measurements. On the Right Side.	On the Left Side.	Supposed Normal Dimen-sions.	Dimen-sions in Proport. Parts.	Di
silar Length. On the Left Side.				Lateral Length of the Basilar Maxillæ.				
Similar dimension on the left side . . 2·03	2·00	**8**		Distance from the rostral margin of the (basilar) incisor teeth, To the caudal margin of the socket of the right large basilar canine tooth . . . . 3·26	Similar dimension on the left side . . 3·26	3·25	**13**	
Similar dimension on the left side . . 4·58	4·50	**18**	10	Distance from the rostral margin of the (basilar) incisor teeth, To the caudal margin of the socket of the right basilar subsidiary canine tooth . . . . 4·88	Similar dimension on the left side . . 4·91	5·00	**20**	7
Similar dimension on the left side . . 6·26	6·25	**25**	7	Distance from the rostral margin of the (basilar) incisor teeth, To the rostral margin of the socket of the (right basilar) caudal molar tooth . . . . 7·14	Similar dimension on the left side . . 7·65	7·50	**30**	1
			25					2
Similar dimension on the left side . . 12·38	12·50	**50**		Distance from the rostral margin of the (basilar) incisor teeth, To the caudal margin of the socket of the (right basilo-) caudal molar tooth . . . . 12·90	Similar dimension on the left side . . 13·07	13·00	**52**	
Similar dimension on the left side . . 14·25	14·25	**57**	7	Distance from the rostral margin of the (basilar) incisor teeth, To the corono-caudal extremity of the coronary process of the right basilar maxilla . . . . 16·53	Similar dimension on the left side . . 16·50	16·50	**66**	1
				Distance from the rostral margin of the (basilar) incisor teeth, To the basilar margin of the articular surface of the condyle of the right basilar maxilla. . . . . . 17·50	Similar dimension on the left side . . 17·47	17·50	**70**	4
			34	Distance from the rostral margin of the (basilar) incisor teeth, To the caudal margin of the basilar maxilla at its coronal termination . . . . 17·90	Similar dimension on the left side . . 17·90	18·00	**72**	2
Similar dimension on the left side . . 5·74	5·75	**23**		Distance from the rostral margin of the socket of the (right basilo-) rostral molar tooth, To the caudal margin of the socket of the (right basilo-) caudal molar tooth . . 5·50	Similar dimension on the left side . . 5·50	5·50	**22**	5
				Distance from the basilar margin of the right basilar maxilla at its caudal termination, To the coronal extremity of its coronary process . . . . 8·95	Similar dimension on the left side . . 8·95	9·00	**36**	1

Dimensions of the CRANIUM

Transverse Dimensions (Bre

Actual Measurements.		Supposed Normal Dimensions.	Dimensions in Proport. Parts.	Diff.	Actual Measurements.		Supposed Normal Dimensions.	Dimensions in Proport. Parts.	Diff.
Coronal Breadth.					Zigomatic Breadth.				
istance coronad and rostrad between the lateral surfaces of the margins of the nostrils . . .	2·69	2·75	**11**						
				2					
mallest distance between the lateral surfaces of the coronal maxillæ interveningly to the nostrils and the orbits. Being over the rostral molar teeth	2·25	2·25	**9**						
				5					
istance between the mesial margins of the corono-orbital arteries; in the frontal hollow over the orbits	1·00	1·00	**4**		Distance between the hollows of the orbicular grooves on the mesio-rostral margins of the orbits	6·20	6·25	**25**	
				2					12
istance between the lateral margins of the corono-orbital arteries; in the frontal hollow over the orbits	1·45	1·50	**6**		Distance between the lateral terminations of the caudal margins of the orbits. Being the greatest breadth of the head	9·25	9·25	**37**	
				6					13
mallest distance between the hollows of the temporal fossæ immediately caudad from the orbits	3·00	3·00	**12**		Distance between the latero-basilar extremities of the occipital plates. Being immediately caudad from the entrance of the auditory canals .	5·90	6·00	**24**	
				3					12
istance between the lateral surfaces of the cerebral bulge of the cranium	3·80	3·75	**15**		Distance between the hollows of the grooves that separate the occipital plate from the occipital condyles	3·10	3·00	**12**	
									2
					Greatest distance between the lateral margins of the occipital condyles	3·42	3·50	**14**	

Dimensions of Apertures.

Dimensions of the Nasal Passage.					Dimensions of the Orbits. On the Right Side.		On the Left Side.				
istance internally between the lateral margins of the entrance of the nasal passage . . .	2·23	2·25	**9**		Distance from the internal surface of the hollow of the orbicular groove of the right orbit. To the nearest point on its caudo-lateral margin	2·20	Similar dimension on the left side . .	2·30	2·25	**9**	
				3							0
nallest distance internally between the lateral surfaces of the nasal passage. Being over the caudal margin of the palate and the caudal molar teeth	1·52	1·50	**6**		Greatest distance from the inner surface of the coronal margin of the right orbit. To the inner surface of the opposite basilar margin . .	2·28	Similar dimension on the left side . .	2·47	2·25	**9**	
				2							
istance internally between the lateral margins of the caudal termination of the nasal passage .	2·00	2·00	**8**								

in the Bactrian Camel.

adth) of the Cranium.

Actual Measurements.		Supposed Normal Dimensions.	Dimensions in Proport. Parts.	Diff.
Basilar Breadth.				
Smallest distance between the lateral surfaces of the corono-maxillary bones; immediately rostrad from the great canine teeth	2·25	2·25	**9**	
				3
Greatest distance between the lateral surfaces of the sockets of the large coronal canine teeth .	2·95	3·00	**12**	
				7
Smallest distance between the lateral margins of the palate at the interval disjoining the rostral from the lateral teeth	1·15	1·25	**5**	
				16
Distance between the lateral surfaces of the sockets of the (corono-) caudal molar teeth . . .	5·25	5·25	**21**	
				14
Distance between the external surfaces of the partitions forming the lateral inclosures of the nasal passage caudad	1·85	1·75	**7**	
				6
Distance between the caudo-lateral extremities of the pterygoid processes	3·25	3·25	**13**	

Dimensions of Apertures.

Dimensions of the Occipital Foramen.				
Smallest distance internally between the lateral surfaces of the occipital foramen	1·28	1·25	**5**	
				1
Distance in the mesial plane from the internal surface of the coronal margin of the occipital foramen. To the internal surface of the opposite basilar margin	1·50	1·50	**6**	

Actual Measurements.		Supposed Normal Dimensions.	Dimensions in Proport. Parts.	D
Breadth of the Basilar Maxillæ.				
Greatest distance between the lateral surfaces of the sockets of the large basilar canine teeth .	2·50	2·50	**10**	
Smallest distance between the lateral surfaces of the basilar maxillæ, interveningly to the large canine teeth and the (caudal) subsidiary canines	1·33	1·25	**5**	
Greatest distance between the sockets of the (caudal) subsidiary canine teeth of the basilar maxillæ	1·71	1·75	**7**	
				1
Greatest distance between the caudo-basilar margins of the basilar maxillæ	6·57	6·50	**26**	
Distance between the lateral surfaces of the basilar maxillæ at the coronal terminations of the caudal margins	5·82	5·75	**23**	
Distance between the lateral extremities of the condyles of the basilar maxillæ	6·58	6·50	**26**	
Distance between the lateral surfaces of the coronal extremities of the coronary processes of the basilar maxillæ	5·80	5·75	**23**	
				1
Distance between the mesial margins of the arterial canals on the mesial surfaces of the basilar maxillæ and basilad from the sockets of their (caudal) subsidiary canine teeth	1·02	1·00	**4**	
Distance between the mesial extremities of the processes on the mesial surfaces of the basilar maxillæ immediately caudad from the sockets of the caudal molar teeth	1·97	2·00	**8**	
Greatest distance between the lateral and the mesial surfaces of the right basilar maxillæ. Being at the pene-caudal molar tooth on the right side . . . . 1·63 — Similar dimension on the left side . .	1·65	1·75	**7**	

Dimensions of the Auditory Canal.

Width of the aperture of the auditory canal rostro-caudally on the right side . . . . ·30	Similar dimension on the left side ·31	Width of the aperture of the auditory canal corono-basilarly on the right side . . ·38	Similar dimension on the left side ·

Dimensions of the CERVICAL VER

Rostro-caudal Dimensions (Le

	I. Actual Measurements.		Supposed Normal Dimensions of Mesio-sternal Length.	Dimensions in Proportional Parts.	Diff.	II. Actual Measurements.		Supposed Normal Dimen. of Sterno-rostral Diagonal Length.	Dimensions in Proportional Parts.	Diff.
st,	Distance in the mesial plane from the rostral margin of the sternal surface, To the caudal margin of the same surface	2·55	2·50	**10**		Distance in the mesial plane from the rostral margin of the sternal surface, To the caudal margin of the dorsal surface	3·25	3·25	**13**	
nd,	Distance in the mesial plane from the rostral rounded margin of the sternal surface, To the sternal margin of the ball of articulation caudad	7·60	7·50	**30**	20	Distance in the mesial plane from the rostral rounded margin of the sternal surface, To the marginal termination of the dorsal surface caudad	8·00	8·00	**32**	19
rd,	Distance in the mesial plane from the sternal margin of the ball of articulation rostrad, To the sternal margin of the ball of articulation caudad	6·65	6·75	**27**	3	Distance in the mesial plane from the sternal margin of the ball of articulation rostrad, To the marginal termination of the dorsal surface caudad	7·00	7·00	**28**	4
th,	. . . .	6·50	6·50	**26**	1	. . . .	6·60	6·75	**27**	1
th,	. . . .	6·00	6·00	**24**	2	. . . .	6·55	6.50	**26**	1
th,	. . . .	5·25	5·25	**21**	3	. . . .	6·22	6·25	**25**	1
th,	. . . .	4·06	4·00	**16**	5	. . . .	5·58	5·50	**22**	3
		38·61	38·50	**154**	34		43·20	43.25	**173**	29

	V. Actual Measurements.		Supposed Normal Dimensions of Mesio-dorsal Length.	Dimensions in Proportional Parts.	Diff.	VI. Actual Measurements.		Supposed Normal Dimen. of Sterno-caudal Diagonal Length.	Dimensions in Proportional Parts.	Diff.
st,	Distance in the mesial plane from the rostral margin of the dorsal surface, To the caudal margin of the same surface	2·55	2·50	**10**		Distance in the mesial plane from the caudal margin of the sternal surface, To the rostral margin of the dorsal surface	3·50	3·50	**14**	
nd,	Distance in the mesial plane from the rostral process of the spinous ridge, To the marginal termination of the dorsal surface caudad	5·95	6·00	**24**	14	Distance in the mesial plane from the sternal margin of the ball of articulation caudad, To the rostral process of the spinous ridge on the dorsal surface	6·70	6·75	**27**	13
rd,	. . . .	5·68	5·75	**23**	1	. . . .	6·70	6·75	**27**	0
th,	. . . .	5·36	5·25	**21**	2	. . . .	6·64	6·50	**26**	1
th,	. . . .	5·12	5·00	**20**	1	. . . .	6·30	6·25	**25**	1
th,	. . . .	4.22	4·25	**17**	3	. . . .	5·78	5·75	**23**	2
th,	. . . .	3·12	3·00	**12**	5	. . . .	5·50	5·50	**22**	1
		32·00	31·75	**127**	26		41·12	41·00	**164**	18

TEBRÆ in the Bactrian Camel.

ngth) in the Mesial Plane.

III. Actual Measurements.		Supposed Normal Dim. of Rostro-spinal Diagonal Length.	Dimensions in Proportional Parts.	Diff.
Distance in the mesial plane from the rostral margin of the sternal surface, To the caudal extremity of the spinous process				
. . . .	7·05	7·00	**28**	
				7
. . . .	8·72	8·75	**35**	
	15·77	15·75	**63**	7

VII. Actual Measurements.		Supposed Normal Dimen. of Caudo-spinal Diagonal Length.	Dimensions in Proportional Parts.	Diff.
Distance in the mesial plane from the caudal margin of the sternal surface, To the rostral extremity of the spinous process				
. . . .	6·50	6·50	**26**	
				7
. . . .	8·30	8·25	**33**	
	14·80	14·75	**59**	7

Sterno-dorsal Dimensions (Thickness) in the Mesial Plane

IV. Actual Measurements.		Supposed Normal Dimensions of Rostral Thickness.	Dimensions in Proportional Parts.	Diff.	
Distance in the mesial plane rostrad, from the sternal, To the dorsal surface	2·10	2·00	**8**		1s
				1	
Distance in the mesial plane, from the dorsal margin of the spinous ridge, at its greatest elevation rostrad, To the nearest point on the sternal surface	2·34	2·25	**9**		2n
				1	
Distance in the mesial plane from the dorsal margin of the spinous ridge, at its greatest elevation rostrad in 3rd, 4th, and 5th, (in 6th and 7th from the termination of the spinous process over the nerval canal,) To the nearest point on the sternal surface .	2·42	2·50	**10**		3r
				1	
. . . .	2·82	2·75	**11**		4t
				2	
. . . .	3·26	3·25	**13**		5t
				2	
. . . .	2·82	2·75	**11**		6t
				4	
. . . .	3·70	3.75	**15**		7t
	19·46	19·25	**77**	11	

VIII. Actual Measurements.		Supposed Normal Dimensions of Caudal Thickness.	Dimensions in Proportional Parts.	Diff.	
Distance in the mesial plane caudad, from the sternal, To the dorsal surface . . .	2·82	2·75	**11**		1s
				6	
Distance in the mesial plane from the sternal surface of the caudo-sternal protuberance, To the caudal summit of the spinous ridge on the dorsal surface	4·33	4·25	**17**		2n
				3	
Distance in the mesial plane from the sternal margin of the caudal ball of articulation, To the nearest point on the dorsal surface caudad; in the 6th and 7th, To the common termination caudad of the caudal margin of the spinous process, and of the internal surface of the nerval canal	3·57	3·50	**14**		3r
				1	
. . . .	3·78	3·75	**15**		4t
				1	
. . . .	4·05	4·00	**16**		5t
				0	
. . . .	4·00	4·00	**16**		6t
				2	
. . . .	4·50	4·50	**18**		7t
	27·05	26·75	**107**	13	

Dimensions of the CERVICAL VER

Rostro-Caudal Dimensions (Length) on each

	IX. Actual Measurements. On the Right Side.		IX. Actual Measurements. On the Left Side.		Supposed Normal Dimensions of smallest Sterno-lateral Length.	Dimensions in Proportional Parts.	Diff.	X. Actual. On the Right Side.	
1st,								Distance from the sterno-lateral sinuosity of the rostral margin, To the dorso-lateral sinuosity of the caudal margin	3·80
2nd,	Distance from the caudal margin of the sternal division of the arterial canal rostrad (at the sternal root of the slender rostral spoke), To the sinuosity on the caudal margin of the sternal plate	4·32	Similar dimension on the left side . .	4·22	4·25	**17**		Distance from the caudal margin of the dorsal division of the arterial canal rostrad (at the dorsal root of the slender rostral spoke,) To the sinuous surface caudad, at the root of the caudal oblique process	3·92
3rd,	Smaller distance from the sinuosity on the rostral margin of the sternal plate, To the corresponding sinuosity caudad	5·32	Similar dimensions on the left side . .	5·42	5·25	**21**	4	Smallest distance from the sinuous surface rostrad, at the root of the rostral oblique process, To the sinuous surface at the root of the caudal oblique process . . .	4·40
4th,	. . . .	5·38	. . . .	5·28	5·25	**21**	0	. . . .	4.36
5th,	. . . .	4·72	. . . .	4·94	4·75	**19**	2	. . . .	4·48
6th,	. . . .	4·60	. . . .	4·57	4·50	**18**	1	. . . .	3·47
7th,	. . . .	1·52	. . . .	1·48	1·50	**6**	12	. . . .	1·53
		25·86		25·91	25·50	**102**	19		25·96

Rostro-Caudal Dimensions (Length) &c. (*continued*).

Oblique Sterno-dorsal Dimensions

	XII. Actual Measurements. On the Right Side.		XII. Actual Measurements. On the Left Side.		Supposed Normal Dimensions of smallest Dorsal Length of Nerval Canal.	Dimensions in Proport. Parts.	Diff.	XIII. Actual. On the Right Side.	
1st,	Distance from the rostro-lateral margin of the dorsal surface, To the caudo-lateral margin of the same surface	4·04	. . . .	4·02	4·00	**16**			
2nd,	Smallest distance from the sinuous margin on the right side of the rostro-mesial process of the dorsal surface, To the caudal margin of the same surface, between the spinous ridge and the right caudal oblique process .	5·80	Similar dimensions on the left side . .	5·80	5·75	**23**	7		
3rd,	Smallest distance interveningly to the spinous dorsal ridge and the oblique processes, from the rostral margin of the dorsal surface, To the caudal margin of the same surface . .	5·30	Similar dimensions on the left side . .	5·62	5·50	**22**	1	Distance from the rostro-lateral extremity of the sternal plate, To the nearest mesial point on the spinous dorsal ridge; in 6th, To the rostral process over the nerval canal	5·15
4th,	. . . .	4·80	. . . .	5·33	5·25	**21**	1	. . . .	6·09
5th,	. . . .	4·70	. . . .	4 68	4·75	**19**	2	. . . .	6·60
6th,								. . . .	6·60
7th,									
		24·61		25·45	25·25	**101**	11		24·44

TEBRÆ in the Bactrian Camel.

Side of and parallel to the Mesial Plane.

Measurements.		Supposed Normal Dimensions of Dorso-lateral Sinuous Length.	Dimensions in Proportional Parts.	Diff.	XI. Actual Measurements. On the Right Side.		On the Left Side.		Supposed Normal Dimensions of Dorso-lateral extreme Length.	Dimensions in Proportional Parts.	Diff.	
On the Left Side.												
Similar dimension on the left side . .	3·70	3·75	**15**		Distance from the rostral margin of the atlas dorsally, To the caudo-lateral extremity of the bone, Being the length of the inclined plane of the rounded margin whereon the caudal edge of the basilar maxilla rests in the elevated position of the head . . .	5·54	Similar dimension on the left side . .	5·86	5·75	**23**		1st
Similar dimension on the left side . .	3·75	3·75	**15**	0	Distance from the right rostral extremity of the dental process, To the caudal margin of the right caudal oblique process . . .	8·36	Similar dimension on the left side . .	8·25	8·25	**33**	10	2nd
Similar dimensions on the left side . .	4·35	4·50	**18**	3	Distance from the rostral margin of the rostral oblique process, To the caudal margin of the caudal oblique process	8·20	Similar dimensions on the left side . .	8·18	8·25	**33**	0	3rd
. . . . .	4·50	4·50	**18**	0	. . . .	8·18	. . . .	8·28	8·25	**33**	0	4th
. . . . .	4·50	4·50	**18**	0	. . . .	7·93	. . . .	8·10	8·00	**32**	1	5th
. . . . .	3·74	3·75	**15**	3	. . . .	7·25	. . . .	7·50	7·50	**30**	2	6th
. . . . .	1·54	1·50	**6**	9	. . . .	6·48	. . . .	6·30	6·50	**26**	4	7th
	26·08	26·25	**105**	15		51·94		52·47	52·50	**210**	17	

on each Side of the Mesial Plane.

Measurements.		Supposed Normal Dimensions of Rostro-Lateral Height.	Dimensions in Proport. Parts.	Diff.	XIV. Actual Measurements. On the Right Side.		On the Left Side.		Supposed Normal Dimensions of Caudo-lateral Height.	Dimensions in Proport. Parts.	Diff.	
On the Left Side.												
												1st
												2nd
Similar dimensions on the left side . .	5·03	5·00	**20**									3rd
. . . . .	6·07	6·00	**24**	4	Distance from the rostro-lateral extremity of the sternal plate, To the summit of the elevation of the spinous dorsal ridge in the 4th, 5th, and 6th cervical vertebræ, And to the caudo-dorsal extremity of the spinous process of the 7th	6·44	. . . .	6 30	6·50	**26**		4th
. . . . .	6·60	6 50	**26**	2	. . . .	6·95	. . . .	6·90	7·00	**28**	2	5th
. . . . .	6·60	6·50	**26**	0	. . . .	*	. . . .	*	9·00	**36**	8	6th
					. . . .	8·44	. . . .	8·46	8·50	**34**	2	7th
	24·30	24·00	**96**	6					31·00	**124**	12	

Dimensions of the CERVICAL VER

Transverse Dimensions (Bre

	XV. Actual Measurements.		Supposed Normal Dimensions of Rostral Articular Breadth.	Dimensions in Proportional Parts.	Diff.	XVI. Actual Measurements.		Supposed Normal Dimensions of Rostro-sternal Breadth.	Dimensions in Proportional Parts.	Diff.
1st,						Distance between the mesial margins of the arterial canals on the sternal surface of the atlas	2·55	2·50	**10**	
2nd,	Distance between the lateral margins of the rostral globular surfaces of articulation; that surface being in each cervical vertebra connected with the similar caudal surfaces of the vertebra preceding					Distance between the lateral rounded margins of the rostral articulation	3·63	3·75	**15**	5
3rd,		2·00	2·00	**8**		Distance between lateral extremities of sternal plates rostrad	4·61	4·50	**18**	3
4th,	. . . .	2·30	2·25	**9**	1	. . . .	5·80	5·75	**23**	5
5th,	. . . .	2·48	2·50	**10**	1	. . . .	6·05	6·00	**24**	1
6th,	. . . .	2·75	2·75	**11**	1	. . . .	5·26	5·25	**21**	3
7th,	. . . .	2·98	3·00	**12**	1	. . . .	6·06	6·00	**24**	3
		12·51	12·50	**50**	4		33·96	33·75	**135**	20

Transverse Dimensions (Breadth) on the Sternal Aspect (*continued*).

	XIX. Actual Measurement.		Supposed Normal Dimensions of Transverso-caudal Breadth.	Dimension in Proportional Parts.	Diff.	XX. Actual Measurements.		Supposed Normal Dimensions of Caudal Articular Breadth.	Dimensions in Proportional Parts.	Diff.
2nd,						Distance between the lateral margins of the caudal globular surface of articulation, connected with the similar rostral surface of the 3rd cervical vertebra	2·10	2·00	**8**	
3rd,	Smallest distance between the sinuosities that disjoin the transverso-sternal process of the 7th cervical vertebra from the caudal ball of articulation					Distance between the lateral margins of the caudal globular surfaces of articulation, connected with the similar rostral surfaces of the succeeding vertebræ	2·14	2·25	**9**	1
4th,						. . . .	2·60	2·50	**10**	1
5th,						. . . .	2·79	2·75	**11**	1
6th,						. . . .	2·78	2·75	**11**	0
7th,	. . . .	2·82	2 75	**11**		. . . .	3·56	3·50	**14**	3
		2·82	2·75	**11**			15·97	15·75	**63**	6

TEBRÆ in the Bactrian Camel.

adth) on the Sternal Aspect.

XVII. Actual Measurements.		Supposed Normal Dimensions of intermediate Sternal Breadth.	Dimensions in Proportional Parts.	Diff.	XVIII. Actual Measurements.		Supposed Normal Dimensions of Caudo-sternal Breadth.	Dimensions in Proportional Parts.	Diff.	
					Distance between the caudo-lateral extremities of the atlas; Being the greatest breadth of that bone	6·22	6·25	**25**	10	1st,
Smallest distance between the rostral origins of the sternal plates	1·25	1·25	**5**	9	Distance between the lateral extremities of the sternal plates caudad	3·77	3·75	**15**	4	2nd
Smallest distance between the lateral margins of the sternal plates, interveningly to the rostral and the caudal distance between these plates	3·47	3·50	**14**	1	Distance between the lateral extremities of the sternal plates caudad	4·75	4·75	**19**	1	3rd
. . . .	3·68	3·75	**15**	1	. . . .	4·98	5·00	**20**	2	4th
. . . .	4·10	4·00	**16**	3	. . . .	4·57	4·50	**18**	1	5th
. . . .	4·73	4·75	**19**	3	. . . .	4·63	4·75	**19**	6	6th
. . . .	5·54	5·50	**22**		. . . .	6·18	6·25	**25**		7th
	22·77	22·75	**91**	17		35·10	35·25	**141**	24	

Transverse Dimensions (Breadth) on the Dorsal Aspect.

XXI. Actual Measurements.		Supposed Normal Dimensions of Rostro-dorsal extreme Breadth.	Dimensions in Proportional Parts.	Diff.	XXIV. Actual Measurements.		Supposed Normal Dimensions of Caudo-dorsal extreme Breadth.	Dimensions in Proportional Parts.	Diff.	
Greatest distance dorsally between the lateral surfaces of the rostral processes of the atlas, forming the socket for receiving the occipital condyles	3·95	4·00	**16**	6						1st
Distance between the lateral surfaces of the rostral terminations of the slender spokes extended rostro-caudally over the rostral enlargement and division of the arterial canals	2·50	2·50	**10**	3	Distance between the lateral margins of the caudal oblique processes	3·15	3·25	**13**	1	2nd
Distance between the lateral margins of the rostral oblique processes	3·30	3·25	**13**	0	. . . .	2·96	3·00	**12**	1	3rd
. . . .	3·18	3·25	**13**	1	. . . .	3·28	3·25	**13**	0	4th
. . . .	3·60	3·50	**14**	0	. . . .	3·22	3·25	**13**	2	5th
. . . .	3·62	3·50	**14**	2	. . . .	3·00	3·75	**15**	2	6th
. . . .	4·02	4·00	**16**		. . . .	4·18	4·25	**17**		7th
	24·17	24·00	**96**	12		19·79	20·75	**83**	6	

Dimensions of the CERVICAL VERTEBRÆ in the Bactrian Camel.

Transverse Dimensions (Breadth) on the Dorsal Aspect (*continued*).

	XXII. Actual Measurements.		Supposed Normal Dimensions of Rostro-dorsal sinuous Breadth.	Dimensions in Proportional Parts.	Diff.
1st,	Smallest distance laterally between the lateral surfaces of the rostral processes of the atlas, forming the socket for receiving the occipital condyles	3·70	3·75	**15**	
2nd,	Distance between the lateral surfaces of the 2nd vertebra at the attenuation in the middle of the bone	1·80	1·75	**7**	8
3rd,	Smallest distance between the lateral sinuous surfaces at the roots of the rostral oblique processes	2·00	2·00	**8**	1
4th,	. . . .	2·48	2·50	**10**	2
5th,	. . . .	2·80	2·75	**11**	1
6th,	. . . .	3·18	3·25	**13**	2
7th,	. . . .	3·94	4·00	**16**	3
		19·90	20·00	**80**	17

	XXV. Actual Measurements.		Supposed Normal Dimensions of Caudo-dorsal sinuous Breadth.	Dimensions in Proportional Parts.	Diff.
1st,	Distance between the mesial margins of the arterial canals on the dorsal surface of the atlas caudad	3·26	3·25	**13**	
2nd,	Smallest distance between the lateral sinuous surfaces at the roots of the caudal oblique processes	1·26	1·25	**5**	8
3rd,	. . . .	1·25	1·25	**5**	0
4th,	. . . .	1.50	1·50	**6**	1
5th,	. . . .	1·60	1·50	**6**	0
6th,	. . . .	1·80	1·75	**7**	1
7th,	. . . .	2·12	2·00	**8**	1
		12·79	12·50	**50**	11

	XXIII. Actual Measurements.		Supposed Normal Dimensions of Intermediate Dorsal Breadth.	Dimensions in Proportional Parts.	Diff.
1st,	Distance between the mesial margins of the arterial canals on the dorsal surface of the atlas rostrad	2·32	2·25	**9**	
2nd,	Smallest distance between the lateral surfaces on the dorsal aspect, interveningly to the arterial canals rostrad and the caudal oblique processes	1·28	1·25	**5**	4
3rd,	Smallest distance between the lateral surfaces on the dorsal aspect, interveningly to the rostral and the caudal oblique processes .	1·25	1·25	**5**	0
4th,	. . . .	1.44	1·50	**6**	1
5th,	. . . .	1·57	1·50	**6**	0
6th,	. . . .	1·72	1·75	**7**	1
7th,	. . . .	2·10	2·00	**8**	1
		11·68	11·50	**46**	7

Dimensions of the DORSAL VERTEBRÆ in the Bactrian Camel.

Dorsal Vertebræ.	Rostro-caudal Dimension (Length) in the Mesial Plane. I. Distance in the mesial plane from the rostral margin of the sternal surface, To the caudal margin of the same surface.				Sterno-dorsal Dimensions (Height) in the Mesial Plane. III. Distance in the mesial plane from the rostral margin of the sternal surface, To the caudal junction of the solid bone of the spinous processes with the osteo-steatomatous epiphyses that form the nucleus of the hump.				III. Distance in the mesial plane from the rostral margin of the sternal surface, To the caudo-dorsal extremity of the osteo-steatomatous epiphyses that form the nucleus of the hump.			
	Actual Measurements.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.	Actual Measurements.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.	Actual Measurements.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.
1st,	2·70	2·75	**11**	1	12·50	12·50	**50**	4	13·95	14·00	**56**	2
2nd,	2·40	2·50	**10**	2	13·55	13·50	**54**	5	14·50	14·50	**58**	8
3rd,	3·20	3·00	**12**	0	14·85	14·75	**59**	3	16·45	16·50	**66**	3
4th,	2·98	3·00	**12**	0	14·10	14·00	**56**	2	15·80	15·75	**63**	3
5th,	3·20	3·00	**12**	0	13·40	13·50	**54**	1	15·05	15·00	**60**	2
6th,	3·10	3·00	**12**	0	13·20	13·25	**53**	3	14·55	14·50	**58**	2
7th,	2·95	3·00	**12**	0	12·50	12·50	**50**		13·90	14·00	**56**	5
8th,	2·85	3·00	**12**	0					12·75	12·75	**51**	2
9th,	3·10	3·00	**12**	0					12·25	12·25	**49**	4
10th,	3·00	3·00	**12**	1					11·25	11·25	**45**	5
11th,	2·73	2·75	**11**	1					10·05	10·00	**40**	3
12th,	2·45	2·50	**10**						9·30	9·25	**37**	
	34·66	34·50	**138**	5	94·10	94·00	**376**	18	159·80	159·75	**639**	39

Dorsal Vertebræ.		VII. Distance in the mesial plane from the caudal margin of the sternal surface, To the rostral junction of the solid bone of the spinous processes with the osteo-steatomatous epiphyses that form the nucleus of the hump.				VII. Distance in the mesial plane from the caudal margin of the sternal surface, To the rostro-dorsal extremity of the osteo-steatomatous epiphyses that form the nucleus of the hump.			
1st,	. . . .	11·00	11·00	**44**	4	12·45	12·50	**50**	1
2nd,	. . . .	12·00	12·00	**48**	4	12·35	12·25	**49**	6
3rd,	. . . .	12·90	13·00	**52**	2	13·80	13·75	**55**	1
4th,	. . . .	12·55	12·50	**50**	1	13·95	14·00	**56**	3
5th,	. . . .	12·85	12·75	**51**	3	13·20	13·25	**53**	5
6th,	. . . .	12·00	12·00	**48**	4	12·05	12·00	**48**	3
7th,	. . . .	11·00	11·00	**44**	2	11·30	11·25	**45**	2
8th,	. . . .	10·65	10·50	**42**	2	10·80	10·75	**43**	2
9th,	. . . .	9·90	10·00	**40**	3	10·20	10·25	**41**	3
10th,	. . . .	9·35	9·25	**37**		9·50	9·50	**38**	0
11th,	. . . .					9·45	9·50	**38**	2
12th,	. . . .					9·00	9·00	**36**	
		114·20	114·00	**456**	25	138·05	138·00	**552**	28

Dimensions of the DORSAL VERTEBRÆ in the Bactrian Camel.

Transverse Dimensions (Breadth).

Dorsal Vertebræ.	XV. Distance between the rostro-lateral margins of the sternal portions (the bodies) of the dorsal vertebræ.				XXIII. Distance between the lateral margins at the roots of the spinous processes of the dorsal vertebræ.				XVI. Distance between the lateral extremities of the transverse processes of the dorsal vertebræ.			
	Actual Measurements.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.	Actual Measurements.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.	Actual Measurements.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.
1st,	1·88	1·75	**7**	1	1·48	1·50	**6**		4·96	5·00	**20**	2
2nd,	1·52	1·50	**6**	1	1·36			0	4·40	4·50	**18**	1
3rd,	1·72	1·75	**7**	2	1·42				4·22	4·25	**17**	0
4th,	2·26	2·25	**9**	4	1·50	1·50	**6**		4·38	4·25	**17**	0
5th,	3·20	3·25	**13**	2	1·40			1	4·40	4·25	**17**	0
6th,	3·78	3·75	**15**	4	1·32				4·25	4·25	**17**	0
7th,	2·80	2·75	**11**	1	1·22	1·25	**5**		4·22	4·25	**17**	1
8th,	2·40	2·50	**10**	1	1·24			1	3·90	4·00	**16**	0
9th,	2·16	2·25	**9**	1	1·17				3·96	4·00	**16**	1
10th,	1·97	2·00	**8**	0	1·00	1·00	**4**		3·65	3·75	**15**	0
11th,	2·00	2·00	**8**	0	·97				3·65	3·75	**15**	2
12th,	2·00	2·00	**8**		1·17				3·34	3·25	**13**	
	27·69	28·75	**111**	17	15·25				49·33	49·50	**198**	7

Dorsal Vertebræ.	XX. Distance between the caudo-lateral margins of the sternal portions (the bodies) of the dorsal vertebræ.					XIX. Smallest distance between the sinuosities that disjoin the transverse processes of the dorsal vertebræ from the caudo-lateral margins of the sternal portions (the bodies) of the vertebræ.			
1st,	2·26	2·25	**9**	0	. . . .	2·35	2·25	**9**	3
2nd,	2·30	2·25	**9**	2	. . . .	3·05	3·00	**12**	1
3rd,	2·82	2·75	**11**	0	. . . .	3·22	3·25	**13**	1
4th,	2·88	2·75	**11**	4	. . . .	3·48	3·50	**14**	1
5th,	3.73	3·75	**15**	2	. . . .	3·30	3·25	**13**	1
6th,	3·26	3·25	**13**	0	. . . .	2·93	3·00	**12**	1
7th,	3·32	3·25	**13**	4	. . . .	2·78	2·75	**11**	1
8th,	2·24	2·25	**9**	1	. . . .	2·66	2·50	**10**	0
9th,	2·03	2·00	**8**	0	. . . .	2·50	2·50	**10**	1
10th,	2·06	2·00	**8**	0	. . . .	2·30	2·25	**9**	0
11th,	2·03	2·00	**8**	1	. . . .	2·20	2·25	**9**	1
12th,	2·14	2·25	**9**		. . . .	1·98	2·00	**8**	
	31·07	30·75	**123**	14		32·75	32·50	**130**	11

Dimensions of the LUMBAR VERTEBRÆ in the Bactrian Camel.

	Rostro-caudal Dimension (Length) in the Mesial Plane.				Sterno-dorsal Dimensions (Height) in the Mesial Plane.							
	I. Distance in the mesial plane from the rostral margin of the sternal surface, To the caudal margin of the same surface.				IV. Distance in the mesial plane from the rostral margin of the sternal surface, To the dorso-rostral extremity of the spinous process.				III. Distance in the mesial plane from the rostral margin of the sternal surface, To the dorso-caudal extremity of the spinous process.			
Lumbar Vertebræ.	Actual Measurements.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.	Actual Measurements.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.	Actual Measurements.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.
1st,	2·58	2·50	**10**		8·55	8·50	**34**	4	7·72	7·75	**31**	3
2nd,	2·60			1	7·48	7·50	**30**	2	7·00	7·00	**28**	2
3rd,	2·60				6·90	7·00	**28**	2	6·45	6·50	**26**	2
4th,	2·65	2·75	**11**		6·46	6·50	**26**	2	6·02	6·00	**24**	1
5th,	2·65			1	5·90	6·00	**24**	1	5·82	5·75	**23**	0
6th,	2·40	2·50	**10**	2	5·62	5·75	**23**	2	5·74	5·75	**23**	3
7th,	2·00	2·00	**8**		5·31	5·25	**21**		5·02	5·00	**20**	
	17·48				46·22	46·50	**186**	13	43·77	43·75	**175**	11

		VIII. Distance in the mesial plane from the caudal margin of the sternal surface, To the dorso-caudal extremity of the spinous process.				VII. Distance in the mesial plane from the caudal margin of the sternal surface, To the dorso-rostral extremity of the spinous process.			
Lumbar Vertebræ. 1st,	. . . .	7·25	7·25	**29**	3	8·50	8·50	**34**	3
2nd,	. . . .	6·55	6·50	**26**	1	7·85	7·75	**31**	1
3rd,	. . . .	6·16	6.25	**25**	2	7·50	7·50	**30**	1
4th,	. . . .	5·67	5·75	**23**	1	7·17	7·25	**29**	3
5th,	. . . .	5·34	5·50	**22**	1	6·54	6·50	**26**	2
6th,	. . . .	5·40	5·25	**21**	1	6·00	6·00	**24**	1
7th,	. . . .	5·08	5·00	**20**		5·70	5·75	**23**	
		41·45	41·50	**166**	9	49·26	49·25	**197**	11

Dimensions of the LUMBAR VERTEBRÆ in the Bactrian Camel.

Transverse Dimensions (Breadth).

Lumbar Vertebræ.	XV. Distance between the rostro-lateral margins of the sternal cylindrical portions (the bodies) of the lumbar vertebræ.				XXI. Distance between the lateral surfaces of the extremities of the rostral oblique processes.				XXII. Smallest distance between the lateral surfaces of the roots of the rostral oblique processes.			
	Actual Measurements.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.	Actual Measurements.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.	Actual Measurements.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.
1st,	2·11				1·78	1·75	**7**	1	1·58	1·50	**6**	1
2nd,	1·98	2·00	**8**		1·92	2·00	**8**	1	1·66	1·75	**7**	0
3rd,	1·95				2·14	2·25	**9**	1	1·70	1·75	**7**	1
4th,	1·92			2	2·54	2·50	**10**	2	2·07	2·00	**8**	1
5th,	2·04				2·90	3·00	**12**	1	2·32	2·25	**9**	3
6th,	2·19				3·30	3·25	**13**	3	2·90	3·00	**12**	3
7th,	2·40	2·50	**10**		3·92	4·00	**16**		3·80	3·75	**15**	
	14·59				18·50	18·75	**75**	9	16·03	16·00	**64**	9

Lumbar Vertebræ.	XX. Distance between the caudo-lateral margins of the sternal cylindrical portions (the bodies) of the lumbar vertebræ.				XVI. Distance between the lateral extremities of the transverse processes.				XIX. Smallest distance between the sinuosities that disjoin the transverse processes from the caudo-lateral margins of the bones.			
1st,	2·04	2·00	**8**		9·30	9·25	**37**	18	1·98	2·00	**8**	
2nd,	2·05			1	13·65	13·75	**55**	5	2·02			
3rd,	2·10				15·00	15·00	**60**	4	2·09			1
4th,	2·20	2·25	**9**		15·90	16·00	**64**	1	2·12			
5th,	2·32			1	16·25	16·25	**65**	3	2·24	2·25	**9**	
6th,	2·46				15·55	15·50	**62**	13	2·33			1
7th,	2·52	2·50	**10**		12·15	12·25	**49**		2·50	2·50	**10**	
	15·69				97·80	98·00	**392**	44	15·28			

Dimensions of the SACRUM in the Bactrian Camel.

Rostro-caudal Dimensions (Length) in the Mesial Plane.

Actual Measurements.			Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.
Distance in the mesial plane from the rostral margin of the sternal surface of the sacrum, To the caudal margin of the same surface	I.	6·70	6·75	**27**	
Distance in the mesial plane from the rostral margin of the root of the spinous process of the rostral (1st) of four vertebræ that compose the sacrum, To the caudal margin of the root of the caudal (4th) of these four vertebræ, being over the nerval canal	V.	6·55	6·50	**26**	1
Distance in the mesial plane from the rostro-dorsal extremity of the spinous process of the rostral (1st) of four vertebræ that compose the sacrum, To the caudo-dorsal extremity of the caudal (4th) of these four vertebræ	V.	7·02	7·00	**28**	2
Distance in the mesial plane from the rostral margin of the sternal surface of the sacrum, To the caudo-dorsal extremity of the spinous process of the caudal (4th) of four vertebræ that compose the bone . . .	III.	7·18	7·25	**29**	1
Distance in the mesial plane from the caudal margin of the sternal surface of the sacrum, To the rostro-dorsal extremity of the spinous process of the rostral (1st) of four vertebræ that compose the bone . . .	VII.	7·58	7·50	**30**	1

Sterno-dorsal Dimensions (Height) in the Mesial Plane.

Actual Measurements.			Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.
Distance in the mesial plane from the rostral margin of the sternal surface of the sacrum, To the summit of the corresponding spinous process of the rostral (1st) of four vertebræ that compose the bone . . .	IV.	4·45	4·50	**18**	
Distance in the mesial plane from the summit of the rostral (1st) of four vertebræ that compose the sacrum, To the nearest point on the sternal surface of the bone . . .	IV.	3·94	4·00	**16**	2
Similar dimension from the spinous summit of the 2nd vertebra of the sacrum . . .		3·13	3·25	**13**	3
Similar dimension from the spinous summit of the 3rd vertebra of the sacrum . . .		2·34	2·25	**9**	4
Similar dimension from the spinous summit of the caudal (4th) vertebra of the sacrum		1·96	2·00	**8**	1
Distance in the mesial plane from the caudal margin of the sternal surface of the sacrum, To the summit of the corresponding spinous process of the caudal (4th) of four vertebræ that compose the bone . . .	VIII.	1·50	1·50	**6**	2
Distance in the mesial plane from the caudal margin of the sternal surface of the sacrum, To the caudal margin of the floor of the nerval canal	VIII.	·71	·75	**3**	3

Transverse Dimensions (Breadth).

On the Sternal Aspect.

Actual Measurements.			Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.
Distance between the lateral terminations of the rostral margin of the sternal surface of the sacrum	XV.	8·50	8·50	**34**	
On the sternal surface of the sacrum. Distance between the mesial margins of the foramina intervening to the rostral (1st) and the 2nd of the vertebræ that compose the bone	XVI.	1·84			27
Similar dimension between the sternal foramina intervening to the 2nd and the 3rd vertebræ of the sacrum		1·64	1·75	**7**	
Similar dimension between the sternal foramina intervening to the 3rd and the caudal (4th) vertebræ of the sacrum		1·49	1·50	**6**	1
Distance between the lateral extremities of the caudal margin of the sternal surface of the sacrum	XX.	3·26	3·25	**13**	7

On the Dorsal Aspect.

Actual Measurements.			Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.
On the dorsal surface of the sacrum. Distance between the mesial margins of the foramina intervening to the rostral (1st) and the 2nd of four vertebræ that compose the bone	XXV.	2·58	2·50	**10**	
Similar dimension between the dorsal foramina intervening to the 2nd and the 3rd vertebræ of the sacrum		2·37			3
Similar dimension between the dorsal foramina intervening to the 3rd and the caudal (4th) vertebræ of the sacrum		1·62	1·75	**7**	

Dimensions of the CAUDAL VERTEBRÆ in the Bactrian Camel.

	Rostro-caudal Dimensions (Length) of the Vertebræ of the Tail, in the Mesial Plane.				Sterno-dorsal Dimensions (Height) of the Vertebræ of the Tail, in the Mesial Plane.							
	I. Distance in the mesial plane from the rostral margin of the sternal surface of the vertebræ of the tail, To the caudal margin of the same surface.				IV. Distance in the mesial plane from the rostral margin of the sternal surface of the vertebræ of the tail, To the opposite dorsal margin, Being at the articulation of each vertebra with that preceding.				VIII. Distance in the mesial plane from the summit of the spinous process of each vertebra of the tail, To the nearest point on the sternal surface of the vertebra.			
Vertebræ of the Tail.	Actual Measurements.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.	Actual Measurements.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.	Actual Measurements.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.
1st,	1·34				·75	·75	**3**		1·48	1·50	**6**	1
2nd,	1·32				·75				1·28	1·25	**5**	
3rd,	1·16				·78				1·20			1
4th,	1·22				·83				1·06	1·00	**4**	
5th,	1·22				·72				·93			
6th,	1·22				·73			1	·93			
7th,	1·23	1·25	**5**		·72							
8th,	1·20				·66							
9th,	1·20				·66							
10th,	1·15			1	·58							
11th,	1·18				·58							
12th,	1·12				·50	·50	**2**					
13th,	1·05				·43							
14th,	1·00	1·00	**4**		·36							
	16·61				9·05				6·88			

	Transverse Dimensions (Breadth) of the Vertebræ of the Tail.								
		XXI. Distance between the lateral extremities of the (rostral) oblique processes of the vertebræ of the tail.				XVI. Distance between the lateral extremities of the transverse processes of the vertebræ of the tail.			
Vertebræ of the Tail.		Actual Measurements.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.	Actual Measurements.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.
1st,	. . . .	None.				3·35	3·25	**13**	4
2nd,	. . . .	1·36				2·18	2·25	**9**	1
3rd,	. . . .	1·26	1·25	**5**		2·03	2·00	**8**	1
4th,	. . . .	1·21			1	1·65	1·75	**7**	2
5th,	. . . .	·99	1·00	**4**		1·30	1·25	**5**	
6th,	. . . .	·89			2	1·14			2
7th,	. . . .	·63				·87			
8th,	. . . .	·48	·50	**2**		·73	·75	**3**	
9th,	. . . .					·68			
10th,	. . . .					·61			1
11th,	. . . .					·54			
12th,	. . . .					·47	·50	**2**	
13th,	. . . .					·40			
14th,	. . . .					·34			
		6·82				16·29			

Dimensions of the RIBS and of the Width of the THORAX in the Bactrian Camel.

Dorso-sternal Dimensions (Length) of the Ribs.

Ribs.	Distance from the summit of the dorsal edge of the mesial articulation of each rib with the rostro-lateral margin of the sternal cylindrical portion of the dorsal vertebra of the same number, and likewise with the similar caudo-lateral margin of the preceding vertebra (in the rostral (1st) rib, with that margin of the caudal, 7th cervical vertebra), To the sternal termination of the rostral margin of each rib in its sternal cartilage.					Greatest distance from the rostral extremity of the dorsal edge of the mesial articulation of each rib with the rostro-lateral margin of the sternal cylindrical portion of the dorsal vertebra of the same number, and likewise with the similar caudo-lateral margin of the preceding vertebra (in the rostral (1st) rib, with that margin of the caudal, 7th cervical vertebra,) To the sternal termination of the caudal margin of each rib in its sternal cartilage.					Distance from the summit of the caudal margin of the rostral (1st) rib—in the 2nd and nine succeeding ribs, From the rostral extremity of the elevated rostro-caudal ridge on each rib, immediately laterad from its articulation with the transverse process of the same number—the caudal (12th) rib having no transverse articulation, From a slight rostral enlargement on the summit of its curvature,—in all the twelve ribs,—To the sternal termination of the caudal margin of each rib in its sternal cartilage.				
	Actual Measurements.		Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.	Actual Measurements.		Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.	Actual Measurements.		Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.
	On the right side.	On the left side.				On the right side.	On the left side.				On the right side.	On the left side.			
1st,	8·40	8·45	8·50	**34**	10	8·94	9·04	9·00	**36**	8	9·28	9·28	9·25	**37**	8
2nd,	10·97	10·80	11·00	**44**	10	10·90	11·00	11·00	**44**	11	11·36	10·75	11·25	**45**	11
3rd,	13·70	13·35	13·50	**54**	10	13·90	13·55	13·75	**55**	10	14·00	13·70	14·00	**56**	10
4th,	16·10	15·80	16·00	**64**	7	16·37	16·03	16·25	**65**	8	16·60	16·20	16·50	**66**	7
5th,	17·80	17·45	17·75	**71**	4	18·30	18·07	18·25	**73**	5	18·40	18·03	18·25	**73**	5
6th,	18·73	18·30	18·75	**75**	3	19·58	19·33	19·50	**78**	3	19·60	19·17	19·50	**78**	3
7th,	19·43	19·33	19·50	**78**	2	20·22	20·00	20·25	**81**	1	20·20	20·07	20·25	**81**	0
8th,	20·00	19·82	20·00	**80**	1	20·45	20·30	20·50	**82**	0	20·25	20·03	20·25	**81**	1
9th,	19·87	19·50	19·75	**79**	1	20·50	20·10	20·50	**82**	1	20·12	19·32	20·00	**80**	2
10th,	19·70	19·15	19·50	**78**	2	20·36	19·60	20·25	**81**	3	19·50	18·95	19·50	**78**	4
11th,	19·13	18·20	19·00	**76**	7	19·64	18·76	19·50	**78**	8	18·50	17·87	18·50	**74**	10
12th,	17·37	17·03	17·25	**69**		17·54	17·42	17·50	**70**		15·90	15·90	16·00	**64**	
	201·20	197·18	200·50	**802**	57	206·70	203·20	206·25	**825**	58	203·71	199·27	203·25	**813**	61

Ribs.	Dorso-sternal Dimensions (Length) of the Ribs (*continued*).					Rostro-caudal Dimensions (Breadth) of the Ribs.					Dimensions of the Width of the Thorax.				
	Distance from the summit of the dorso-lateral edge of the lateral articulation of each rib with the sternal surface of the lateral extremity of the transverse process of the same number, To the apparent termination of the middle of the osseous lateral surface of each rib in its sternal cartilage.					Distance from the sternal termination of the rostral margin of each rib, To the opposite sternal termination of its caudal margin.					Distance between the dorsal terminations of the lateral surfaces of the right and the left rostral (1st) ribs; between the caudo-lateral surfaces of the 2nd ribs; and between the caudal margins of seven right and left succeeding ribs; disregarding exostoses (from burden) on the 5th and 6th ribs.				
1st,	9·20	9·25	9·25	**37**	7	1·71	1·73	1·75	**7**	1	5·92		6·00	**24**	2
2nd,	11·00	11·00	11·00	**44**	10	2·00	1·72	2·00	**8**	1	5·52		5·50	**22**	4
3rd,	13·50	13·50	13·50	**54**	12	2·11	2·22	2·25	**9**	3	6·55		6·50	**26**	14
4th,	16·50	16·50	16·50	**66**	8	3·02	2·98	3·00	**12**	0	10·00		10·00	**40**	14
5th,	18·50	18·00	18·50	**74**	2	2·93	2·95	3·00	**12**	2	13·32		13·50	**54**	12
6th,	19·00	19·00	19·00	**76**	4	2·43	2·36	2·50	**10**	2	16·50		16·50	**66**	6
7th,	20·00	20·00	20·00	**80**	0	2·03	1·86	2·00	**8**	0	17·87		18·00	**72**	6
8th,	20·00	20·00	20·00	**80**	2	1·93	1·93	2·00	**8**	1	19·25		19·50	**78**	6
9th,	19·70	19·70	19·50	**78**	2	2·12	2·22	2·25	**9**	2	20·83		21·00	**84**	
10th,	19·00	19·00	19·00	**76**	2	1·68	1·84	1·75	**7**	2					
11th,	18·50	18·00	18·50	**74**	8	1·20	1·37	1·25	**5**	1					
12th,	16·50	16·50	16·50	**66**		1·02	1·10	1·00	**4**						
	201·40	200·45	201·25	**805**	57	24·18	24·28	24·75	**99**	15	115·76		116·50	**466**	64

Dimensions of the STERNUM and of the

	ostro-Caudal Dimensions (Length) of the separate Portions of the Sternum, in the Mesial Plane. Actual Measurements.		Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.	Dermo-pleural Dimensions. Actual Measurements.		Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.
1st,	Distance in the mesial plane from the rostral extremity of the rostral (1st) bone of the sternum, To the caudal margin of its dermal (sternal) surface	·96	1·00	**4**						
2nd,	Distance in the mesial plane from the rostral margin of the dermal (sternal) surface, To the caudal margin of the same surface; That surface being smooth and round in the 2nd and 3rd bones; a smooth blunt ridge in the 4th; villous and bulging in the 5th; in the 6th villous and bulging laterally, smooth and deeply hollowed mesially . .	3·05	3·00	**12**	8	Distance in the mesial plane from the rostral margin of the dermal (sternal) surface, To the opposite rostral margin of the pleural (dorsal) surface	·78	·75	**3**	
3rd,	. . . .	3·56	3·50	**14**	2	. . . .		1·00	**4**	1
4th,	. . . .	3·30	3·25	**13**	1	. . . .	1·42	1·50	**6**	2
5th,	. . . .	3·53	3·50	**14**	1	. . . .	1·98	2·00	**8**	2
6th,	. . . .	7·10	7·00	**28**	14	. . . .	2·90	3·00	**12**	4
		21·50	21·25	**85**	26			8·25	**33**	9

Whole Length of the Sternum.				
Distance from the rostral extremity of the rostral (1st) bone of the sternum, To the caudal margin of the caudal (6th) bone .	22·64	22·50	**90**	30
Dimensions of the Depth of the Thorax.				
Distance in the mesial plane from the dermal (sternal) surface of the rostral (1st) bone of the sternum, To the summit of the spinous process of the 7th cervical vertebra	30·00	30·00	**120**	
Distance in the mesial plane from the caudal margin of the caudal (6th) bone of the sternum, To the summit of the epiphysis of the spinous process of the 6th dorsal vertebra	15·50	15·50	**62**	58

Depth of the THORAX in the Bactrian Camel.

(Thickness) of the separate Portions of the Sternum, in the Mesial Plane.

Actual Measurements.		Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.	Actual Measurements.		Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.
Greatest distance from the dermal (sternal) scabrous surface of the rostral (1st) bone of the sternum, To the opposite dorsal surface, at the sternal ends of the 1st ribs . . .	·56	·50	**2**						
				0					
Smallest distance in the mesial plane from the dermal (sternal), To the pleural (dorsal) surface; interveningly to the rostral and the caudal ends of each portion of the sternum	51	·50	**2**		Distance in the mesial plane from the caudal margin of the dermal (sternal) surface, To the opposite caudal margin of the pleural (dorsal) surface	1·04	1·00	**4**	
				2					2
. . . .	·90	1·00	**4**		. . . .	1·45	1·50	**6**	
				1					2
. . . .	1·32	1·25	**5**		. . . .	2·08	2·00	**8**	
									5
. . . .					. . . .	3·20	3·25	**13**	
									11
. . . .					. . . .	0·38	·50	**2**	
	3·29	3·25	**13**	3		8·15	8·25	**33**	20

Transverse Dimensions (Breadth) of the separate Portions of the Sternum.

Portions of the Sternum.									
1st,	Distance between the lateral scabrous surfaces of the rostral (1st) bone of the sternum, Being at the meeting of the sternal ends of the right and the left rostral (1st) ribs	·76	·75	**3**					
					3				
2nd,	Smallest distance between the lateral sinuous margins of the 2nd, 3rd, and 4th bones of the sternum, and between the smooth sinuous surfaces of the 5th and 6th bones, in the intervals of the junction of the cartilages of the six rostral ribs with the ligamento-cartilaginous connection of the ends of the bones of the sternum	1·58	1·50	**6**		Distance between the rounded lateral margins of the dermal (sternal) surface of the 6th bone of the sternum, at the dermal (sternal) termination of the cartilage of the 6th rib; the cartilage of the 7th rib, the last joined to the sternum being closely caudad from that of the 6th			
					3				
3rd,	. . . .	2·13	2·25	**9**		. . . .			
					1				
4th,	. . . .	2·40	2·50	**10**		. . . .			
					1				
5th,	. . . .	2·64	2·75	**11**		. . . .			
					5				
6th,	. . . .	4·15	4·00	**16**		. . . .	6·12	6·00	**24**
						Distance between the lateral extremities of the caudal margin of the caudal (6th) bone of the sternum	2·95	3·00	**12**
		13·66	13·75	**55**	13				

Dimensions of the SCA

Dorso-sternal Dimensions (Length).						Rostro-caudal Dimen	
Actual Measurements.			Supposed Normal Dimensions.	Dimensions in Proport. Parts.	Diff.	Actual	
On the Right Side.		On the Left Side.				On the Right Side.	
Distance from the rostral edge of the glenoid cavity, To the osseous rostral angle of the dorsal expansion of the scapula	15·10	. . . . 15·45	15·50	**62**		Distance from the osseous rostral angle of the dorsal expansion of the scapula, To the cartilaginous dorso-caudal extremity of the expansion of the bone	12·10
					11		
Distance from the hollow of the sinuous surface at the root of the scabrous and elongated digital process of the lateral ridge (spine), To the extremity of the cartilaginous dorsal margin (base)	18·36	. . . . 18·28	18·25	**73**		Smallest distance from the thin and falciform rostral margin of the scapula, To the firm and rounded caudal margin	3·22
					7		
Distance from the digital extremity of the scabrous and elongated digital process of the lateral ridge (spine), To the extremity of the cartilaginous dorsal margin (base) . .	20·00	. . . . 19·90	20·00	**80**			
					2	Distance from the rostral extremity of the scabrous rostral protuberance immediately over the glenoid cavity, To the caudal edge of that cavity	4·74
Distance from the caudal edge of the glenoid cavity, To the extremity of the cartilaginous dorsal margin (base) in the line of the dorsal termination of the lateral ridge . . .	19·50	. . . . 19·45	19·50	**78**			
					6		
Distance from the caudal edge of the glenoid cavity, To the cartilaginous dorso-caudal extremity of the dorsal expansion of the scapula	*	. . . . 18·00	18·00	**72**		Distance from the rostral edge of the glenoid cavity, To the opposite caudal edge of that cavity	2·90
					8		
Distance from the caudal edge of the glenoid cavity, To the dorsal termination of the osseous portion of the firm and rounded caudal margin (costa)	16·00	. . . . 16·00	16·00	**64**			

PULA in the Bactrian Camel.

sions (Breadth).				Latero-mesial Dimensions (Thickness).					
Measurements.	Supposed Normal Dimensions.	Dimensions in Proport. Parts.	Diff.	Actual Measurements.			Supposed Normal Dimensions.	Dimensions in Proport. Parts.	Diff.
On the Left Side.					On the Right Side.	On the Left Side.			
. . . . . 12·05	12·00	**48**							
			35						
. . . . . 3·13	3·25	**13**		Distance between the margin of the lateral ridge of the scapula at the rise of the scabrous and elongated digital process of that ridge, And the nearest point on the mesial surface of the bone	2·28	. . . . 2·30	2·25	**9**	
									11
			6	Distance between the rostro-lateral extremity of the scabrous and elongated digital process of the lateral ridge, And the furthest point of the caudo-mesial rounding of the glenoid cavity	5·04	. . . . 5·06	5·00	**20**	
									11
. . . . . 4·84	4·75	**19**		Distance between the lateral marginal extremity of the lateral and larger portion of the scabrous rostral protuberance immediately over the glenoid cavity, And the mesial extremity of the mesial and smaller portion of that protuberance, The separation being by a narrow proximo-digital groove	2·23	. . . . 2·12	2·25	**9**	
									3
			7	Smallest distance between the lateral and the mesial surfaces of the scapula; interveningly to the lateral ridge (spine) of the bone and the glenoid cavity	1·50	. . . . 1·47	1·50	**6**	
									5
. . . . . 2·94	3·00	**12**		Distance between the lateral extremity of the caudo-lateral enlargement of the glenoid cavity, And the furthest opposite point of the mesial rounding of that cavity	2·63	. . . . 2·72	2·75	**11**	

Dimensions of the Pelvis in the Mesial Plane. Actual Measurements.		Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.
nce in the mesial plane from the rostral nination of the union of the ossa pubis, the caudal termination of that union .	6·15	6·25	**25**	
				20
nce in the mesial plane from the rostral nination of the union of the sternal faces of the ossa pubis, To the rostral nination of the union of their dorsal faces	1·32	1·25	**5**	
				5
nce in the mesial plane from the caudal nination of the union of the sternal surs of the ossa pubis, To the caudal teriation of the union of their dorsal surs	2·50	2·50	**10**	
				42
nce in the mesial plane from the rostral nination of the union of the sternal faces of the ossa pubis, To the summit he spinous process of the 1st (rostral) ebra of the sacrum	12·98	13·00	**52**	
				14
nce in the mesial plane from the rostral nination of the union of the sternal surs of the ossa pubis, To the caudal mar- of the floor of the nerval canal of the um	9·45	9·50	**38**	
				4
nce in the mesial plane from the rostral nination of the union of the sternal faces of the ossa pubis, To the dorsodal extremity of the spinous process of 4th (and caudal) vertebra of the sam	10·52	10·50	**42**	
				18
nce in the mesial plane from the caudal termination of the union of the sternal faces of the ossa pubis, To the rostrosal extremity of the spinous process of 1st (rostral) vertebra of the sacrum .	15·02	15·00	**60**	
				5
nce in the mesial plane from the caudal termination of the union of the sternal faces of the ossa pubis, To the rostrosal extremity of the spinous process of 2nd vertebra of the sacrum . . .	13·75	13·75	**55**	

Dimensions of the Pelvis on each side of, and parallel or nearly parallel to, the Mesial Plane. Actual Measurements.	On the right side.	On the left side.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.
Distance from the rostral extremity of the scabrous rostral margin (spine) of the right os ilium, To the rostro-lateral margin of the right thyroid foramen	11·20	11·00	11·25	**45**	
					5
Distance from the rostro-mesial extremity of the scabrous rostral margin (spine) of the right os ilium, To the sterno-caudal margin of the right acetabulum	12·42	12·50	12·50	**50**	
					7
Distance from the rostral extremity of the scabrous rostral margin (spine) of the right os ilium, To the caudal sinuous surface disjoining the scabrous caudo-mesial process of the right os ischii, and the large lateral protuberance of that bone	14·46	14·18	14·25	**57**	
					5
Distance from the rostral extremity of the scabrous rostral margin (spine) of the right os ilium, To the caudal extremity of the scabrous caudo-mesial process of the right os ischii	15·50	15·44	15·50	**62**	
					57
Smallest distance from the rostral surface of the right os pubis, To the rostral margin of the right thyroid foramen	1·22	1·30	1·25	**5**	
					3
Smallest distance from the caudal margin of the thyroid foramen, To the caudal sinuous surface disjoining the scabrous caudo-mesial process of the right os ischii, and the large lateral protuberance of that bone	1·95	1·93	2·00	**8**	

Oblique Dimensions of the Pelvis through the Mesial Plane.					
Distance from the rostro-lateral extremity of the scabrous rostral margin (spine) of the right os ilium, To the hollow of the sinuous surface immediately caudad from the left acetabulum	16·75	16·67	16·75	**67**	
					17
Distance from the lateral extremity of the scabrous rostral margin of the right os ilium, To the caudo-lateral extremity of the large lateral protuberance of the left os ischii	21·15	20·93	21·00	**84**	
					29
Distance from the rostro-dorsal margin of the right acetabulum, To the lateral extremity of the large lateral protuberance of the left os ischii	13·73	13·68	13·75	**55**	

VIS in the Bactrian Camel.

Transverse Dimensions (Breadth) of the Pelvis.

Actual Measurements.		Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.
Greatest distance between the lateral extremities of the scabrous rostral margins (spines) of the ossa ilium	19·45	19·50	**78**	
				40
Smallest distance between the lateral surfaces of the ossa ilium; interveningly to the rostral expansion of these bones and the rostral surfaces of the acetabula . .	9·50	9·50	**38**	
				10
Greatest distance between the dorso-mesial surfaces of the ossa ilium, Being interveningly to the rostral expansion of these bones and the rostral surfaces of the acetabula	7·00	7·00	**28**	
				19
Smallest distance between the mesial margins of the thyroid foramina	2·26	2·25	**9**	
				28
Smallest distance between the dorso-lateral margins of the acetabula	9·35	9·25	**37**	
				6
Smallest distance between the lateral surfaces of the ossa ischii: interveningly to the caudal surfaces of the acetabula and the large lateral protuberances of the ossa ischii	7·75	7·75	**31**	
				26
Greatest distance between the lateral extremities of the large lateral protuberances of ossa ischii	14·20	14·25	**57**	

Oblique Dimensions of the Pelvis on each side of the Mesial Plane.

Actual Measurements.	On the right Side.	On the left Side.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.
Distance from the rostral termination of the union of the sternal surfaces of the ossa pubis, To the summit of the scabrous rostral margin (spine) of the right os ilium .	13·66	13·59	13·75	**55**	
					11
Distance from the caudal termination of the union of the sternal surfaces of the ossa pubis, To the rostro-mesial extremity of the scabrous rostral margin (spine) of the right os ilium	16·60	16·62	16·50	**66**	
					18
Greatest distance between the lateral extremity of the scabrous rostral margin of the right os ilium, And the furthest mesial extremity of that margin	11·95	12·20	12·00	**48**	
					36
Smallest distance between the sterno-lateral rounded margin of the right os ilium, And the opposite dorso-mesial rounded margin of the bone; interveningly to the rostral expansion of the os ilium and the rostral surface of the acetabulum	3·04	3·08	3·00	**12**	
					6
Smallest distance from the dorso-lateral margin of the right thyroid foramen, To the dorsal sinuous and fluted surface disjoining the dorso-caudal surface of the acetabulum, and the large lateral protuberance of the os ischii	1·55	1·58	1·50	**6**	
					15
Distance from the caudo-lateral margin of the right thyroid foramen, To the lateral extremity of the large lateral protuberance of the right os ischii	5·22	5·28	5·25	**21**	

Proximo-digital Dimensions (Length) of the Bones of

	Proximo-digital Dimensions (Length) of the Humerus.					Proximo-digital Dimensions
	Actual Measurements.		Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.	Actual
	On the Right Side.	On the Left Side.				On the Right Side.
On the Lateral Aspect.	Distance from the proximal extremity of the prominent rostral margin of the lateral of three rostral protuberances at the proximal end of the humerus, To the digital extremity of the lateral margin of the digital articular surface of the bone . . . . . 17·53	. . . 17·35	17·50	**70**		Distance from the lateral margin of the proximal articular surface of the cubitus, To the lateral margin of the digital articular surface of the bone . . . . 20·90
					4	
	Distance from the most digital point laterally on the large hollow space disjoining the summits of the rostro-proximal protuberances of the humerus, and the ball of its glenoid articulation, To the digital extremity of the lateral margin of the digital articular surface of the bone . . . . 16·52	. . . 16·40	16·50	**66**		
On the Rostral Aspect.						Distance from the proximal extremity of the process of the rostral articular margin of the cubitus received within the groove on the rostro-digital articular surface of the humerus, To the digital extremity of the rostral sharp and prominent ridge separating the lateral and the mesial wide grooves at the digital end of the cubitus . 21·90
					14	
On the Caudal Aspect.	Distance from the most digital point in that part of the large proximal hollow of the humerus, adjoining to the rounded and middle of its three rostro-proximal protuberances, To the most proximal point in the caudo-digital cavity that receives the articular portion of the olecranon . . 13·02	. . . 13·10	13·00	**52**		Distance from the proximal scabrous summit of the olecranon, To the digital extremity of the rostral sharp and prominent ridge separating the lateral and the mesial wide grooves at the digital end of the cubitus . 24·82
					12	
	Distance from the most digital point mesially on the large hollow space disjoining the summits of the rostro-proximal protuberances of the humerus and the ball of its glenoid articulation, To the digital extremity of the mesial margin of the digital articular surface of the bone . . . . 16·14	. . . 16·04	16·00	**64**		
On the Mesial Aspect.					6	
	Distance from the proximal acuminated extremity of the prominent rostral margin of the mesial of three rostral protuberances at the proximal end of the humerus, To the digital extremity of the mesial margin of the digital articular surface of the bone 17·63	. . . 17·52	17·50	**70**		Distance from the mesial margin of the proximal articular surface of the cubitus, To the mesial margin of the digital articular surface of the bone . . . . . 21·60

he ATLANTAL LIMBS in the Bactrian Camel.

(Length) of the Cubitus.				Proximo-digital Dimensions (Length) of the Metacarpus.					
Measurements.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.	Actual Measurements.		Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.	
On the Left Side.				On the Right Side.	On the Left Side.				
. . . . 20·90	21·00	**84**		Distance from the lateral margin of the articular surface at the proximal end of the metacarpus, To the digital extremity of the articular surface of the latero-digital condyle of the bone . . . . 14·94	. . . . 14·88	15·00	**60**		On the Lateral Aspect.
			4					3	
				Distance from the rostral margin of the proximal articular surface of the lateral portion of the metacarpus, To the rostral margin of the digital articular surface of the latero-digital condyle of the bone . 14·22	. . . . 14·10	14·25	**57**		On the Rostral Aspect.
								7	
. . . 21·90	22·00	**88**		Distance from the rounded rostral margin of the groove disjoining the proximal articular surfaces of the lateral and the mesial portions of the metacarpus, To the rostral angle of the digital bifurcation of the bone 12·54	. . . . 12·26	12·50	**50**		
								7	
				Distance from the rostral margin of the proximal articular surface of the mesial portion of the metacarpus, To the rostral margin of the digital articular surface of the mesio-digital condyle of the bone . 14·38	. . . . 14·04	14·25	**57**		
			11					1	
				Distance from the mesio-caudal margin of the proximal articular surface of the lateral portion of the metacarpus, To the summit of the mesial of three tubercles on the caudal articular margin of the latero-digital condyle of the bone . . . . 13·97	. . . . 13·68	14·00	**56**		On the Caudal Aspect.
								6	
. . . 24·70	24·75	**99**		Distance from the blunt caudal margin of the inter-articular hollow, being the caudal enlargement of the groove disjoining the proximal articular surfaces of the lateral and the mesial portions of the metacarpus, To the caudal angle of the digital bifurcation of the bone . . . . 12·68	. . . . 12·48	12·50	**50**		
								6	
			12	Distance from the caudal margin of the caudal extension of the proximal articular surface of the mesial portion of the metacarpus, To the summit of the middle of three tubercles on the caudal articular margin of the mesio-digital condyle of the bone . . . . 14·03	. . . . 13·83	14·00	**56**		
								4	
. . . 21·64	21·75	**87**		Distance from the proximal extremity of the slight prominence of the mesial articular margin at the proximal end of the metacarpus, in the interval of the two mesio-digital bones of the carpus, To the digital extremity of the articular surface of the mesio-digital condyle of the bone . . . 15·10	. . . . 14·91	15·00	**60**		On the Mesial Aspect.

Proximo-digital Dimensions (Length) of the Bones of

	Proximo-digital Dimensions (Length) of the Femur.					Proximo-digital Dimensions
	Actual Measurements.		Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.	Actual
	On the Right Side.	On the Left Side.				On the Right Side.
On the Lateral Aspect.	Distance from the summit of the lateral (larger) trochanter of the femur, To the most proximal point in the circular lateral cavity on the space disjoining the latero-digital condyle and the lateral margin of the patellar groove . . . . 20·22	. . . 20·60	20·50	**82**		Distance from the proximal extremity of the slightly elevated lateral margin of the proximal articular surface of the crus, To the digital extremity of the lateral articular margin of the digital end of the bone, at the caudal portion of that margin . . . 17·61
	Distance from the summit of the lateral (larger) trochanter of the femur, To the digital extremity of the mesial rounded margin of the articular surface of the latero-digital condyle of the bone . . . 21·12	. . . 21·20	21·25	**85**	3	
					0	
On the Rostral Aspect.	Distance from the summit of the lateral (larger) trochanter of the femur, To the digital extremity of the lateral margin of the patellar groove . . . . 21·05	. . . 21·28	21·25	**85**		
					0	Distance from the summit of the elevated process of the lateral margin of the mesio-proximal articular surface of the crus, for receiving the mesio-digital condyle of the femur, To the digital extremity of the process of the rostro-digital articular margin of the bone, disjoining the lateral and the mesial curvatures of that margin . . . 19·50
	Distance from the summit of the lateral (larger) trochanter of the femur, To the digital extremity of the mesial margin of the patellar groove . . . . 21·10	. . . 21·22	21·25	**85**		
On the Caudal Aspect.	Distance from the most digital point on the depression of the proximal surface of the femur uniting the globular articulation with the lateral (larger) trochanter—the cervix,—To the blunt caudo-digital margin of the hollow disjoining the lateral and the mesial condyles at the digital end of the bone . . . . 19·38	. . . 19·50	19·50	**78**	7	Distance from the summit of the elevated process of the mesial margin of the latero-proximal articular surface of the crus, for receiving the latero-digital condyle of the femur, To the sharp sinuous caudal margin of the articular surface of the digital end, over the caudo-lateral surface of the astragalus . . . . 18·55
					5	Distance from the summit of the elevated process of the lateral margin of the mesio-proximal articular surface of the crus, To the mesio-caudal extremity of the digital articular margin of the bone . . . . 19·22
On the Mesial Aspect.	Distance from the most digital point on the depression of the proximal surface of the femur uniting the globular articulation with the lateral (larger) trochanter—the cervix,—To the digital extremity of the lateral rounded margin of the articular surface of the mesio-digital condyle of the bone . . . . 20·80	. . . 20·88	20·75	**83**		Distance from the mesial margin of the proximal articular surface of the crus, To the rostro-mesial extremity of the digital articular margin of the bone . . . . 19·28

the SACRAL LIMBS in the Bactrian Camel.

(Length) of the Crus.				Proximo-digital Dimensions (Length) of the Metatarsus.						
Measurements. On the Left Side.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.	Actual Measurements. On the Right Side.	Actual Measurements. On the Left Side.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.		
. . . 17·61	17·50	**70**		Distance from the lateral margin of the articular surface at the proximal end of the metatarsus, To the digital extremity of the articular surface of the latero-digital condyle of the bone . . . . 15·10	. . . . 15·18	15·25	**61**		On the Lateral Aspect.
			8	Distance from the mesio-rostral margin of the proximal articular surface of the lateral portion of the metatarsus, To the mesio-rostral margin of the digital articular surface of the latero-digital condyle of the bone . . . . 14·32	. . . . 14·30	14·25	**57**	4	On the Rostral Aspect.
. . . 19·50	19·50	**78**		Distance from the hollow of the groove disjoining rostrally the articular surfaces of the lateral and the mesial portions of the metatarsus, To the rostral angle of the digital bifurcation of the bone . . . . . . 12·30	. . . . *	12·25	**49**	8	
				Distance from the mesio-rostral margin of the proximal articular surface of the mesial portion of the metatarsus, To the nearest point (at the middle) of the rostral margin of the digital articular surface of the mesio-digital condyle of the bone . . . . . 14·00	. . . . 14·00	14·00	**56**	7	
			4	Distance from the latero-caudal margin of the proximal articular surface of the lateral portion of the metatarsus, To the summit of the middle of three tubercles on the caudal articular margin of the latero-digital condyle . . . . 14·30	. . . . 14·20	14·25	**57**	1	On the Caudal Aspect.
. . . 18·50	18·50	**74**		Distance from the summit of the smooth proximal process closing caudally the groove that disjoins the proximal articular surfaces of the lateral and the mesial portions of the metatarsus, To the caudal angle of the digital bifurcation of the bone . 13·25	. . . . 13·30	13·25	**53**	4	
. . . 19·12	19·25	**77**	3	Distance from the caudal margin of the circular mesio-caudal articular surface of the proximal end of the mesial portion of the metatarsus, To the summit of the middle of three tubercles on the caudal articular margin of the mesio-digital condyle of the bone . . . . 13·88	. . . . 13·86	13·75	**55**	2	
. . . 19·28	19·25	**77**	0	Distance from the proximal extremity of the process of the mesial articular margin of the proximal end of the metatarsus, disjoining the two mesial bones of the tarsus, To the digital extremity of the articular surface of the mesio-digital condyle of the bone . . . . 14·98	. . . . 14·98	15·00	**60**	5	On the Mesial Aspect.

Latero-mesial and Rostro-caudal Dimensions (Breadth and Thickness), Girth and

	Latero-mesial Dimensions (Breadth).						Rostro-caudal Dimen	
	Actual Measurements.			Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.	Actual	
	On the Right Side.		On the Left Side.				On the Right Side.	
At the Proximal end of the Bone.	At the proximal end of the humerus. Greatest distance between the lateral surface of the lateral of three rostro-proximal protuberances, And the opposite mesial surface of the mesial of these three protuberances	5·30	. . . 5·23	5·25	**21**		At the proximal end of the humerus. Greatest distance from the rostral surface of the rounded and middle of three rostro-proximal protuberances, To the opposite caudal margin of the ball of articulation with the glenoid cavity of the scapula	5·30
						5	At the proximal end of the humerus. Distance from the hollow of the mesial of two proximo-digital grooves on the rostral surface; at the marginal termination of the groove digitad, To the opposite caudal margin of the ball of articulation	4·52
Intermediately to the Proximal and the Digital ends of the Bone.	Smallest distance, interveningly to the proximal end of the humerus and the lateral scabrous and tuberous ridge; between the lateral And the mesial surfaces of the rostro-caudal flattening of the bone	3·92	. . . 3·88	4·00	**16**			
	Greatest distance between the lateral margin of the lateral scabrous ridge of the humerus, And the opposite mesial surface of the bone	4·14	. . . 4·18	4·25	**17**	1	Smallest distance from the rostral surface of the humerus, To the opposite caudal surface, Being at the digital termination of the lateral scabrous ridge	1·93
	Smallest distance between the lateral And the mesial surfaces of the humerus; interveningly to the lateral scabrous ridge and the digital end of the bone	2·32	. . . 2·32	2·25	**9**	8		
At the Digital end of the Bone.	At the digital end of the humerus. Distance between the lateral surface of the scabrous ridge over the lateral condyle, And the opposite mesial surface of the smooth ridge over the mesial condyle	4·10	. . . 4·00	4·00	**16**	7	At the digital end of the humerus. Distance from the rostro-mesial margin of the mesial condyle, To the caudo-mesial prominent margin of the socket for receiving the articular portion of the olecranon . . .	3·77
	At the digital end of the humerus. Distance between the digital extremity of the lateral margin of the lateral condyle, And the opposite digital extremity of the mesial margin of the mesial condyle	3·50	. . . 3·45	3·50	**14**	2	At the digital end of the humerus. Distance from the rostral surface of the lateral condyle, To the caudo-lateral margin of the socket for receiving the articular portion of the olecranon	2·52
	At the digital end of the humerus. Greatest distance between the lateral And the mesial margins of the caudal cavity that receives the articular portion of the olecranon . .	*	. . . 1·50	1·50	**6**	8	At the digital end of the humerus. Distance from margin To margin of the mesial surface of the articulation of the mesial condyle	2·78

Arterial Distances of the HUMERUS in the Bactrian Camel.

sions (Thickness).			
Measurements. On the Left Side.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.
. . . 5·25	5·25	**21**	
			3
. . . 4·53	4·50	**18**	
			10
. . . 1·93	2·00	**8**	
			7
. . . 3·76	3·75	**15**	
			5
. . . 2·52	2·50	**10**	
			1
. . . 2·78	2·75	**11**	

Girth.

Actual Measurements. On the Right Side.	Actual Measurements. On the Left Side.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.
Girth of the humerus at the digital termination of the lateral scabrous ridge . . . 10·00	. . . . 10·02	10·00	**40**	
				10
Smallest girth of the humerus, interveningly to the lateral scabrous ridge and the digital end of the bone . . . . 7·56	. . . . 7·61	7·50	**30**	

Arterial Distance.

Actual Measurements. On the Right Side.	Actual Measurements. On the Left Side.	Supposed Normal Distance.	Distance in Proportional Parts.	Diff.
Distance from the summit of the rounded and middle of three rostral protuberances at the proximal end of the humerus, To the digital margin of the entrance of the medullary artery, on the rostral surface of the bone . . . . 11·35	. . . . 11·40	11·25	**45**	

Latero-mesial and Rostro-caudal Dimensions (Breadth and Thickness), Girth

	Latero-mesial Dimensions (Breadth).					Rostro-caudal Dimen	
	Actual Measurements.		Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.	Actual	
	On the Right Side.	On the Left Side.				On the Right Side.	
At the Proximal end of the Bone.	At the proximal (caudal) end of the olecranon. Distance between the scabrous elevation of the lateral surface, And the opposite mesial smooth surface . . . . 1·78	. . . . 1·80	1·75	**7**			
					3		
	Smallest distance between the lateral And the mesial smooth surfaces of the olecranon; interveningly to the proximal (caudal) end, and the articulation with the digital end of the humerus . . . . 1·00	. . . . 1·00	1·00	**4**		Smallest distance from the rostral (dorsal) margin of the olecranon, To its caudal (sternal) margin; interveningly to the proximal (caudal) end of the olecranon and the articulation with the digital end of the humerus	3·10
					9		
	At the proximal end of the cubitus. Distance between the lateral And the mesial margins of the surface of articulation with the digital end of the humerus . . . . 3·32	. . . . 3·32	3·25	**13**		At the proximal end of the cubitus. Smallest distance from the rostral surface of the marginal process of the articular socket, received within the articular groove separating the condyles of the humerus, To the opposite caudal margin of the bone extending digitad from the olecranon . .	3·50
					4		
	At the proximal end of the cubitus. Distance between the lateral extremity of the lateral scabrous protuberance, And the opposite mesial scabrous surface . . . . . . 4·16	. . . . 4·22	4·25	**17**			
					8		
Intermediate to the Proximal and the Digital ends of the Bone.	Smallest distance between the lateral And the mesial surfaces of the cubitus; interveningly to the proximal and the digital ends of the bone . . . . 2·23	. . . . 2·31	2·25	**9**		Smallest distance from the rostral surface of the cubitus, To the opposite caudal surface; interveningly to the proximal and the digital ends of the bone, Being towards the digital end	1·45
					8		
At the Digital end of the Bone.	At the digital end of the cubitus. Distance between the lateral And the mesial scabrous tuberosities; over the articulation with the proximal bones of the carpus . . 4·35	. . . . 4·32	4·25	**17**		At the digital end of the cubitus. Distance from the hollow of the lateral of two wide proximo-digital grooves on the rostral surface, To the opposite caudal surface . .	1·50
					2		
	At the digital end of the cubitus. Distance between the lateral And the mesial margins of the surface of articulation with the proximal bones of the carpus . . . . 3·68	. . . . 3·72	3·75	**15**		At the digital end of the cubitus. Distance from the rostral margin of the proximo-digital sharp and prominent ridge separating the lateral and the mesial wide articular groove on the rostral surface, To the tuberosity on the opposite caudal surface . .	2·58
						At the digital end of the cubitus. Distance from the hollow of the mesial of two wide proximo-digital grooves on the rostral articular surface, To the opposite smooth caudal surface	2·17

and Arterial Distances of the CUBITUS in the Bactrian Camel.

sions (Thickness).			
Measurements.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.
On the Left Side.			
. . . . 3·05	3·00	**12**	
			2
. . . . 3·55	3·50	**14**	
			8
. . . . 1·43	1·50	**6**	
			0
. . . . 1·46	1·50	**6**	
			4
. . . . 2·58	2·50	**10**	
			1
. . . . 2·22	2·25	**9**	

Girth.				
Actual Measurements. On the Right Side.	Actual Measurements. On the Left Side.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.
Smallest girth of the cubitus, interveningly to the proximal and the digital ends of the bone, Being towards the digital end . . 6·48	. . . . 6·53	6·50	**26**	

Arterial Distances.				
Actual Measurements. On the Right Side.	Actual Measurements. On the Left Side.	Supposed Normal Distances.	Distances in Proportional Parts.	Diff.
Distance from the rostro-proximal surface of the unciform articular process of the cubitus, received within the caudal articular groove separating the condyles of the humerus, To the blunt proximal margin of the entrance of the medullary artery, on the mesial side of the digital prolongation of the olecranon . . . . 5·07	. . . . 4·73	5·00	**20**	
				2
Distance from the rostro-proximal surface of the unciform articular process of the cubitus, received within the articular groove separating the condyles of the humerus, To the blunt digital margin of the entrance of the proximal medullary artery . . . . 5·60	. . . . 5·35	5·50	**22**	
				7
Distance from the digital extremity of the latero-digital articular surface of the cubitus, To the digital margin of the entrance of the digital medullary artery, on the caudal surface of the bone and towards the lateral margin of that surface . . . . 3·78	. . . . 3·97	3·75	**15**	

Latero-mesial and Rostro-caudal Dimensions (Breadth and Thickness), Girth

	Latero-mesial Dimensions (Breadth).						Rostro-caudal Dimen	
	Actual Measurements.			Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.	Actual	
	On the Right Side.		On the Left Side.				On the Right Side.	
At the Proximal end of the Bone.	At the proximal end of the metacarpus. Distance between the lateral And the mesial margins of the surface of articulation with the carpal bones	3·02	. . . . 3·00	3·00	**12**		At the proximal end of the metacarpus. Distance from the lateral pitted surface immediately digitad from the rostral articular margin, To the opposite and similar caudal surface	1·49
	At the proximal end of the metacarpus. Distance between the lateral And the mesial scabrous elevations immediately digitad from the articular margins	3·11	. . . . 3·10				At the proximal end of the metacarpus. Distance from the rostral protuberance immediately digitad from the rostro-mesial articular margin, To the opposite caudal scabrous surface	2·07
						5		
Intermediately to the Proximal and the Digital ends of the Bone.	Greatest distance, interveningly to the proximal and the digital ends of the metacarpus; between the lateral And the mesial surfaces of the caudal margins of the groove occupying the caudal surface of the bone . .	1·78	. . . . 1·77	1·75	**7**		Greatest distance, interveningly to the proximal and the digital ends of the metacarpus; from the rostral surface of the lateral portion of the bone (divided from the mesial portion by a furrow-like depression), To the opposite caudo-lateral margin of the groove occupying the caudal surface . .	1·45
						1		
	Smallest distance between the lateral And the mesial surfaces of the rostral and more solid portion of the metacarpus; interveningly to the proximal and the digital ends of the bone	1·55	. . . . 1.57	1·50	**6**		Greatest distance, interveningly to the proximal and the digital ends of the metacarpus; from the rostral surface of the mesial portion of the bone, To the opposite caudo-mesial margin of the groove occupying the caudal surface	1·43
							Smallest distance from the rostral surface of the metacarpus, To the opposite caudal surface; over the digital bifurcation of the bone, Being the smallest distance interveningly to the proximal and the digital ends .	1·04
						11		
At the Digital end of the Bone.	At the digital end of the metacarpus. Distance between the lateral And the mesial terminations of the rostral articular margins . .	4·22	. . . . *	4'25	**17**		At the digital end of the metacarpus. Distance from the rostro-lateral articular margin of the lateral condyle, To the hollow of the disjunction of the lateral and the middle of three tubercles on the caudal articular margin of that condyle	1·80
						2		
	At the digital end of the metacarpus. Distance between the sinuosity on the caudo-digital extremity of the lateral articular margin, And the opposite and similar sinuosity on the mesial articular margin	3·82	. . . . *	3·75	**15**		At the digital end of the metacarpus. Distance from the rostro-mesial articular margin of the lateral condyle, To the caudal extremity of the mesial of three tubercles on the caudal articular margin of that condyle . .	2·01
							At the digital end of the metacarpus. Distance from the rostro-lateral articular margin of the mesial condyle, To the caudal extremity of the lateral of three tubercles on the caudal articular margin of that condyle . .	1·95

and Arterial Distances of the METACARPUS in the Bactrian Camel.

sions (Thickness).

Measurements. On the Left Side.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.
. . . . . 1·59	1·50	**6**	
			2
. . . . . 2·03	2·00	**8**	
			2
. . . . . 1·48	1·50	**6**	
			0
. . . . . 1·43	1·50	**6**	
			2
. . . . . 1·00	1·00	**4**	
			3
. . . . . 1·78	1·75	**7**	
			1
. . . . . 1·95	2·00	**8**	
			0
. . . . . 1·93	2·00	**8**	

Girth.

Actual Measurements. On the Right Side.		Actual Measurements. On the Left Side.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.
Greatest girth of the metacarpus interveningly to its proximal and its digital ends, Being at the greatest elevation of the sides of the groove that occupies the caudal surface of the bone	5·75	. . . . 5·76	5·75	**23**	
					3
Smallest girth of the metacarpus interveningly to the proximal and the digital ends of the bone, Being over its digital bifurcation .	*	. . . . 5·10	5·00	**20**	

Arterial Distances.

Actual Measurements. On the Right Side.		Actual Measurements. On the Left Side.	Supposed Normal Distances.	Distances in Proportional Parts.	Diff.
Distance from the blunt caudal margin of the inter-articular hollow at the proximal end of the metacarpus, To the proximal margin of the entrance of the lateral of two medullary arteries in the groove occupying the caudal surface of the bone	5·58	. . . . 5·48	5·5	**22**	
					0
Distance from the blunt caudal margin of the inter-articular hollow at the proximal end of the metacarpus, To the proximal margin of the entrance of the mesial of two medullary arteries in the groove occupying the caudal surface of the bone	5·92	. . . . 5·34	5·5	**22**	

Latero-mesial and Rostro-caudal Dimensions (Breadth and Thickness), Girth and

	Latero-mesial Dimensions (Breadth). Actual Measurements. On the Right Side.		On the Left Side.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.	Rostro-caudal Dimen[sions] Actual [Measurements.] On the Right Side.	
At the Proximal end of the Bone.	At the proximal end of the femur. Distance between the lateral surface of the lateral (larger) trochanter, And the digito-mesial margin of the globular surface of articulation with the acetabulum (the head) . .	*	. . . 5·17	5·25	**21**		At the proximal end of the femur. Distance from the rostral scabrous surface of the (larger) lateral trochanter, To the caudo-mesial margin of the (mesial) opening of the cavity within the trochanter . . .	2·30
	At the proximal end of the femur. Smallest distance between the lateral smooth surface immediately digitad from the lateral (larger) trochanter, And the mesial smooth surface connecting the globular articulation of the bone with the mesial (smaller) trochanter	3·45	. . . 3·45	3·50	**14**	7	At the proximal end of the femur. Smallest distance from the rostral To the caudal surface of the flattening of the bone that unites the globular articulation with the lateral and the mesial trochanters (the cervix)	1·28
						7	At the proximal end of the femur. Distance from the rostral To the caudal surface of the globular articulation with the acetabulum (the head)	2·22
Intermediately to the Proximal and the Digital ends of the Bone.	Smallest distance between the lateral And the mesial surfaces of the femur; interveningly to the proximal and the digital ends of the bone	1·80	. . . 1·78	1·75	**7**		Smallest distance, interveningly to the proximal and the digital ends of the bone, from the rostral smooth surface of the femur, To the opposite caudal ridge of the linea aspera	1·56
At the Digital end of the Bone.	At the digital end of the femur. Distance between the lateral And the mesial smooth surfaces of the rostral projection grooved proximo-digitally rostrad for the motion of the patella	1·98	. . . 2·06	2·00	**8**	1	At the digital end of the femur. Distance from the lateral rostro-digital margin of the patellar groove, To the opposite caudal surface of articulation of the lateral condyle	4·66
	At the digital end of the femur. Distance between the smooth lateral surface of the enlargement immediately over the lateral condyle, And the mesial margin of the mesial condyle	4·50	. . . 4·74	4·50	**18**	10	At the digital end of the femur. Distance from the hollow of the patellar groove, To the opposite caudal surface disuniting the lateral and the mesial condyles . . .	3·33
							At the digital end of the femur. Distance from the mesial rostro-digital margin of the patellar groove, To the opposite caudal surface of articulation of the mesial condyle	4·93

and Arterial Distances of the FEMUR in the Bactrian Camel.

sions (Thickness).

Measurements. On the Left Side.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.
. . . . 2·25	2·25	**9**	
			4
. . . . 1·30	1·25	**5**	
			4
. . . . 2·22	2·25	**9**	
			3
. . . . 1·60	1·50	**6**	
			13
. . . . 4·66	4·75	**19**	
			6
. . . . 3·33	3·25	**13**	
			7
. . . . 4·88	5·00	**20**	

Girth.

Actual Measurements. On the Right Side.	Actual Measurements. On the Left Side.	Supposed Normal Dimension.	Dimension in Proportional Parts.
Smallest girth of the femur, interveningly to the proximal and the digital ends of the bone . . . . 5·44	. . . . 5·50	5·50	**22**

Arterial Distance.

Actual Measurements. On the Right Side.	Actual Measurements. On the Left Side.	Supposed Normal Distance.	Distance in Proportional Parts.
Distance from the most digital point on the proximal surface of the cervix of the femur, To the proximal margin of the entrance of the medullary artery, on the caudal surface of the bone, and within the scabrous enlargement of the linea aspera . . . 11·38	. . . . 8·48	11·25	**45**

Latero-mesial and Rostro-caudal Dimensions (Breadth and Thickness), Girth

	Latero-mesial Dimensions (Breadth). Actual Measurements. On the Right Side.		On the Left Side.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.	Rostro-caudal Dimen Actual On the Right Side.	
At the Proximal end of the Bone.	At the proximal end of the crus. Distance between the lateral And the mesial pitted surfaces immediately digitad from the margins of the articulation with the digital end of the femur	4·94	. . . 4·94	5·00	**20**		At the proximal end of the crus. Distance from the rostral projection of the lateral (fibular) surface of articulation, To the opposite caudal projection of the same surface	2·53
							At the proximal end of the crus. Distance from the rostral proximo-digital groove, separating the lateral (fibular) and the mesial (tibial) surface of articulation, To the opposite caudal rounded margin . .	1·76
						12	At the proximal end of the crus. Distance from the rostro-digital extremity of the scabrous prominence of the knee, To the smooth caudo-lateral extension of the mesial articular surface	4·80
Intermediately to the Proximal and the Digital ends of the Bone.	Smallest distance between the lateral And the mesial surfaces of the crus; interveningly to the proximal and the digital ends of the bone	1·93	. . . 1·99	2·00	**8**		Smallest distance from the rostro-digital extremity of the scabrous prominence of the knee, To the opposite plane caudal surface of the bone; the prominence of the knee being continued digitad in a sharp falciform ridge	3·50
							Smallest distance from the rostral to the caudal surface of the crus; interveningly to the proximal and the digital ends of the bone; being towards the digital end . .	1·20
						5		
At the Digital end of the Bone.	At the digital end of the crus. Distance between the lateral extremity of the styloid termination of the rostral articular margin, And the scabrous elevation over the mesial termination of that margin . .	3·22	. . . 3·28	3·25	**13**		At the digital end of the crus. Distance from the rostro-lateral scabrous surface over the rostral margin of articulation, To the opposite caudo-lateral scabrous surface over the caudal margin of articulation . .	1·74
						1		
	At the digital end of the crus. Distance between the lateral extremity of the scabrous tuberosity terminating the caudal articular margin, And the similar mesial termination of that margin; a denticular process of the proximo-lateral bone of the tarsus being interposed in the lateral disjunction of the rostral and the caudal margins	3·44	. . . 3·48	3·50	**14**		At the digital end of the crus. Distance from the rostro-mesial scabrous elevation over the rostral articular margin, To the opposite caudal surface	2·04

and Arterial Distances of the CRUS in the Bactrian Camel.

sions (Thickness).

Measurements. On the Left Side.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.
. . . 2·53	2·50	**10**	
			3
. . . 1·77	1·75	**7**	
			12
. . . 4·77	4·75	**19**	
			5
. . . 3·49	3·50	**14**	
			9
. . . 1·20	1·25	**5**	
			2
. . . 1·79	1·75	**7**	
			1
. . . 2·04	2·00	**8**	

Girth.

Actual Measurements. On the Right Side.	Actual Measurements. On the Left Side.	Supposed Normal Dimension.	Dimension in Proportional Parts.
Smallest girth of the crus; interveningly to the proximal and the digital ends of the bone, Being towards the digital end . . 5·20	. . . . 5·26	5·25	**21**

Arterial Distances.

Actual Measurements. On the Right Side.	Actual Measurements. On the Left Side.	Supposed Normal Distance.	Distance in Proportional Parts.
Distance from the caudal margin of the latero-proximal articular surface of the crus, To the digital margin of the entrance of the medullary artery, on the caudal surface of the bone, and towards the lateral margin of that surface . . . . 4·06	. . . . 4·03	4·00	**16**

Latero-mesial and Rostro-caudal Dimensions (Breadth and Thickness), Girth

	Latero-mesial Dimensions (Breadth).							Rostro-caudal Dimen	
	Actual Measurements.			Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.		Actual	
	On the Right Side.		On the Left Side.					On the Right Side.	
At the Proximal end of the Bone.	At the proximal end of the metatarsus. Distance between the lateral And the mesial margins of the surface of articulation with the tarsal bones	2·47	. . . . 2·50	2·50	**10**			At the proximal end of the metatarsus. Distance from the rostro-lateral articular margin, To the opposite caudal extremity of the tuberous proximal elevation of the caudal articular margin	2·05
						1			
	At the proximal end of the metatarsus. Distance between the lateral scabrous surface immediately digitad from the articular margin, And the extremity of the scabrous protuberance on the opposite mesial surface .	2·65	. . . . 2·75	2·75	**11**			At the proximal end of the metatarsus. Distance from the scabrous surface immediately digitad from the rostro-mesial articular margin, To the opposite smooth and flattened surface of the enlargement and proximal elevation of the caudal articular margin	1·96
						5			
Intermediately to the Proximal and the Digital ends of the Bone.	Greatest distance; interveningly to the proximal and the digital ends of the metatarsus, between the lateral and the mesial surfaces of the caudal margins of the groove occupying the caudal surface of the bone . . .	1·56	. . . . 1·58	1·50	**6**			Greatest distance from the rostral surface of the lateral portion of the metatarsus (divided from the mesial portion by a furrow-like depression), To the caudo-lateral margin of the groove occupying the caudal surface of the bone; interveningly to the proximal and the digital ends	1·72
						1			
	Smallest distance between the lateral And the mesial surfaces of the rostral and more solid portion of the metatarsus; interveningly to the proximal and the digital ends of the bone	1·25	. . . . 1·25	1·25	**5**			Greatest distance from the rostral surface of the mesial portion of the metatarsus, To the caudo-mesial margin of the groove occupying the caudal surface of the bone; interveningly to the proximal and the digital ends	1·48
								Smallest distance from the rostral surface of the metatarsus, To the opposite caudal surface; interveningly to the proximal and the digital ends of the bone, Being over its digital bifurcation	1·00
						9			
At the Digital end of the Bone.	At the digital end of the metatarsus. Distance between the lateral And the mesial margins of the digital extremity of the surfaces of articulation with the plantar bones . . .	*	. . . . 3·58	3·50	**14**			At the digital end of the metatarsus. Distance from the rostro-lateral articular margin of the lateral condyle, To the hollow of the disjunction of the lateral and the middle of three tubercles on the caudal articular margin of that condyle	1·49
						1			
	At the digital end of the metatarsus. Distance between the sinuosity on the caudo-digital extremity of the lateral articular margin, And the opposite similar sinuosity on the mesial articular margin	*	. . . . 3·28	3·25	**13**			At the digital end of the metatarsus. Distance from the rostro-mesial articular margin of the lateral condyle, To the caudal extremity of the mesial of three tubercles on the caudal articular margin of that condyle . .	1·58
								At the digital end of the metatarsus. Distance from the rostro-lateral articular margin of the mesial condyle, To the caudal extremity of the lateral of three tubercles on the caudal articular margin of that condyle . .	1·73

and Arterial Distances of the METATARSUS in the Bactrian Camel.

sions (Thickness).			
Measurements. On the Left Side.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.
. . . . . 2·00	2·00	**8**	
			0
. . . . . 1·97	2·00	**8**	
			1
. . . . . 1·69	1·75	**7**	
			1
. . . . . 1·51	1·50	**6**	
			2
. . . . . 1·00	1·00	**4**	
			2
. . . . . 1·47	1·50	**6**	
			0
. . . . . 1·60	1·50	**6**	
			1
. . . . . 1·80	1·75	**7**	

Girth.

Actual Measurements. On the Right Side.		Actual Measurements. On the Left Side.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.
Greatest girth of the metatarsus interveningly to its proximal and its digital ends, Being at the greatest elevation of the sides of the groove occupying the caudal surface of the bone	5·52	. . . . 5·50	5·50	**22**	
					5
Smallest girth of the metatarsus interveningly to the proximal and the digital ends of the bone, Being over its digital bifurcation .	*	. . . . 4·28	4·25	**17**	

Arterial Distances.

Actual Measurements. On the Right Side.		Actual Measurements. On the Left Side.	Supposed Normal Distances.	Distances in Proportional Parts.	Diff.
Distance from the summit of the smooth caudal inter-condylar process at the proximal end of the metatarsus, To the proximal margin of the entrance of the lateral of two medullary arteries in the groove occupying the caudal surface of the bone	6·28	. . . . 6·38	6·25	**25**	
					0
Distance from the summit of the smooth caudal inter-condylar process at the proximal end of the metatarsus, To the proximal margin of the entrance of the mesial of two medullary arteries in the groove occupying the caudal surface of the bone	5·77	. . . . 6·20	6·25	**25**	

Proximo-digital Dimensions (Length) of the PALMAR and of the PLANTAR

	Proximo-digital Dimensions (Length) of the Palmar Bones.						
	Actual Measurements				Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.
	of the Lateral Fore Pasterns.		of the Mesial Fore Pasterns.				
	On the Right Side.	On the Left Side.	On the Right Side.	On the Left Side.			
Proximo-palmar Bones (First Pasterns of the Fore Feet).	Distance from the lateral margin of the proximal articular surface of the lateral of the two proximo-palmar bones, To the lateral margin of the digital articular surface of the bone 4·39	Similar dimension in the left lateral proximo-palmar bone . . . 4·45 . . .	. . . .	. . . .	4·50	**18**	
	Distance from the proximal extremity of the rostro-proximal articular margin of the lateral of the two proximo-palmar bones, To the nearest point (at the middle) of the rostral margin of the digital articular surface of the bone 3·48	Similar dimension in the left lateral proximo-palmar bone . . . 3·53 . . .	Similar dimension in the corresponding right mesial proximo-palmar bone . . . 3·47 . . .	Similar dimension in the corresponding left mesial proximo-palmar bone . . . 3·60 . . .	3·50	**14**	4
			Distance from the mesial margin of the proximal articular surface of the mesial of the two proximo-palmar bones, To the mesial margin of the digital articular surface of the bone 4·37 . . .	Similar dimension in the left mesial proximo-palmar bone . . . 4·41 . . .	4·50	**18**	4
Digito-palmar Bones (Second Pasterns of the Fore Feet).	Distance from the lateral margin of the proximal articular surface of the lateral of the two digito-palmar bones, To the lateral margin of the ungual (digital) articular surface of the bone 2·58 . . .	Similar dimension in the left lateral digito-palmar bone . . . 2·72 . . .	. . . .	. . . .	2·75	**11**	
	Distance from the proximal extremity of the rostro-proximal articular margin of the lateral of the two digito-palmar bones, To the nearest point (at the middle) of the rostral margin of the ungual (digital) articular surface of the bone 2·17 . . .	Similar dimension in the left lateral digito-palmar bone . . . 2·10 . . .	Similar dimension in the corresponding right mesial digito-palmar bone . . . 2·12 . . .	Similar dimension in the corresponding left mesial digito-palmar bone . . . 2·17 . . .	2·25	**9**	2
			Distance from the mesial margin of the proximal articular surface of the mesial of the two digito-palmar bones, To the mesial margin of the ungual (digital) articular surface of the bone 2·60 . . .	Similar dimension in the left mesial digito-palmar bone . . . 2·62 . . .	2·75	**11**	2

BONES (the Pasterns of the Fore and of the Hind Feet) in the Bactrian Camel.

	Proximo-digital Dimensions (Length) of the Plantar Bones.						
	Actual Measurements of the Lateral Hind Pasterns. On the Right Side.	Actual Measurements of the Lateral Hind Pasterns. On the Left Side.	Actual Measurements of the Mesial Hind Pasterns. On the Right Side.	Actual Measurements of the Mesial Hind Pasterns. On the Left Side.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Di
Proximo-plantar Bones (First Pasterns of the Hind Feet).	Distance from the lateral margin of the proximal articular surface of the lateral of the two proximo-plantar bones, To the lateral margin of the digital articular surface of the bone 3·67 . . .	Similar dimension in the left lateral proximo-plantar bone . . . 3·65 . . .	. . . .	. . . .	3·75	**15**	
	Distance from the proximal extremity of the rostro-proximal articular margin of the lateral of the two proximo-plantar bones, To the nearest point (at the middle) of the rostral margin of the digital articular surface of the bone 3·10 . . .	Similar dimension in the left lateral proximo-plantar bone . . . 3·12 . . .	Similar dimension in the corresponding right mesial proximo-plantar bone . . . 3·20 . . .	Similar dimension in the corresponding left mesial proximo-plantar bone . . . 3·15 . . .	3·25	**13**	2
			Distance from the mesial margin of the proximal articular surface of the mesial of the two proximo-plantar bones, To the mesial margin of the digital articular surface of the bone 3·78 . . .	Similar dimension in the left mesial proximo-plantar bone . . . . . *	3·75	**15**	2
Digito-plantar Bones (Second Pasterns of the Hind Feet).	Distance from the lateral margin of the proximal articular surface of the lateral of the two digito-plantar bones, To the lateral margin of the ungual (digital) articular surface of the bone 2·22 . . .	Similar dimension in the left lateral digito-plantar bone . . . 2·35 . . .	. . . .	. . . .	2·25	**9**	
	Distance from the proximal extremity of the rostro-proximal articular margin of the lateral of the two digito-plantar bones, To the nearest point (in the middle) of the rostral margin of the ungual (digital) articular surface of the bone 1·83 . . .	Similar dimension in the left lateral digito-plantar bone . . . 1·92 . . .	Similar dimension in the corresponding right mesial digito-plantar bone . . . 1·92 . . .	Similar dimension in the corresponding left mesial digito-plantar bone . . . 1·98 . . .	2·00	**8**	1
			Distance from the mesial margin of the proximal articular surface of the mesial of the two digito-plantar bones, To the mesial margin of the ungual (digital) articular surface of the bone 2·25 . . .	Similar dimension in the left mesial digito-plantar bone . . . 2·40 . . .	2·25	**9**	1

Latero-mesial Dimensions (Breadth) of the PALMAR and of the PLANTAR BONES (the Pasterns of the Fore

Latero-mesial Dimensions (Breadth) of the Palmar Bones.

	Actual Measurements of the Lateral Fore Pasterns. On the Right Side.		On the Left Side.	Actual Measurements of the Mesial Fore Pasterns. On the Right Side.	On the Left Side.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.
Proximo-palmar Bones (First Pasterns of the Fore Feet).	At the proximal end of the lateral of the two proximo-palmar bones. Distance between the lateral And the mesial margins of the surface of articulation with the metacarpus	1·89	Similar dimensions in the left lateral proximo-palmar bone . . . 1·94 . . .	Similar dimensions in the corresponding right mesial proximo-palmar bone . . . 1·92 . . .	Similar dimensions in the corresponding left mesial proximo-palmar bone . . . 1·92 . . .	2·00	**8**	
	Smallest distance between the lateral And the mesial surfaces of the lateral of the two proximo-palmar bones; interveningly to the proximal and the digital ends of the bone	·88	. . . ·89 . . .	. . . ·87 . . .	. . . ·90 . . .	1·00	**4**	4
	At the digital end of the lateral of the two proximo-palmar bones. Distance between the lateral And the mesial margins of the surface of articulation with the lateral of the two digito-palmar bones	1·75	. . . 1·78 . . .	. . . 1·75 . . .	. . . 1·75 . . .	1·75	**7**	3
Digito-palmar bones (Second Pasterns of the Fore Feet).	At the proximal end of the lateral of the two digito-palmar bones. Distance between the lateral And the mesial margins of the surface of articulation with the lateral of the two proximo-palmar bones	1·38	Similar dimensions in the left lateral digito-palmar bone . . . 1·38 . . .	Similar dimensions in the corresponding right mesial digito-palmar bone . . . 1·35 . . .	Similar dimensions in the corresponding left mesial digito-palmar bone . . . 1·32 . . .	1·50	**6**	
	Smallest distance between the hollows of the notches on the lateral And on the mesial margins of the lateral of the two digito-palmar bones; and, interveningly to the proximal and the digital ends of the bone .	1·30	. . . 1·27 . . .	. . . 1·34 . . .	. . . 1·32 . . .	1·25	**5**	1
	At the digital end of the lateral of the two digito-palmar bones. Distance between the lateral And the mesial margins of the surface of articulation with the lateral of the two unguo-palmar bones	1·58	. . . 1·65 . . .	. . . 1·60 . . .	. . . 1·60 . . .	1·75	**7**	2

Girth of the Proximo-palmar Bones.

Actual Measurements. On the Right Side.		On the Left Side.	On the Right Side.	On the Left Side.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff. from the Hind.
Smallest girth of the lateral proximo-palmar bone, interveningly to its proximal and its digital ends	3·00	Similar girth of the left lateral proximo-palmar bone . . . 2·96 . . .	Similar girth in the corresponding right mesial proximo-palmar bone . 3·00 . . .	Similar girth in the corresponding left mesial proximo-palmar bone . 2·98 . . .	3·00	**12**	2

and of the Hind Feet) and Girth of the Proximo-palmar and of the Proximo-plantar Bones in the Bactrian Camel.

	Latero-mesial Dimensions (Breadth) of the Plantar Bones.						
	Actual Measurements of the Lateral Hind Pasterns. On the Right Side.	Actual Measurements of the Lateral Hind Pasterns. On the Left Side.	Actual Measurements of the Mesial Hind Pasterns. On the Right Side.	Actual Measurements of the Mesial Hind Pasterns. On the Left Side.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Dif
Proximo-plantar Bones (First Pasterns of the Hind Feet).	At the proximal end of the lateral of the two proximo-plantar bones. Distance between the lateral And the mesial margins of the surface of articulation with the metatarsus . . . . 1·64	Similar dimensions in the left lateral proximo-plantar bone . . . 1·64 . . .	Similar dimensions in the corresponding right mesial proximo-plantar bone . . . 1·66 . . .	Similar dimensions in the corresponding left mesial proximo-plantar bone . . . 1·63 . . .	1·75	7	
	Smallest distance between the lateral And the mesial surfaces of the lateral of the two proximo-plantar bones; interveningly to the proximal and the digital ends of the bone . . . . ·83	. . . ·83 . . .	. . . ·78 . . .	. . . ·75 . . .	·75	3	4
	At the digital end of the lateral of the two proximo-plantar bones. Distance between the lateral And the mesial margins of the surface of articulation with the lateral of the two digito-plantar bones . . . . . 1·50	. . . 1·52 . . .	. . . 1·58 . . .	. . . * . . .	1·50	6	3
Digito-plantar Bones (Second Pasterns of the Hind Feet).	At the proximal end of the lateral of the two digito-plantar bones. Distance between the lateral And the mesial margins of the surface of articulation with the lateral of the two proximo-plantar bones . . . . . 1·18	Similar dimensions in the left lateral digito-plantar bone . . . 1·20 . . .	Similar dimensions in the corresponding right mesial digito-plantar bone . . . 1·18 . . .	Similar dimensions in the corresponding left mesial digito-plantar bone. . . . 1·20 . . .	1·25	5	
	Smallest distance between the hollows of the notches on the lateral And on the mesial margins of the two digito-plantar bones; interveningly to the proximal and the digital ends of the bone . . . . 1·06	. . . 1·00 . . .	. . . 1·09 . . .	. . . 1·00 . .	1·00	4	1
	At the digital end of the lateral of the two digito-plantar bones. Distance between the lateral And the mesial margins of the surface of articulation with the lateral of the two unguo-plantar bones . . . . 1·53	. . . 1·43 . . .	. . . 1·58 . . .	. . . 1·44 . .	1·50	6	2

Girth of the Proximo-plantar Bones.						
Actual Measurements. On the Right Side.	Actual Measurements. On the Left Side.	Actual Measurements. On the Right Side.	Actual Measurements. On the Left Side.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Di fr th Fo
Smallest girth of the lateral proximo-plantar bone, interveningly to its proximal and its digital ends . . . . 2·52	Similar girth of the left lateral proximo-plantar bone . . . 2·52 . . .	Similar girth of the corresponding right mesial proximo-plantar bone . 2·53 . . .	Similar girth of the corresponding left mesial proximo-plantar bone . 2·53 . . .	2·50	10	2

Dimensions of the PATELLA and of

	Dimensions of the Patella.							Dimen	
	Actual Measurements.			Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.	Actual		
	On the Right Side.		On the Left Side.				On the Right Side.		
Length.	Distance from the proximal extremity of the proximal articular surface of the patella, To the digital extremity of the digital scabrous and flattened surface of the bone .	3·61	. . . . 3·61	3·50	**14**		Greatest distance from the extremity of the rostral process of the lateral articular margin of the calcaneum, To the extremity of the flattened and irregular surface at the further end of the bone	6·42	
							Distance from the curvature of the mesial margin of the articular surface of the calcaneum, To the extremity of the flattened and irregular surface at the further end of the bone	4·37	
						7			
Breadth.	Greatest distance between the lateral margin of the articular surface of the patella, And the opposite mesial scabrous surface of the bone, Being towards the proximal end . .	1·78	. . . . 1·78	1·75	**7**		Distance between the lateral margin of the surface of the calcaneum articulated with the proximo-lateral bone of the tarsus, And the opposite curved mesial margin contiguous to the astragalus	2·32	
							Smallest distance between the lateral And the mesial smooth surfaces of the calcaneum; interveningly to the tarsal articulated surface and the further end of the bone	·88	
						1	At the further end of the calcaneum (digital end). Distance between the scabrous lateral margin, And the opposite scabrous mesial surface of the bone	1·68	
Thickness.	Greatest distance from the irregular rostral surface of the patella, To the opposite caudal surface of articulation adapted to the rostro-digital groove of the femur . . .	2·00	. . . . 2·00	2·00	**8**		Smallest distance from the rostral smooth surface of the calcaneum, To the opposite caudal scabrous surface; interveningly to the tarsal articulated surface and the further end of the bone.	1·68	

the CALCANEUM in the Bactrian Camel.

sions of the Calcaneum.

Measurements.	Supposed Normal Dimensions.	Dimensions in Proportional Parts.	Diff.	Actual Measurements.		Supposed Normal Dimension.	Dimension in Proportional Parts.
On the Left Side.				On the Right Side.	On the Left Side.		
. . . 6·36	6·50	**26**					
			9				
. . . 4·32	4·25	**17**					
			8				
. . . 2·30	2·25	**9**					
			6				
. . . . . ·88	·75	**3**					
			4				
. . . 1·68	1·75	**7**					
			0				
. . . 1·64	1·75	**7**		Smallest girth of the calcaneum, interveningly to the tarsal articulated surface and the further end of the bone . . . . . 4·60	. . . . 4.60	4.50	**18**

XXXII. *Remarks*

XXXII. *Remarks on a certain Kind of Organic Matter found in Sulphureous Springs. By Charles Daubeny, M.D., F.R.S. and L.S., Professor of Chemistry in the University of Oxford.*

Read June 7, 1831.

The general occurrence in certain thermal waters of a substance which, from its general aspect, as well as from certain of its chemical properties, is thought to possess a claim to be classed among animal products; the medical importance that has often been attached to its presence; and the singular theories by which its existence has been explained,—are circumstances, that combine to confer an interest on any observations calculated to throw light upon the real nature of such a phænomenon.

Hence, though the present communication may, perhaps, be regarded as little more than a confirmation of what has been already affirmed with regard to the hot springs of Aix in Savoy, by Saussure*, and the cold sulphureous ones of this country, by Dillwyn†,—yet the additional evidence to the same effect which I have to offer, derived from an examination of certain thermal waters in France last summer, will not be regarded as superfluous, when it is recollected that, in defiance of the statements of the above-mentioned naturalists, several crude notions and erroneous hypotheses prevail concerning this deposit,

* Vide *Journal de Physique* for 1790, p. 410.

† Dillwyn's *British Confervæ*, p. 54.

deposit, which have served to throw a certain air of mystery over its nature and origin.

I am therefore induced to lay before this Society a drawing*, which represents the appearances exhibited, under a microscope of Amici's construction, by an organic substance which I obtained last summer at the hot spring of Greoulx in Provence (departement des Basses Alpes). This matter was found everywhere on the pavements of the bathing-rooms, in parts exposed to the splashing of the thermal water, which, for the convenience of topical bathing, or the *douche*, is usually allowed to descend in a constant stream from an open pipe, communicating with the reservoir which receives the mineral water, and terminating just below the ceiling of the room, through which it passes in a direction nearly perpendicular.

The substance alluded to, seen by the naked eye, has a greenish tinge, and seems made up of bundles of filaments: under the microscope, however, the latter are magnified into long cylindrical tubes, almost transparent, and divided into articuli, the length and diameter of which appear nearly equal, filled with a darkish fluid, whilst the intervening spaces are nearly colourless. This appearance may, perhaps, be explained by supposing a double tube, the exterior one transparent and continuous throughout, the interior composed of articulations filled with a coloured matter, and distinct one from the other, in conformity to the general structure of *Confervæ*, as laid down by Bory de St. Vincent† and others. These same filaments are sometimes so disposed with reference one to the other, as to present a stellated appearance of greater or less regularity.

In fig. 5. of the plate representing *Arthrodiæ*, which is given in the 2nd volume of the *Dictionnaire Classique d'Histoire Naturelle*,

* The drawing is deposited in the Library of the Society.

† *Dict. Classique d'Hist. Nat.*, article "*Arthrodiées.*"

Naturelle, may be seen figured an *Oscillatoria*, the filaments of which are disposed a good deal in the same manner; and Vaucher, in his work on *Confervæ**, has depicted, under the name of *Oscillatoria major*, an appearance very similar in kind to the cylindrical tubes detected by the microscope in my specimen. Now this particular species of *Oscillatoria* is one of those found by Saussure in the hot springs of Aix near Chambery, occasioning there a deposit in the canals and cisterns of the baths, which, notwithstanding the explanation thus long ago afforded of it by the above able naturalist, continues even at the present day to give rise to much speculation and wonder.

The mineral water of Greoulx resembles in constitution that of Aix, being a hot sulphureous spring, possessing a temperature of 31° Reaumur, and containing, according to the Report published by the proprietor of the baths, the following saline ingredients in the pint.

Common salt	12·25 grains.
Muriate of magnesia . .	1·75
Sulphate of lime . . .	1·66
Carbonate of lime . . .	3·00
Total . . .	18·66

The quantity of organic matter present in the water of Greoulx is estimated in the above document at no less than 6·66 grains to the pint; but the greater part of this quantity must have been merely suspended in the water; for a portion of it, which I collected on the spot, being evaporated to dryness, gave but very feeble indications of ammonia, or of any animal or vegetable matter whatsoever.

A substance altogether similar to that from Greoulx was found

* Geneva, 1803.

in

in the analogous thermal spring of Digne in the same department. I met with it, as at the former locality, wherever the water was allowed to drop upon the floor of the bath.

When examined under Amici's microscope, it presented a fibrous structure, the filaments being so interlaced as to form a kind of network. These filaments by a stronger magnifying power exhibited the same appearance of tubes with granulations, as those did from the former locality.

Among the hot springs which are so abundant in the Pyrenees, I collected several samples of this same organic matter, and remarked, that when the spring from which it had been obtained was impregnated with sulphuretted hydrogen, the appearances approached those already described.

Thus, at Arles in the departement des Pyrenées Orientales, south of Perpignan, there occurs an abundant deposit of organic matter, which, examined through the microscope, presented a tubular structure, in which, however, the granulations were not very distinguishable.

At Barege, one of the most powerful of the sulphureous springs, a substance is collected in the pipes and reservoirs receiving the water, which seems to consist of a cluster of little transparent irregular vesicles, having interspersed certain dark-coloured roundish bodies, that appears like the same vesicles, rendered opake by some kind of matter which fills their interior. As, however, there were signs of decomposition in this matter at the time when I was first enabled to submit it to the microscope, I considered it useless to obtain a drawing of the appearances it then presented,—and I allude to it at present, only in order to establish the general position, that the glairy or mucous-looking matter called *baregine*, which is met with in so many warm sulphureous springs, derives its origin from the growth of *Confervæ*.

This

This proposition has indeed been contested by an eminent chemist at Montpellier, Professor Anglada, who is engaged in publishing an elaborate description of the thermal sulphureous waters of Roussillon *, in which he endeavours to show, that the *baregine* must be considered a chemical product, held in solution by the waters at the time they issue from the earth, and deposited by them in a flocculent form, when they come in contact with the external air.

Others, on the contrary, and amongst the rest the celebrated Vauquelin †, inclined to the opinion, that the substance in question had been extracted from the organic remains present in the rocks through which the mineral water found a passage, owing to the high temperature which the latter may be supposed to possess before it issues from the ground, just as gelatine is separated from bones by water under a high pressure,—a notion, unfortunately, inconsistent with the geological position of many of these springs, which proceed from granitic, or other rocks, totally destitute of all traces of organization.

It will be time, however, to discuss the probability of these chemical theories, when any specimen of the substance alluded to has been submitted to us, in no part of which signs of an organic structure can be perceived: at present it may be sufficient to remark, that since, in all the situations in which I have collected it, the greater part at least of the mass appeared to be made up of a congeries of *Confervæ* or *Oscillatoriæ*, we need not hesitate in ascribing the whole to the rapid growth of those organic bodies, to which the temperature and constitution of the thermal waters alluded to might chance to be congenial.

I am happy to be able to fortify this conclusion by the authority of Professor DeCandolle, who has assured me, that he

* *Mémoires pour servir à l'Histoire Générale des Eaux Minérales, &c.*—Two volumes have already appeared. † *Annales de Chimie*, vol. xxviii.

 formerly

formerly examined the mucous matter deposited by the waters of Valdieri in Piedmont,—a thermal spring containing sulphuretted hydrogen,—and that he fully satisfied himself, as to the whole being derived from bodies that once possessed organization, having traced the different stages of decomposition and change exhibited by the several parts of the same deposit, from a structure completely analogous to that of a *Conferva*, to a gelatinous mass in which no distinction of parts was visible.

It has been remarked, indeed, by Anglada, Gimbernat, and others who have noticed this phænomenon, that a portion of the substance in question is chemically dissolved in these waters; and although I cannot admit the proposition as a general truth, yet I have myself found, that the thermal waters of Aix in Savoy, and those of Chaudes-aigues in the department of Cantal in France, even when carefully filtered and completely transparent, begin to exhibit traces of a substance of this kind as soon as they are concentrated.

But this only proves, that the mucous matter derived from such sources is soluble in water*, and that the growth of these bodies takes place, not only in the reservoirs which receive the water after it has escaped from the earth, but also in the subterranean canals through which it finds its way in reaching the surface;—a notion which will be admitted without difficulty, when we reflect upon the luxuriant growth of many species belonging to the lower tribes of animals and vegetables in spots equally secluded from light and the external air. Neither, if the substance called *zoogene* by Gimbernat agree in its characters with this product of the Pyrenean waters, (and I am induced to suspect that it does, from his enumerating Aix in Savoy as one of the spots in which he found it,) need we

* During the process of evaporation it seems to undergo some chemical change; for it is no longer soluble in water, when once separated from it.

be

be embarrassed to account for the fact he states, of his having met with it in the thermal waters of Ischia, or even in those temporary springs which are caused by the condensation of the steam disengaged from Vesuvius*.

I have myself collected the water emitted from the spiracles of several volcanos, as at Ætna, Volcano, and the Solfatara of Puzzuoli; and have remarked, that it was in general perfectly pure, with the exception of a slight impregnation either of sulphuretted hydrogen, sulphureous, or muriatic acid, and that it was entirely destitute of any ingredient to which an animal or vegetable origin could be ascribed.

The deposition of *zoogene* therefore, in such situations, must be supposed, as it may be without difficulty, to have arisen from the rapid generation of certain *Oscillatoriæ* or other living bodies allied to them, owing to the temperature and chemical constitution of the water derived from this source being favourable to their existence.

To show the impossibility of supposing the organic matter to have been disengaged, according to Professor Anglada's notion, from a state of chemical solution, I may mention, that at Arles in Roussillon (the thermal water already alluded to), it occurs in great abundance, adhering in flakes to the rock, with which the hot spring comes in contact on first issuing from the earth: now this rock is inclined at so high an angle, that a substance deposited by the water could not possibly have adhered to its surface, but must inevitably have been washed down into the reservoir below, which receives the runnings from the spring, where, however, comparatively little of it is to be found.

On the other hand, it is not more difficult to account for the growth of organic bodies in such a position, favoured, as it is, by

* *Bibliothèque Universelle,* tom. xi. p. 410. He supposes the animal matter to be carried up along with the steam in a state of vapour.

the genial temperature and mineral constitution of the water that flows over it, than to understand the production of *Algæ* on the abrupt escarpment of a cliff exposed to the waves of the sea.

It would be natural to inquire, what degree of resemblance this product of warm sulphuretted springs may bear to that which Mr. Dillwyn has described, under the name of *Conferva nivea**, as peculiar to the cold sulphureous waters of various parts of England and Wales. The latter was first discovered by Dr. Willan† in the sulphureous water of Croft in Yorkshire, where a white hairy mucous matter is seen adhering to the sticks, grass, &c., which had been mistaken for sulphur, until Dr. Willan proved it to be of a vegetable nature, corresponding with *Byssus* of Linnæus‡. He notices, as a remarkable circumstance, that this *Byssus* should be found below the spring no further than the water retains its sensible sulphureous qualities, as if the hepatic gas were necessary for its production and nourishment. It occurs also at Dimsdale in the same county, at Middleton-One-Row near Darlington, at Llanwrtyd in Wales,—all springs of the same quality. It grows, says Mr. Dillwyn, on roots and other substances, which it covers with white filaments two or three lines in length, and so extremely slender, that under the highest power of my microscope their thickness scarcely appeared equal to that of a horse-hair. Some of the filaments are simple, but most of them are singularly beset towards the middle with a whorl-like cluster of very simple branches, resembling proliferous shoots. Dissepiments with a high power are clearly discernible, and they divide the filaments into joints, the length and thickness of which are nearly equal.

* C. filis ramosis, tenuissimis, rigidiusculis, niveis; ramis in verticillo confertis, articulis diametrum longitudine superantibus.—*Dillwyn's Confervæ*, p. 54.

† Willan *On Sulphureous Waters*, p. 10.

‡ I found it myself this autumn growing in great abundance at the old spring of Croft.

Mr.

Mr. Dillwyn adds, in a private communication with which he has favoured me, that he has since found *Conferva nivea* abundant in the hot springs about Aix la Chapelle, especially near Frankenburg.

I leave it to the many better judges of such matters, than myself, that are to be found among the members of this Society, to pronounce, whether the body, whose appearances under the microscope are faithfully depicted in the accompanying drawing, approaches near enough to the characters of Dillwyn's *Conferva nivea* to be regarded as the same, or as an allied species. To this, the want of resemblance as to colour must not be regarded an objection; for the specimen I obtained at Digne, which appeared under the microscope to be the same kind of *Oscillatoria* as the one alluded to, was perfectly white; and M. Longchamp, in his treatise on the Waters of Vichy, informs us, that what he collected at Bareges was originally white, but became green when kept for a few days*, so that the discrepancy as to colour ought not to be looked upon as establishing a distinction of species. Neither will the difference of temperature between the sulphureous water of Harrowgate and of Greoulx be considered inconsistent with the notion of the same *Conferva* growing in both, when we are reminded that it has also been found by Mr. Dillwyn himself in the thermal waters of Aix la Chapelle†.

At all events, it must be considered as a curious circumstance, that springs, of whatever temperature, which give out sulphu-

* This change also took place very rapidly in the *C. nivea* which I collected at Croft in Yorkshire this autumn.

† Dr. Hooker found close to the edge of the Geysers in Iceland, and within a few inches of the boiling water, *Conferva limosa*, Dillw., a new species of *Oscillatoria*, and the finest specimens of *Jungermannia angulosa* he ever saw. In water, also, of a very great degree of heat, were, both abundant and luxurious, *Conferva flavescens* of Roth, and a new species allied to *C. rivularis*.

retted

retted hydrogen,—a gas so noxious to most other living bodies,—should be eminently fitted to favour the growth of certain kinds of *Conferva*, whilst thermal waters destitute of this impregnation—if I may judge from those of the Pyrenees—would seem not to deposit any organic matter of the same description.

I am aware, indeed, that similar appearances are noticed as occurring in hot springs of other kinds; but, judging from my own experience, I should be disinclined to attribute their existence, in this as in the former instance, to any peculiar property of the water. Thus, I observed on the reservoirs which received the water of the hot spring of Bagneres de Bigorre, departement des Hautes Pyrenees, a red coriaceous-looking scum covering the surface of the water, which appeared to derive its colour from a portion of oxide of iron entangled in the interstices of some kind of organic matter. It is easy to understand how it happens, that the ferruginous contents of the water, when no longer held in solution, are found to collect in this instance on the surface, and not at the bottom, of the reservoir. Every successive portion of the water, as it issues from the ground, being of a higher temperature than that which has been for some time exposed to the cooling influence of the external air, will, by virtue of its inferior specific gravity, rise to the surface, where it gives out a portion of that carbonic acid, with which it was surcharged whilst under pressure. But this gas having been the solvent of the carbonate of lime and oxide of iron which the water contained, a portion of both these ingredients will be separated at the moment of its disengagement; and, supposing any vegetable or animal matter to be at the time floating near, the earthy and ferruginous particles will be entangled within its interstices, and thereby be prevented from sinking to the bottom.

In this way I likewise account for a red scum, which I have found

found at Vichy*, and in several other warm springs, that liberate carbonic acid, but are destitute of sulphuretted hydrogen*, and notwithstanding the similarity of external appearance belonging to the specimens of this substance which are taken from different localities, I am inclined to doubt whether they possess anything in common, except the earthy and ferruginous matter with which they are respectively charged.

In support of this opinion, I might appeal to a drawing executed by M. Heuland, to whom I am also indebted for that of the *Oscillatoria* from Greoulx, which represents the appearances exhibited under the microscope by a portion of the red coriaceous-looking substance, already alluded to as having been found at Bagneres de Bigorre.

From this it would appear, that the medium, by which the earthy and ferruginous matters disengaged from the water were in that instance held together, consisted of nothing more than the *parenchyma* of decayed leaves, some of the *stomata* of which were still visible.

Without meaning indeed to deny, that *Confervæ* are met with in thermal waters of all descriptions, I am inclined to believe, that they are peculiarly abundant in sulphureous ones; for it has never occurred to me to witness, in any of the numerous mineral springs I have visited in different parts of Europe, an accumulation of organic matter at all comparable to that, which takes place in some of the sulphureous ones of the Pyrenees already alluded to; and, whereas there are many of the purer kinds of hot springs, such as that of Buxton, which do not appear to contain, or to deposit, any organic matter whatsoever, I scarcely know one containing sulphuretted hydrogen, that does not exhibit more or less of it.

* As that of Campagne in Roussillon, on the road from Carcassone to Perpignan.

XXXIII. *On*

XXXIII. *On the Plant which yields the Gum Ammoniacum. By Mr. David Don, Libr. L.S.*

Read December 7, 1830.

To discriminate and characterize those plants which more immediately administer to the wants and comforts of man, is one of the chief objects of practical botany; but it is a task replete with difficulties,—the countries whence many of the substances are derived, particularly those belonging to the Materia Medica, being generally remote and often inaccessible to travellers.

Although the gum Ammoniacum has held a place in the Materia Medica from a very early period, yet the plant from which it is obtained has hitherto remained almost totally unknown; and the same may be said of the analogous gum Galbanum, and many other articles derived from the vegetable kingdom enumerated in the Pharmacopœia. It is true, Dioscorides and Pliny mention the plant which yields the gum Ammoniacum, the former under the appellation of *Agasyllis*, and the latter under that of *Metopium*, and give Libya as its native country: but if the gum was anciently imported thence, it must have been the produce of a different plant from the one I shall shortly describe; and probably identical with the species of *Ferula* represented by Jackson in his Account of Morocco, as the gum now comes to Europe by way of the Levant and India. Dioscorides, whose opinion is adopted by all subsequent writers, derives the name *Ammoniacum* from Ammon or Hammon, the Jupiter of the Libyans, whose temple was situated in the desert of Cyrene, near to which the plant was said to grow. But it appears to me that Dioscorides was altogether mistaken as to its native country; and that the name Ammoniacum or Armoniacum, as it is indifferently written, is really a corruption of Armeniacum, for it is now ascertained beyond all doubt that the plant is a native of Persia, and that the gum must have anciently been brought to Europe by way of Armenia; and we find in ancient authors the name of the apricot sometimes written *Malum Armoniacum.*

Willdenow fancied he had obtained the plant itself; for having sown some seeds picked from the gum Ammoniacum, a species of *Heracleum* came up, of which he has published a figure and description in the "*Hortus Berolinensis,*" under the name of *H. gummiferum;* but as the plant possesses no smell analogous to Ammoniacum, and affords no gummy substance whatever, it is probable it was only an accidental weed, as it does not appear to be specifically different from *Heracleum pyrenaicum.*

The materials from which I drew up the following description were procured, by Lieut.-Colonel Wright of the Royal Engineers, in the district where the gum Ammoniacum is collected,—namely, in the vicinity of Jezd Khāst, a town of Irāk El Ajam, the ancient Parthia, about forty-two miles south of Ispahan,—and presented by him along with other dried plants to the Linnean Society. Every part of the specimen is covered with drops of a gum possessing all the properties of Ammoniacum; and this circumstance alone, independent of any other evidence, would seem sufficient to remove all doubt on the subject: but besides, I have carefully compared the specimen with the portions of inflorescence and fruit, which are found abundantly intermixed with

with the gum in the shops, and I find them to agree in every particular. The name applied to the plant by Dioscorides is already preoccupied by another genus of *Umbelliferæ;* and that of Pliny is scarcely unexceptionable, as originating in a mistake, *Metopium* having been used by some ancient authors to denote the Galbanum, and by others the gum Arabic tree; but most writers seem to agree in considering it the appellation of an ointment, or some oleaginous substance, rather than of a plant. To avoid any confusion, and as the plant proves to be a new genus, I propose to call it *Dorema,* from the Greek word δωρημα, a gift or benefit; not that I consider the Ammoniacum plant as pre-eminently deserving that title, but the name is at least a short one, and agreeable to the ear,—considerations not to be overlooked in nomenclature. I shall now proceed to give the essential character and a detailed description of the genus.

DOREMA.

Syst. Linn. PENTANDRIA DIGYNIA.

Ord. Nat. UMBELLIFERÆ. *Juss.* Trib. vii. PEUCEDANEÆ. *DeCand.*

CHAR. ESSENT. *Discus epigynus* cyathiformis. *Achenia* compressa, marginata: *costis* 3 *intermediis* distinctis, filiformibus. *Valleculæ* univittatæ. *Commissura* 4-vittata.

DESCR. *Flores* lanugini immersi, sessiles! *Calycis margo* 5-dentatus: *dentibus* ovatis, acutis, membranaceis, exiguis. *Petala* 5, ovata, acumine inflexo. *Stamina* 5, citò caduca: *filamenta* complanata, basi dilatata: *antheræ* incumbentes, biloculares: *loculis* longitudinaliter dehiscentibus, basi solutis, parùm divergentibus. *Ovaria* subteretia, lineis 6 utrinque exarata: *disco epigyno* amplo, carnoso,

noso, cyathiformi, margine plicato, sublobulato. *Styli* complanati, leviter canaliculati, basi dilatati, subconnati apice recurvati. *Stigmata* truncata. *Fructus* ellipticus, à dorso valdè compressus, margine complanato, latiusculo cinctus: *raphe* angustissimâ, sæpè clausâ. *Achenia* 2, parallela, 5-costata; *costis intermediis* 3, distinctis, filiformibus, equidistantibus; *lateralibus* 2 cum margine confluentibus. *Valleculæ* univittatæ: *vittis* prominulis. *Commissura* plana, dilatata, 4-vittata, sulco levissimo medio exarata. *Columella* filiformis, tenuissima, bipartita. *Semen* complanatum: *albumen* corneum, continuum, testâ adhærenti.

Herba (Persica) *robusta, glauco-viridis, radice perenni, pube glandulosâ vestita, facie ferè* Opopanacis. Folia *ampla, petiolata, subbipinnata, bipedalia:* pinnis *subtrijugis, per paria remotis:* foliolis inferioribus *distinctis;* superioribus *confluentibus, inciso-pinnatifidis:* segmentis *oblongis, mucronulatis, integerrimis, v. raró sublobatis, coriaceis, subtùs venosis, 1—5-pollicaribus, semunciam v.* 2 *uncias latis.* Petioli *cum* rachide *teretiusculi, costati, pubescentes, basi valdè dilatati, subvaginantes, margine superiore alato, stipulaceo.* Umbella *prolifera, racemosa.* Umbellulæ *globosæ, breviter pedunculatæ, spicato modo sæpè dispositæ, pilorum lanæ minorum instar.* Pedunculi *teretes, lanuginosi.* Involucrum *et* Involucellum *nulla.* Petala *alba.* Stamina *et* Styli *flava.* Ovaria *densissimè lanata.* Fructus *nudus.*

1. D. Ammoniacum.

Habitat circa pagum Jezd Khāst in Persiâ meridionali. *D. Wright.* ♃. (v. s. sp. in Mus. Soc. Linn.)

The large cup-shaped epigynous disk, and the solitary resiniferous canals distinguish this genus from *Ferula* and *Opopanax*, to to both of which it is closely allied. The flowers being completely sessile is also a remarkable character.

With respect to the plant which yields the gum Galbanum I am enabled to say but little, not having seen any part of it except the fruit, some of which, almost perfect, I have been so fortunate as to pick from the gum. These, however, are quite sufficient to determine the most important characters of the plant, which appears to constitute a new genus allied to *Siler*, but differing essentially from it in the absence of dorsal resiniferous canals, and the commissure being furnished with only two. I propose for the plant the appellation of *Galbanum officinale*, and shall conclude these few imperfect observations by adding a description of the fruit.

Fructus à dorso compressus, ellipticus, unguicularis: *raphe* angustâ apertâ, nec clausâ. *Achenia* 7-juga: *jugis* elevatis, compressis, obtusè carinatis, nec alatis; *lateralibus* distinctis, marginalibus. *Valleculæ* latiusculæ, concavæ, evittatæ! *Commissura* plana, dilatata, bivittata: *vittis* latis, subarcuatis.

The plant, according to Dioscorides, is a native of Syria; but it must be in some remote and inaccessible part of it, as it has not been observed by any of the numerous travellers who have visited that country.

As the gum is partly imported from Smyrna, and partly from India, it is very probable that the plant is also a native of Persia.

The *Bubon Galbanum* of Linnæus possesses neither the smell nor the taste of Galbanum, but in these particulars agrees better with Fennel, and the fruit has no resemblance whatever to that found in the gum. How a plant differing so essentially from

from Galbanum should yet have been retained so long in the Pharmacopœia may well be a subject of surprise, especially as the *Bubon Galbanum*, being so frequent in botanical collections, afforded abundant opportunities of settling the question.

Since writing the above, I have been enabled, by the assistance of friends, to add the following information on the subject of the Ammoniacum plant.

The first volume of the *Dictionnaire Universel de Matière Médicale*, by Mérat and De Lens, published at Paris in 1829, contains some valuable notices on the Ammoniacum plant, from which it appears that the plant was already known to Mr. Brown, and had been determined by him to constitute a new genus. We also learn from the same work, that M. Fontanier, a geologist sent into the Levant by the French Government, had visited the district where the plant grows spontaneously, and transmitted a drawing together with specimens of the herb and gum to the Museum of Natural History at Paris. M. Fontanier was informed that the plant grows likewise in Khorāsān.

In the Appendix to the first volume of the Transactions of the Medical Society of Calcutta, p. 369, is an extract of a letter addressed to Dr. Wallich by Lieut.-Colonel Kennett, accompanied by a rude figure of the plant which yields the gum Ammoniacum, of which the following is a copy.

"I have the pleasure to forward you a drawing and description of the *Oshac*, a Persian plant that produces the gum Ammoniac. It was procured by Captain Hart (of the 5th batallion Bombay native regiment) whilst on sick certificate in Persia; and understanding it was a desideratum in botany, he has requested me to send it to you in his name. It is to be regretted that Captain Hart did not know enough of botany to give

give a particular description of the plant, flower, and seed; but he brought away a root, with a piece of the stem and some dry leaves attached, and which I have forwarded in a box to your address. You will observe the account of the plant is dated in July 1822, though I only received it a short time ago.

" '*Description of the Oshac, or Gum Ammoniac Plant.*

" 'It having been intimated to me while at Bushire, by the Resident, Captain Bruce, that the plant which produces the gum Ammoniac,—called by the Persians *Oshac*,—would be acceptable to botanists, as it was but imperfectly known, I procured the accompanying piece of stem, leaf, and flower, and took a drawing of one of the finest plants. Its height was seven feet two inches, and the circumference of the lower part of the stem four inches. It grows principally on the plains between Yerdekaust and Kumisha, in the province of Irauk, without cultivation. The gum is so abundant, that upon the slightest puncture being made, it instantly oozes forth, even at the ends of the leaves. When the plant has attained perfection, innumerable beetles, armed with an anterior and posterior probe of half an inch in length, pierce it in all directions; it soon becomes dry, and is then picked off, and sent *viâ* Bushire to India and various parts of the world, and is an article of considerable export. I am of opinion it might be cultivated with success in many parts of Kattywar, and the experiment might be worth the consideration of Government. The gum might easily be procured by artificial means, which would answer the purpose equally well.

" 'From the part of the stem attached to the roots of the specimen I sent you, a considerable portion of the gum will be seen exuded, in which respect it resembles the Assafœtida plant,

plant, which abounds in the mountains in the south of Persia, particularly in the province of Lar.'"

The gum is collected about the middle of June; a tenth is remitted as tribute to the Government; the rest is sent to Bushire on the Persian Gulf, and thence to Europe. Part of that imported to this country came from the Levant; but Mr. S. F. Gray, F.L.S. informs me that the largest quantity and the best comes by way of India.

For the following particulars I am indebted to Major Willock, who has visited the districts where the plant grows wild. "The *Ooshāk* or gum Ammoniacum plant grows in great abundance over the arid plains in the vicinity of the town of Jezud Khāst, on the borders of the provinces of Fars and Irak. Jezud Khāst is a district appertaining to the Government of Ispahan. The plant is perennial, and throws up from the root a cluster of leaves, and one or more strong vigorous naked stems, of three or four feet in height, divided into joints of five or six inches long, throwing out various branches of equal length. The white juice which forms the gum pervades the whole plant, but exudes chiefly from the principal stems. It either remains on them in lumps, or, falling to the ground, is gathered by the villagers in the autumn, and is sold by them. The *Ooshāk* plant is to be met with nowhere but in the province of Irak, growing in very dry plains, gravelly soils, and exposed to an ardent sun."

XXXIV. *On*

XXXIV. *On the Paussidæ, a Family of Coleopterous Insects.* *By Mr. J. O. Westwood, F.L.S.*

Read June 1, 1830.

INFLUENCED by the desire which every naturalist ought to entertain, that the treasures of Nature collected and discovered by his countrymen, or added to our museums and cabinets through their zeal and assiduity, should also be made known by fellow-naturalists of his native rather than of foreign countries, (although for the advancement of science it might even be wished that these treasures, rather than remain unnoticed and undescribed, should be thrown open to the examination of and be described by foreign naturalists;) and considering it the duty of every member of the Linnean Society to add his mite, however scanty, to the stores of knowledge which are recorded in its Transactions,—it was my intention, on becoming acquainted with the interesting nondescript insect, subsequently described under the name of *Pentaplatarthrus Paussoides*, merely to have offered to the Society its description, with a few observations upon its affinities, to prove its relationship to the *Paussidæ*, one of the most interesting families of Coleopterous insects. On discovering, however, in our cabinets, in addition to this new genus, not only several other undescribed species belonging to the family, but also such a variation of structure in some of the known species as to warrant their separation from *Paussus*, and finding that confusion had been introduced into the nomenclature even of the few species composing the

 family,

family,—I considered that it might not be deemed uninteresting to extend my observations to the whole family, and which I trust will not be regarded as unworthy of attention, both from the great interest which the insects themselves possess from the extreme singularity of their structure, (for, as Latreille has observed in the *Nouveau Dict. d'Hist. Nat.* vol. xxv. p. 57: "Vainement chercherions nous dans tout l'ordre des Coléoptères un genre qui nous offre des caractères aussi bizarres et aussi insolites que les *Paussus*,") as well as from the circumstance of the records of this Society already containing a valuable paper by the learned Professor Afzelius upon the species known to him; and from the opportunity thus afforded me of exhibiting the rapid strides which Entomology has since made; and lastly, from the circumstance of the genus *Paussus* constituting the final entomological labour of that great man, whose name we have adopted as our own.

But few remarks are requisite upon the *history* of the family. The genus *Paussus* was established in the *Dissertationes Academicæ* in the year 1775, and the genus *Cerapterus* by Swederus in the Swedish Transactions for 1788. These two genera continued to be regarded as unconnected with other genera, or with each other, until Latreille inserted the former, as one of the genera composing the family *Scolitaires*, in his *Histoire Naturelle &c.* tom. xi. p. 204.—Afzelius, regarding only the genus *Paussus*, proposed for its reception in the Linnean Transactions, vol. iv. a distinct fifth section of the *Coleoptera*, characterized "Antennis clavâ integrâ, inflatâ." The genus *Cerapterus*, however, remained unnoticed by entomologists until Donovan pointed out its affinity with *Paussus* in his work upon the Insects of New Holland; and Latreille, profiting by his observations, formed the two genera into a distinct family in the *Genera Crustaceorum &c.* vol. iii. p. 1, and *Considerations Générales*

rales &c. p. 225, under the name of *Paussili*, and which he placed between the *Bostrichidæ* and the *Cisidæ*. This family name was altered in the Edinburgh Encyclopedia by Dr. Leach to *Paussides*. In the *Règne Animal*, the two genera considered a subgenera together form the second genus of the first section of the *Xylophages* between the *Scolytidæ* and the *Bostrichidæ*. And in the *Analecta Entomologica*, Dalman proposed to establish the species, previously named by him *Paussus Bucephalus*, into a distinct genus named *Hylotorus*.

To these three genera I have now the pleasure of adding several others; and the following may be regarded as the principal typical characters of the family.

Ordo. COLEOPTERA.

Sectio. PENTAMERA? *Latr.*

(CHILOPODOMORPHA? *MacLeay.*)

Stirps. NECROPHAGA? *MacLeay.*

Familia. PAUSSIDÆ *mihi.* PAUSSILI. *Latr., &c.* PAUSSIDES. *Leach, Edin. Encycl.*

Genus typicum. PAUSSUS. *Linn.*

Familiæ Character typicus.

CORPUS oblongo-quadratum, subdepressum, antice subacuminatum.

CAPUT parvum, subtriangulari-globosum, porrectum, collo instructum.

ANTENNÆ permagnæ, crassæ, articulis 2—10 plùs minùsve depressæ (pro magnitudine insectorum).

PALPI magni, coriacei, exserti, inæquales.

LABIUM magnum, coriaceum, planum.

THORAX plùs minùsve bipartitus.

ELYTRA postice quadrata.

4 I 2 PEDES

Pedes subæquales, breves, compressi. *Tarsi* breves, articulis integris, articulo basali minuto, subtùs producto.
Abdomen thorace multò majus et elytris longius.
Insecta exotica, parva, duriuscula, longitudine 2—5½ lin.

Of the *habits* of the family we possess but little information, and that only upon two species of *Paussus*, which will be found noticed under that genus: it is, however, probable that the other genera are similar in their habits, and that in their preparatory states their habitat is either under the bark of trees or in timber. They are steady and slow in their movements, and nocturnal in their habits, and in their perfect state are met with in newly-built houses. The species, however, must be of considerable rarity, since many of our richest cabinets do not even possess an individual of the family.

With respect to the *geographical distribution* of the family it may be remarked, that they appear to inhabit the Old World exclusively, and that the tropical and southern portions of Africa and the East Indies and Indian islands, are their peculiar range. *Cerapterus MacLeaii* is, however, described by Donovan as an inhabitant of New Holland.

From the singularity in the structure of these insects, it is difficult to speak of their *affinities* with precision. With respect to their relationship with *Cerocoma*, in which genus they were originally placed by Fabricius, there is, as Afzelius correctly conceived, no affinity, and indeed but little analogy beyond the singularity in the antennæ. Afzelius, indeed, supposed that they approached nearest to *Clerus*, bearing to it, as he observes, at least upon the whole, so much natural resemblance, that their most proper place in the systematic arrangement will be next after that genus. It is to be wished, however, that this author had more precisely stated the points in which he supposed

posed this natural resemblance to consist, since I can scarcely conceive that these insects are more nearly allied to *Clerus* than they are to *Cerocoma*. Swederus was equally distant from their true affinities, when he considered *Cerapterus* as intermediate between *Silpha* and *Hispa;* but the legitimate study of affinities was in the days of these authors in its infancy.

Latreille, in the *Histoire Naturelle &c.* vol. xi. p. 206. "profitant de quelques rapports naturels qu'ont ces insectes avec les *Scolites*, les *Bostriches*, les *Cis*," adds, "J'avois soupçonné qu'on devoit réunir les uns et les autres dans une même famille. De nouvelles considerations ont confirmé ce sentiment, et malgré que les organes de la manducation des *Pausses* diffèrent de ceux des *Scolites*, on voit cépendant qu'il y a entre eux une grande affinité."

He accordingly places *Paussus* immediately between the *Curculionidæ* and the genus *Scolytus* (a location by no means tenable), forming the genera *Paussus*, *Scolytus* (including the modern groups *Scolytus*, *Tomicus*, *Hylesinus* and *Hylurgus*), *Platypus* and *Phloiotribus*, into the family Scolitaires; the genera *Bostrichus*, *Cis* and *Cerylon*, into that of Bostrichini; and the genera *Colydium*, *Nemosoma*, *Bitoma*, *Lyctus*, *Latridius*, *Silvanus*, *Trogosita*, *Meryx* and *Mycetophagus*, into the family Xylophagi. In the *Genera Crustacearum &c.* the family *Paussili* was established and placed between the *Scolitaires* and the *Xylophagi;* which latter family was made to include the *Bostrichini* as well as the genera of which it was previously composed. In the *Considerations Générales* the *Paussidæ* were properly still further removed from the *Scolitaires*, being placed between the *Bostrichini* (including both the *Scolitaires* and the *Bostrichini*) and the *Xylophagi* of the *Histoire Naturelle*. In the *Règne Animal*, *Familles Naturelles*, and 2nd edition of the *Règne Animal*, all these genera and families are formed into one great family group, under the name of *Xylophagi*, by which Latreille endeavours, but as it appears

appears to me unsuccessfully, to establish the passage from the weevils to the capricorn beetles. In the first and last of these works the *Paussidæ* are placed between the *Scolitaires* and *Bostrichini;* and in the second, between the *Bostrichini* and the *Trogositarii.* When we consider the very discordant structure of the insects composing these families,—of which Mr. MacLeay has well observed in the *Annulosa Javanica*, that they at present form a most artificial assemblage,—it cannot be a matter of surprise that the situation of the *Paussidæ* should have been subject to such continued change. It cannot, however, be denied, that it is one of the most difficult, although most interesting tasks of the naturalist, and one in which (from the great number of links which remain to be discovered,) the greatest caution is requisite to trace the affinities of such anomalous animals as these, especially when they have been employed to effect the transition between extensive groups of very distinct structure.

Of the impropriety of Latreille's location of the majority of the insects composing these various families between the *Curculionidæ* and *Cerambycidæ*, and upon their decided affinities with many of the *Necrophaga* of MacLeay, especially the *Eugidæ*, I shall refer the student to the various remarks of that author upon the genera of the latter family in the *Annulosa Javanica*. To him the praise is due for pointing out these affinities, which Latreille himself appears willing to admit in the new edition of the *Règne Animal*, vol. v. p. 89. n. 4, where, speaking of the joints of the tarsi of his family *Xylophagi*, comprising all these subfamilies, he says : "Leur nombre paraît être de cinq dans quelques. Ces insectes semblent se lier avec les *Cryptophages* et autres insectes analogues de la section des *Pentamères*."

The student may also consult with advantage Curtis's British Entomology, genera *Cryptophagus*, *Mycetophagus*, *Tetratoma*, *Ciconis*, and *Bitoma*. I cannot, however, here omit to remark,

remark, with some degree of astonishment, that after the observations of Mr. MacLeay in the *Annulosa Javanica* above referred to, Mr. Curtis should have stated, that "we cannot help expressing some surprise, that out of the many systems that have been proposed, none should have released *Mycetophagus* from its present unnatural situation, viz. from the *Xylophagi* or *Trogositarii* of Latreille." The Systematic Catalogue, and Illustrations of British Entomology, of Mr. Stephens may also be consulted, in which the first attempt has been made to arrange these various genera in accordance with Mr. MacLeay's views, although it may perhaps be considered that this arrangement has been made upon general considerations rather than upon strict analytical examination and dissection. It should, however, be constantly borne in mind, that the characters presented by the larvæ of these various genera will tend in a great degree to establish their affinities upon a sure foundation, and it is greatly to be regretted that so little is recorded concerning them: hence arises the absolute necessity of attentively studying and minutely recording the peculiarities of these preparatory states whenever opportunity presents itself.

Taking, therefore, the preceding observations into consideration, it is evident that in these groups Nature appears to have disregarded all decided regularity in the number of the joints of the tarsi; and hence, if the majority of Latreille's *Xylophagi* should be removed,—as it appears to me they ought to be,—to a situation in the stirps *Necrophaga*, the *Paussidæ* must also accompany them, notwithstanding the absence of the terminal clavation of the antennæ; but between the *Paussidæ* and the true *Scolytidæ* (which are certainly most intimately allied to the *Curculionidæ*,) or the *Bostrichidæ** (compare Mr. Curtis's Dissections of

* I exclude from this family (as Latreille indeed has done in some of his earlier works) the genus *Cis*, which has also, in my opinion, no immediate affinity with *Mycetophagus*. The genus *Bostrichus* Geoffroy (*Apate* Fabr.) is the typical form of this family.

of *Scolytus*, *Cossonus*, and other curculionideous genera), I do not think that any natural affinity exists, either regarding structure or habits: neither do I consider that any material affinity exists between them and the *Mycetophagidæ**. On the other hand, in general appearance, in the consistency of their external structure, and probably also in their natural habits, they make the nearest approach to the *Trogositarii*†: but the trophi are very dissimilar, and the antennæ of *Pentaplatarthrus* and *Cerapterus* present no appearance of a terminal clava; which clearly shows the great hiatus existing between these insects and the *Trogositarii*, and appears to point the way to the *Cucujidæ* (the remaining family placed by Latreille between the *Curculionidæ* and the *Cerambycidæ*), and which may perhaps hence be considered as having the greatest affinity with the *Paussidæ*, particularly when we also notice the depressed bodies, the formation of the antennæ, and

* The genera composing the section *Mycetophagés*, as restricted by Latreille in the new edition of the *Règne Animal*, (with the exception of *Colydium*, which is placed alone in a distinct subdivision,) appear to agree more nearly in natural affinity than those of which the section is composed in any of his previous works, at least so far as I am able to judge from the genera which I have dissected:—they are *Mycetophagus*, *Triphyllus*, *Meryx*, *Dasycerus*, *Latridius*, and *Silvanus*. The situation of the last appears to me, however, doubtful. Mr. Curtis has also proved the intimate affinity between *Tetratoma* and *Mycetophagus*.

† This family appears to me to be capable of demarcation, from the general appearance of the species, and from the structure of their trophi, especially the lower lip;—in my opinion, founded upon the formation of the latter organs in many of these insects which I have dissected, it naturally includes the genera *Trogosita*, *Megagnathus*, *Cerylon*, *Rhyzophagus*, *Nemosoma*, *Colydium*, *Monotoma*, *Bitoma*, *Cicones*, *Synchita*, and probably *Lyctus*. To these groups must also be added the pentamerous genus *Ips*, which has recently been ably illustrated by Mr. Curtis, who however, taking Latreille for his guide, has placed the genus in the family *Nitidulidæ*, and merely stated the chief differences existing between it and *Nitidula*, thus evidently regarded as the genus most nearly allied to *Ips*. It is impossible, however, on examining the *Ips ferrugineus*, (which Mr. Curtis has considered the type of the genus,) not to be struck with its resemblance to some of the preceding genera, such as *Cerylon*, *Nemosoma*, *&c.*, which resemblance

and especially the pentamerous tarsi in many of the genera of that family; such as *Catogenus*, *Clinidium*, *Rhysodes*, *&c.*; upon which point I further beg leave to refer the student to my paper "On the Affinities of *Clinidium*," inserted in the 18th Number of the Zoological Journal.

The following is a *Synoptical view of the genera* belonging to the family, and subsequently described.

Elytra subquadrata; palpi labiales elongati.	Antennæ quasi biarticulatæ.	Caput (ocellis duabus) thorace immersum		3. *Hylotorus.*
		Caput (ocellis nullis) collo instructum.	Palpi labiales articulo ultimo elongato	2. *Paussus.*
			Palpi labiales articulis æqualibus	4. *Platyrhopalus.*
	Antennæ quasi 10-articulatæ			5. *Cerapterus.*
	Antennæ quasi 6-articulatæ			1. *Pentaplatarthrus.*
Elytra subovata; palpi labiales brevissimi				6. *Trochoideus.*

It will at once be perceived, that the characters laid down above tend, in some respects, to give us only an artificial result;

resemblance is fully confirmed by the similarity in the structure of the trophi, although the tarsi (according to the tarsal system) would remove the genera far asunder.

Since the preceding observations were written, Mr. Curtis with his usual ability has illustrated the genus *Nemosoma*: but in his observations upon its affinities, by again implicitly following Latreille as his guide, he has remarked, "*Nemosoma* is placed by Latreille between *Cis* and *Cerylon*, and there can be no doubt that it belongs to the *Bostricidæ*; but never having had an opportunity of examining this rare insect until now, I have arranged it in my Guide between *Bitoma* and *Rhyzophagus*, but its natural situation will be near *Cis* and *Apate*."—Now I do not hesitate to state, that the relationship of this genus with *Cis* or *Apate* is of the most remote and unnatural kind, whilst its affinity with *Ips*, *Cerylon*, *Rhyzophagus*, *&c.* is perfectly evident from Mr. Curtis's own delineations of several of these and allied genera, especially in the structure of the maxillæ; and I am convinced that no one on comparing them together and with Sturm's dissections of *Trogosita*, and my own of *Temnoscheila* (Zool. Journ. no. 18.), can possibly adopt Mr. Curtis's views, or will doubt that *Trogosita* is the type of a group of genera including those above mentioned. But it is not in the perfect insect alone that we are to search for correct ideas of the affinities of the *Coleoptera*. The larvæ, as I have before stated, afford the most important clues to their discovery; and Mr. Curtis will be surprised to learn that *Nemosoma* is chilopodiform; *Cis* chilognathiform, hexapod, forked-tailed; and *Scolytus* an apod-larva.

indeed it does not appear to me (on comparing the characters of the different genera and the observations upon their respective affinities subsequently detailed,) that a natural linear or circular disposition can at present be traced in the few genera composing the family. Thus if we look to the variation in the number of joints in the antennæ, we shall find *Trochoideus* intervening between *Paussus* and *Pentaplatarthrus*, and the latter between *Platyrhopalus* and *Cerapterus*. Again, if we regard the form of the antennæ, we shall find the resemblance between *Hylotorus* and *Paussus pilicornis* Don., sufficient to separate *Paussus* from *Pentaplatarthrus*. Again, as the genera are numerically arranged above, the genus *Hylotorus* unnaturally separates the true *Paussi* with a continuous thorax from the *Platyrhopali*. If, also, we attempt to form a tabular arrangement of the genera from the structure of the trophi,—which, according to the Table given by Mr. MacLeay in the first part of the *Horæ Entomologicæ*, are the organs susceptible of the least variation, and which consequently are of the first importance in regulating the distribution of genera,—I fear that the result will not be more satisfactory: indeed, in some of the genera we are not acquainted with the structure of these organs.

It appears, however, sufficiently natural to commence the series with *Pentaplatarthrus*, and to proceed thence to the true *Paussi* with a bipartite thorax; thence, by means of *P. sphærocerus*, to those with the thorax continuous, and to the *Platyrhopali*, which evidently lead to the *Cerapteri*

Genus 1. PENTAPLATARTHRUS* *mihi*.

Type of the Genus, *P. paussoides* mihi.

Corpus subdepressum; capite parvo; thorace majori; abdomine

* *Πέντε, quinque; πλατὺς, platus; ἄρθρον, articulus*;—in allusion to the formation of the antennæ.

latiore

latiore et corporis longitudinis dimidio paullò longiore. *Caput* thorace angustius, depressum, subquadratum, facie subtransversâ, posticè *collo* brevi instructum. *Oculi* mediocres, laterales, ovales. *Antennæ* ad marginem anticum capitis, inter oculorum partem superiorem insertæ, capite cum thorace paullò longiores, quasi 6-articulatæ; articulo 1mo cylindrico, brevi, posticè subemarginato, tunc articulus? parvus, subglobosus, in apicem prioris insertus, cui insidet articulus 2dus verus, brevis, transversus, subpunctatus, 1mo ferè duplò latior, planus, apice truncato; articuli 3, 4, et 5, longitudine primi at illo ferè triplò latiores, plani, transversi; articulus ultimus planus, paullò major, apice circulari, margineque externo vel postico in angulum parvum producto. *Os* inferum. *Labrum* crustaceum, parvum, subtriangulare margine antico rotundato, basi utrinque obliquè truncato. *Mandibulæ* parvæ sub labro occurrentes et eo longitudine æquantes, corneæ, elongatæ, curvatæ, basi latiores, lobo basali externo, et internè excisione minutâ, apice acutæ, externè angulum formantes. *Palpi, Maxillæ, Labium*que ex oris cavitatis margine infero et transverso parallelo prodeuntia; *palpi* longi; labiales clavati, maxillares longitudine æquantes, porrecti. *Maxillæ* parvæ subconicæ, lobo magno apicali ferè quadrato, suprà externè subhirto, facie internâ coriaceâ ultra mandibulas protensi. *Palpi maxillares* longi, crassi, cylindrici, articulis 4 crassitie æqualibus, articulis 1mo 3tioque brevibus, 2do 4toque longioribus, hoc apice acutiori vel cylindrico-conico. *Mentum* transversum, rigidum, angulis anticis paullò productis. *Labium* internum, mentoque longius et angustius subtriangulare apice transverso. *Palpi labiales* in scapos vel lobos duos corneos inter mentum labiumque inserti, articulis tribus, 1mo brevi, 2ndo illo du-

 plò

plò longiori apice paullò crassiori, 3tioque magno, clavato, apice obliquè subtruncato. *Thorax* subquadratus et subcylindricus, antice latior, abdomine angustior. *Scutellum* parvum, trigonum, pedunculo abdominis immersum. *Mesostethium* magnum, transversum, medio lineâ longitudinali etiam lineâ transversâ, margine postico parallelâ, impressum. *Elytra* elongato-quadrata, lævia, dorso plana, ad latera deflexa, immarginata, posticè truncata. *Alæ* duæ. *Coxæ* posticæ, transversæ, apice majores. *Abdomen* in specimine viso mutilatum. *Pedes* omnes similes, breves, valdè compressi, lati. *Tibiæ* omnes spinâ minutissimâ terminali internè instructæ. *Tarsi* breves, subcylindrici, articulis 5 integris, articulo 1mo brevissimo, tribus proximis brevibus æqualibus subtùs paullò villosis, articulo ultimo longitudine quatuor præcedentium, cylindrico, apice paullò crassiori, unguibus duobus validiusculis, acutis, simplicibus.

The characters of this genus are perhaps as interesting as any hitherto presented to the entomologist. The various parts of the mouth, especially the development of the palpi and their basal scapes, and the internal labium, are worthy of notice, as is also the insertion and structure of the antennæ. Between the upper part of the eyes there are two slightly raised tubercles, the centres of which appear excavated for the reception of a circular ball, probably capable of a rotatory motion, upon the upper or exposed surface of which the lower part of the basal joint of the antennæ is inserted. In general appearance and in the formation of the thorax, this genus resembles the first section of *Paussus;* whilst the formation of the antennæ would lead towards *Cerapterus.* There are four joints more in its antennæ than in *Paussus;* while *Cerapterus* exceeds it by four joints more. In the incrassation of the labial palpi it approaches *Cerapterus;*

Cerapterus; whilst the formation of the mentum and labium, and the insertion of the labial palpi vary very materially from the structure of *Paussus.*

The only species with which I am acquainted being undescribed, I have (in consequence of its general appearance agreeing with the typical species of *Paussus*) given it the name of

PENTAPLATARTHRUS PAUSSOIDES *mihi.*

(TAB. nostr. Fig. 1—14.)

P. totus rufo-piceus, thoracis angulis anticis utrinque in spinam obtusam productis, et in medio anticè subcucullato, dorso centrali profundè excavato.

Habitat in Africa?

Long. corp. (antennis exclusis) lin. $3\frac{1}{2}$.—Lat. corp. (ad basin elytrorum) lin. $1\frac{1}{3}$.

Specimen unicum in Mus. Dom. T. W. Edwards, *Soc. Linn. Sodal.* &c. conservatum, et mihi benevolè delineari describique communicatum.

Nova species. *Caput* parvum, transversum, punctatum, piceum vertice paullò excavato. *Antennæ* rufo-piceæ, articulo 1mo punctato, 2do subpunctato, articulis reliquis lævissimis. *Thorax* lævis, nitidus, rufo-piceus, angulis anticis utrinque in spinam brevem obtusam productis, anticè subcucullatus, disco centrali profundè excavato (sc. in medio elevatione magnâ, anticè rotundatâ, posticèque emarginatâ, culmen formante ad thoracis latera ductum), indè carina longitudinali ad marginem posticum, et utrinque lineâ elevata cum margine laterali parallela. *Elytra* rufo-picea, nitida, tenuissimè punctata, punctis ad suturam in lineas obscuras perpaucas dispositis.

Subtus. *Corpus* et *pedes* picea.

Unique in the cabinet of T. W. Edwards, Esq. F.L.S. &c., who,

who, with a liberality as disinterested as rare, permitted me not only to examine, describe and figure, but also to relax his specimen, thereby enabling me to render my paper more complete by adding figures of its various characters, especially of the trophi, which from their size I was able to effect with facility, and which, together with the other dissections figured by me, are the first representations which have been given in detail of those most valuable organs in the family. Of its locality that gentleman can give me no further information than that it came into his possession in a large box containing chiefly African insects.

Genus 2. Paussus. *Linn., Fabr., Latr., &c.*

Pausus. *Thunb., Afz., &c.*

Type of the Genus *P. microcephalus* Linn.

It is not my intention to detail the characters of this genus, the Transactions of this Society being already enriched with the elaborate details given by Afzelius. I however insert the cibarian characters, in consequence of the confusion existing in the writings of Afzelius and Latreille upon their nomenclature and formation. A considerable portion of the following characters is indeed derived from their researches, but those of the lower lip and its appendages are the result of my own dissections.

Corpus subdepressum. *Caput* mediocre, thorace angustius, posticè collo brevi instructum. *Antennæ* magnæ, articulo 1mo minori, crasso, cylindrico-ovato, apice obliquè emarginato, tunc articulus? parvus, subglobosus, emarginaturæ prioris immersus, cui insidet articulus ultimus maximus sæpiùs irregulariter obtrigonus, compressus vel subdepressus, angulo infero et externo interdum uncinato. *Labrum* subcoriaceum, parvum, transversum, angulis anticis rotundatis. *Mandibulæ*

Mandibulæ corneæ, parvæ, elongatæ, dimidio basali stipitali latiori, compresso, subelongato quadrato ad latus internum membranaceo producto; dimidio apicali in dentem sublunato-trigonum, acutum, formato. *Maxillæ* stipite crustaceo, processu terminali corneo, compresso, plano, mandibuliformi, subquadrato in dentem arcuatum brevem acutum desinente, externè subciliato, latere interno sub eodem apice obtusè uni- vel bi-dentato. *Palpi maxillares* magni, exserti, porrecti, labialibus e tertiâ parte longiores ad originem antennarum usque producti, maxillarum stipiti basin externam versus inserti; articulis 4, basilari parvo, tuberculiformi; 2do maximo, compresso, subquadrato; 3tio valdè angustiore, triplò breviore, subcylindrico; ultimo 3tio paulò minori, cylindrico-conico (ces deux palpes se rapprochent à leur extrémité supérieure, et forment une sorte d'arcade à la lèvre inférieure. *Latr.*). *Mentum* rectangulari-triangulariforme (hypothenusâ anticè transversâ, sc. inter oculos ductâ) lateribus obliquis capite coalitis, nec basi articulatum, medio convexè subelevatum, et margine antico in medio paullulum producto; angulisque anticis lateralibus (basi exarticulatis) porrectis, compressis, in dentem subacutum productis. *Labium*, os inferum claudens, palpis labialibus brevius, subquadratum, corneum, subplanum, vel medio longitrorsum subcarinatum, margine antico integrum (ut in *P. sphærocero*, vid. Afz. Linn. Trans. iv. 252.), vel carinæ apice in dentem parvum centralem producto (ut in *P. microcephala*, vid. Afz. loc. cit.) intùs subconcavum e marginibus ejus anticis lateralibusque intùs conniventibus. *Palpi labiales* maxillaribus breviores, ad ortum subconati inter mentum et labii basin inserti labiique faciem anticam velantes et marginem illius superum ultrà progressi, interdum reflexi, 3-articulati, articulis 2dis inferis brevissimis

mis (priori paulò majori, globoso); ultimo magno, longè ovato, aut cylindrico-subulato, apice acuto. *Thorax* subcylindricus, paulò longior quàm latior, antice plerumque dilatatus, parte elevatâ anticâ plùs minùsve articuliformi. *Elytra* posticè truncata.

The characters given above will at once separate the species of the genus from their immediate affinities, the palpi materially assisting in tracing the boundaries of the genus.

It will be observed that Afzelius (who, notwithstanding his admitted inability satisfactorily to examine the trophi of the genus, has given their characters drawn from an external comparison of *P. microcephalus* and *sphærocerus*,) has, as might have been expected, fallen into several errors, chiefly regarding the nomenclature of the different parts:—thus his *palpi interiores* are the *labial palpi;* his *palpi exteriores*, the *anterior produced lateral lobes of the mentum;* his *mandibulæ*, the *maxillary palpi;* his* *maxillæ* are the *mandibles;* and his *gula triangularis* is the *mentum.*

This author, however, most properly considered the flat plate-like part which closes the underside of the mouth, as the lower lip (labium); and (with the exception of the anterior lateral lobes of the mentum being incorrectly articulated, to represent palpi, as they were considered; and the maxillary palpi being represented as without joints, being regarded as the mandibles,) his figures of the underside of the heads of both species correctly exhibit the general structure of the various parts of the mouth as seen externally.

Latreille, however, both in the *Histoire Naturelle* and *Genera Crustaceorum, &c.* appears to have regarded the organs, which Afzelius described as the external palpi, and which I have de-

* It must be borne in mind that Afzelius is not blameable for this variation of nomenclature, since it was in accordance with that of Fabricius, adopted by him.—See Kirby and Spence, vol. iii. p. 429.

scribed

scribed as the produced lateral angles of the mentum, as part of the labium, expressly stating in the latter work that there is no mentum. His description of the lower lip in the former work is as follows: "Cette dernière piece" (the "lévre inférieure") "est petite, cornée, presque carrée, un peu voutée, tridentée au bord supérieur, dont le milieu est un peu plus élevé; les dents latérales sont formées par les saillies des angles latéraux; le milieu de la face antérieure de cette lévre est en carène et se prolonge en pointe au sommet, d'où résulte la dent intermédiaire." I shall, however, endeavour to prove that there is a mentum, and that these "dents latérales" are in fact the produced angles of that organ, and that they are perfectly distinct from the labium. For this purpose it is necessary for me to state, that these produced angles or "saillies" are not articulated at the base, but merely produced portions of the gula triangularis of Afzelius: indeed that author expressly says, that these parts seem to have neither joints nor motion, and to be of a very different structure and substance from the true palpi labiales: hence, therefore, they cannot be considered as parts of the labium, which, typically regarded, is a distinct organ arising below the insertion of the palpi; and consequently the supposition of Latreille, that these spines are "formées par les saillies des angles latéraux" of the labium, must be considered as incorrect. It may indeed perhaps be contended that these produced lateral spines are representatives of the produced undersides of the head or undercheeks particularly developed, as in *Catogenus*, *Passandra*, *Megagnathus*, *&c.* and consequently, that they do not form part of the mentum, which must either be sought for in the more advanced or in the internal parts of the mouth, or must be, as Latreille states, wanting. I am induced, however, from the abhorrence which Nature entertains of such anomalies,—notwithstanding the absence of any articulation at the sides or base

base of the part which Afzelius terms the gula triangularis,—to consider that part, which Latreille has not noticed, as the representative of the mentum, and consequently, the "dents latérales" of Latreille, or the external palpi of Afzelius, as the produced anterior angles of the mentum; 1st, from the evident analogy between it and the mentum of *Pentaplatarthrus* and *Platyrhopalus;* 2ndly, because Latreille himself has shown that the mentum is not always articulated at the base, as in *Siagona*, which he describes in the *Genera Crustaceorum, &c.* vol. iv. p. 208. as "suturâ nullâ basilari et processu paginæ inferæ capitis efformatum;" 3rdly, because the labial palpi arise between it and the true lip, which appears to be the true typical structure of the *Coleoptera;* and 4thly, because the maxillæ arise at the outer sides of the produced spines and within the mouth; in which respect this formation also agrees with the typical structure of the *Coleoptera*, where the base of the maxillæ arises at the outer sides of the mentum; whereas in *Catogenus, Passandra, Megagnathus, &c.* the maxillæ arise within or between the produced lobes or spines.

As to the "dent intermédiaire" of the labium mentioned by Latreille, it appears from the observations of Afzelius, that it is not a constant generic character; its examination, however, in the various species is rendered more difficult in consequence of the peculiar arched formation of the maxillary palpi described by Latreille as above.

The labial palpi are generally bent backwards, although, as may be observed from Afzelius's figures, they are occasionally stretched forward; in which latter case they fill up the space formed by the arch of the maxillary palpi, and almost entirely conceal the lip.

The paucity of joints in the antennæ, and their comparatively immense size, are circumstances well worthy the attention of the

the philosophical entomologist; and if observation were particularly paid to the peculiar uses which the living insects make of them, it is not to be doubted that some light would be thrown upon the dubious nature of the general uses and senses of those organs. Latreille indeed says in the *Nouveau Dict. d'Hist. Nat.* vol. xxv. p. 57, "l'on soupçonne que quelques espèces se tiennent suspendues au moyen des dents ou des rochets du dernier article de leurs antennes." This circumstance, however, appears to me to be extremely improbable.

In describing the antennæ of the species known to him, Fabricius, in order to state their peculiar structure, employed the term "irregulares," upon which Afzelius has commented in his paper, considering that, as it must convey the idea of the clava being of a shape either not always uniform or deviating from the ordinary rules of Nature, its employment is improper, since he states neither of these circumstances to be the case. That the antennæ of the *Paussi* materially differ from the *ordinary structure* of these organs, no one will be inclined to question; although it cannot be admitted that Nature has here deviated from her ordinary rule of introducing variations in the characters of her groups. The term has, however, another definition, which the Professor has overlooked, which will convey a perfect idea of their formation; namely, by translating the word, 'uneven', or 'with the surface irregular': this I doubt not is the sense in which it was employed by Fabricius.

With regard to the very interesting observations of Afzelius upon the luminosity of the second joint of the antennæ of *P. sphærocerus*, I am under the necessity of stating the doubts which I entertain upon the existence of so extraordinary a circumstance. Might not the light reflected from the wall, falling upon the semipellucid livid-coloured balls of the antennæ, give them the appearance described, *with expressions of doubt*, by

Afzelius?

Afzelius? Without, however, venturing to question the correctness of his observations, I beg to be permitted to throw out this remark as a not unnatural cause of the appearance. Or may not the appearance be accounted for (regard being had to the globular and subpellucid structure of the clava,) precisely in the same manner as the light emitted by the shining moss mentioned in Loudon's Magazine of Natural History, No. xv. p. 463. (published since the preceding observations were written); where Mr. Bowman in explaining its cause observes: "A person acquainted with the laws of optics as exhibited in lenses, would, on examining its (the moss's) structure of innumerable perfect globules filled with a highly pellucid green fluid, have pronounced, *à priori*, that they would condense the rays of light, and appear luminous to an eye placed in the angle of incidence; and the fact, that it is always most brilliant either in the cave, or in a room with only a single window, when the face is turned from the light, illustrates the theory in a singular manner."

Of the "differentiæ sexuales" of the family I am only able to state, that according to Afzelius, the female of *P. sphærocerus* differs chiefly from the male in having the labial palpi rather narrower, the produced lobes of the mentum glaucous, the maxillary palpi shorter, with the second joint narrower, the abdomen longer, and the posterior femora slenderer.

Of the *habits* of the species we know but little. Latreille, in the *Histoire Naturelle*, states, "Les *Pausses* doivent vivre dans les bois."—I need not occupy the valuable time of the Society with repeating the account given by Afzelius of the habits of *P. sphærocerus;* and shall therefore merely add, that Dr. Horsfield has informed me that Mr. Arnold captured a species in Java under precisely similar circumstances.

M. Dupont of Paris has also informed me, (subsequent to the commencement of the reading of this paper,) that the species which

which I have subsequently introduced from his splendid collection under the name of *P. excavatus*, was observed by his correspondent at Senegal, by whom the insect was captured, to make several repeated discharges of smoke, accompanied by a slight noise similar to that produced by the Bombadier Beetle (*Brachinus*), whence M. Dupont named it *P. crepitans*. I cannot, however, help imagining that some mistake must have arisen with respect to this peculiarity. Afzelius, who captured several specimens of the genus, has recorded nothing of the kind, and it may reasonably be doubted whether the internal structure of M. Dupont's insect would so far differ from that of the other species as to enable it to produce these repeated discharges. Having consulted M. Latreille upon the subject, whose opinion corresponds with my own, I have not hesitated to propose another specific name for the insect in question in lieu of that proposed by the possessor of the specimen, which, but for the circumstances stated above, I should with pleasure have adopted.

The following observations comprise the details most worthy of notice regarding the history of this singular genus, upon which but few authors have treated. The genus was established under the name *Paussus* in the last entomological dissertation of the Academy of Upsal, under the presidency of Linnæus, the title whereof is "Bigæ Insectorum quas Præside DD. Car. v. Linne proposuit Andreas Dahl, Westragothus, Upsaliæ 1775." The only species described and figured was *P. microcephalus*, which Linnæus had received in a collection of North American and African insects from Dr. Fothergill of London. In 1781, Thunberg described in the Swedish Transactions two new species of the genus discovered by himself in South Africa in the year 1772 (and which he had previously considered as forming a new genus), under the names *Pausus lineatus* and *P. ruber*, the former of which alone was indifferently figured. Fabricius in the

the *Entomologia Systematica* 1792, deviating from his general plan of adopting well-defined genera established by other authors, inserted the *P. microcephalus* of Linnæus and the *P. lineatus* alone of Thunberg in his genus *Cerocoma*, observing upon the former species, "ad ulteriorem examinationem hîc insero insectum singulare, proprium genus uti videtur constituens, mihi haud ritè notum." To these two species a third was added, named *ruficollis*. Afzelius is the next author who has treated upon the genus, and whose elaborate paper in the 4th volume of the Transactions of the Linnean Society, published in 1798, deserves the study of every naturalist. Leaving no part of his available materials to be elucidated by future entomologists, his remarks (from the advantages which, as a practical collector, as one of the pupils of Linnæus, and as a profound naturalist, he possessed,) are entitled to the greatest consideration. This author deemed it proper, with Thunberg, to alter the generic name *Paussus* into *Pausus*, in consequence of Linnæus's supposed derivation of the name from "*Pausa*," and in which respect he has been followed by many entomologists. Latreille and Fabricius, however, preserved (with great propriety according to my views of entomological nomenclature) the name as originally spelt by Linnæus. In addition to the very extended generic characters, to numerous interesting observations upon its affinities, &c., as well as to the more detailed specific description of the Linnæan species, he added the description of a new species, which he named *sphærocerus*, referring also to the *lineatus* and *ruber* of Thunberg, and the *ruficollis* of Fabricius,—making together five species.

Donovan, in his splendid Natural History of the Insects of India, described and figured not less than four new species belonging to the family, and placed by him in this genus; namely, *Paussus denticornis* Don. (*Platyrhopalus denticornis* mihi);

mihi); *P. thoracicus* Don.; *P. Fichtelii* Don.; and *P. pilicornis* Don.; the second and third of which he conjectures may probably be the sexes of the same species. In the *Systema Eleutheratorum* 1801, Fabricius adopted the genus *Paussus* with this remark: "Novum genus et distinctum, at mihi haud ritè examinatum, nec mihi satisfacit character genericus a D. Afzelio, in A. S. Linn. datus, sed e novo conficiendus." The species inserted in this work in the genus are the *microcephalus*, *lineatus*, and *ruficollis*, with the addition of another insect named *P. flavicornis*, of which he says, "Animalculum singulare vix hujus generis;" which, in fact, does not belong to the family, and which I have formed into the genus *Megadius*, described below. Latreille having received three species of the genus from Mr. MacLeay, (one of which he submitted to dissection for the purpose of giving a more detailed account of the formation of the trophi than had been given by Afzelius,) published the result of his observations in the *Histoire Générale, &c.* vol. xi., giving only the four species recorded in the *Systema Eleutheratorum*, with the same remark upon the *P. flavicornis*. In the *Genera Crustaceorum, &c.* vol. iii. p. 1., he again detailed the characters of the genus, giving as the type the *microcephalus*, and adding a description of Donovan's *P. thoracicus*, under the name of *trigonicornis*.

Schönherr in the *Synonymia Insectorum*, vol. i. part 3. gives the following list of ten species belonging to the genus, as at that time constituted, (including two new species, but omitting those described by Donovan, except the *P. thoracicus*, which it is evident he was only acquainted with through Latreille's synonymical reference in the *Genera Crustaceorum, &c.*); 1. *P. microcephalus* Linn.; 2. *sphærocerus* Afz.; 3. *lineatus* Thunb.; 4. *trigonicornis* Latr. (*thoracicus* Don.); 5. *denticornis* (a new species described under this name by Gyllenhal in the Appendix to the

the volume, but distinct from Donovan's *denticornis*); 6. *ruber* Thunb.; 7. *Bucephalus* (a new species, also described in the Appendix by Gyllenhal); 8. *ruficollis* Fabr.; 9. *flavicornis* Fabr. (without the expression of any doubt as to its belonging to this genus); and 10. the *Hispa bihamata* of Linnæus, with the remark, "An hujus generis?" Dalman in the *Analecta Entomologica* has published some observations upon the propriety of forming the *Bucephalus* into a new genus under the name of *Hylotorus*, and upon the affinities of the *P. flavicornis* Fabr.: and the same author, in a very interesting paper in the Swedish Transactions for 1825, upon insects found in the gum copal, has described an insect under the name of *Paussus cruciatus*, which, although evidently belonging to the family, materially recedes from the genuine *Paussi*, and which I have consequently considered as the type of the genus *Trochoideus* subsequently described.

The above are, I believe, the only works in which any material original matter has been published upon these insects; and I cannot, therefore, but rejoice at being enabled to increase the lists given by Schonherr and Donovan by the addition of several other undescribed species.

The species vary most materially from each other in the formation of the terminal joint of the antennæ: these parts therefore, together with the size and colour of the insects, may be considered as affording the chief specific characters. The thorax may be employed for the purpose of dividing the species into two sections; viz. those in which it is more distinctly bipartite with the margins produced into an angular spine on each side in front, and those with the thorax almost continuous, the anterior part being only separated from the posterior by a slight impression, with the lateral margins rounded in front. The *P. sphærocerus* appears to unite the two sections.

Sectio

Sectio I. *Thorax quasi bipartitus.*

Species 1. PAUSSUS MICROCEPHALUS. *Linn.*

TAB. XXXIII. Fig. 21.

P. obscurè niger, vel nigricanti-brunneus, elytris magìs piceis, vel rufo-piceis, capite mutico, antennarum clavâ permagnâ, oblongo-sphæroidæâ, inæqualiter elevatâ, ad basin subelongatè pedunculatâ, latere externo quadri-tuberculato, infrà in uncum obtusum unidentatum producto, thorace in medio profundè excavato, parte anticâ strangulo distincto, valdè et transversè elevatâ, illius margine supero acuto, tibiis linearibus, posticis paulò latioribus, apice subangustioribus.

Paussus microcephalus. *Linn.* (*Dahl. Diss. Acad. Bigæ Ins.*) *p.* 6. *tab. ann. f.* 6—10. *Thunberg. Act. Suec.* 1781. 170. 1. *Fuess. Arch. Ins. Plag.* iii. *p.* 1. *sq.*; *ed. Gall. p.* 42. *t.* 13. *Afzelius, Act. Soc. Linn. vol.* iv. *p.* 263. *t.* 22. *f.* 1—5. *Herbst. Coll.* iv. *p.* 100. *t.* 39. *f.* 6. *a, b.* *Gmel. Syst. Nat. vol.* i. *p.* 4. *p.* 1737—1. *Fab. Syst. Eleuth.* ii. *p.* 75. 1. *Weidem. Arch.* 1. 2. *p.* 297. 1. *Latr. Hist. Nat. &c. t.* 11. *p.* 208. *Latr. Gen. Crust. &c. t.* 3. *p.* 2. *Nouv. Dict. d'Hist. Nat. vol.* xxv. *p.* 58. *Schonherr, Syn. Ins. vol.* i. *p.* 3. *p.* 18. *Shaw, Gen. Zool.* vi. *part* 1. *p.* 42. *pl.* 12. *Encyclopædia Londinensis, vol.* xix. *Genus & tab.* Pausus, *fig.* 1, 2, 3. *Rees' Encycl. vol.* xxvi. Pausus, *no.* 1.

Cerocoma microcephala. *Fabr. Ent. Syst. t.* i. *p.* 2. *p.* 82. *Leske, Naturg.* i. *t.* 12. *f.* 19.

"*Habitat* in Insula Bananas ejusdemque vicinitate." *Afz.*

Magn. nat. *Dermestes lardarii* Linn.—Long. corp. lin. $3\frac{1}{2}$.

In Mus. Soc. Linn. Lond. (olim Banks). Dom. MacLeay (olim Drury); etiam olim in Musæo Linnæi (Smith); etiam in Mus. Latreille (nunc Dejean).

As this species has already been very fully described by Afzelius, I shall not recapitulate its specific characters. It is necessary, however, to make a few observations upon the species, in consequence of the Linnean cabinet at the present time not possessing the original Linnean specimen, a distinct species being attached to the Linnean generic label. For the purpose therefore of identifying the species, I beg to direct attention to the size of the insect, which is stated in the original description to be equal to *Dermestes lardarius*, and also to the original figures, which are sufficiently exact to convince the student that the specimen originally contained in the Banksian cabinet, and now belonging to the Linnean Society, is the *P. microcephalus*: it is true, that Afzelius states that he only casually examined the Linnean insect in the possession of our late lamented President; but it is not to be supposed that Afzelius, himself the capturer of one of the species, could have mistaken any other species which might at that time have been introduced into the Linnean cabinet when he examined it; and this is rendered more unlikely, from the circumstance of the original figures of the insect having been drawn by J. Afzelius. Whence the first above-mentioned circumstance has arisen may perhaps be learned by tracing the history of the three specimens known to Afzelius. That in the cabinet of Sir Joseph Banks now belongs to the Linnean Society (from which both Afzelius's and my own figures were drawn). The second, originally in the cabinet of Mr. Drury, I understand subsequently came into the possession of Mr. MacLeay: but of the third specimen, originally belonging to Linnæus, I can discover no trace. It appears, however, in the *Histoire Naturelle &c.* that Latreille received from "un des naturalistes de l'Angleterre le plus estimable par ses connoissances, par ses communications amicales, Alexandre MacLeay," three species of the genus, but which

which are not named. In the *Genera Crustaceorum &c.* we learn, however, that Latreille received the *P. microcephalus* "ex dono generosissimi amici Domini Alex. MacLeay." As, however, it is not probable that Mr. MacLeay would have forwarded this species to Latreille, unless the specimen forwarded were a duplicate in his collection, it appears to follow, either that Mr. MacLeay must have obtained other specimens of the insect from abroad, or that he had procured the original Linnean specimen from its then possessor, as well as that belonging to Mr. Drury, and had forwarded one of them to Latreille. Should this latter supposition be correct, it affords an additional instance of the want of that true spirit of veneration towards the scientific relics of Linnæus which every disciple of that great master ought to entertain, and which (although it was sufficiently strong to induce our late President, in consequence of his predilection for botanical studies, to preserve the botanical treasures of Linnæus untouched and in their original and entire condition, and sacred for the interest of science,) it is greatly to be regretted did not also operate with him to prevent the incorporation of the Linnean cabinet of insects with his own private collection. Had this, however, been the only cause of regret, the mischief might easily have been remedied; but the entomologist has also to regret that the original Linnean specimens, and, as in this instance before us, even species, were in many instances allowed to be changed, probably for the purpose of renovating the collection, whereby the authenticity of the cabinet has unfortunately been diminished to so great a degree, that amongst the minute insects it is now almost unsafe, without the greatest possible caution, to rely on the collection as a standard of reference. It is not, however, too late to remedy much of the mischief which has been thus occasioned; and I state these circumstances in the hope of inducing the influential members of

 the

the Society to institute such an inquiry into the state of the Linnean cabinet of insects as will tend in the result to diminish the confusion which has so inadvertently been produced,—whereby the value of the cabinet has been diminished, and the increase of knowledge retarded,—by endeavouring, as far as may be possible, to reinstate the collection in its original form.

Species 2. Paussus Linnæi *mihi.*
Tab. XXXIII. Fig. 22—24.

P. subcylindricus, rufo-piceus, elytris rufescentibus, antennarum clavâ suprà latâ subquadratâ, apice valdè depresso, recurvo, subhirsuto.

Habitat ——?

Long. corp. (exclus. antennis) lin. 2.

In Mus. Soc. Linn. Lond. (olim Smith?).

Nova species. Parvus, subcylindricus, tenuissimè punctatissimus. *Caput* suprà subconvexum, piceum, obscurum, porrectum, subtriangulare, posticè in *collum* breve productum; margine antico emarginato; vertice impressione parvâ, subrotundatâ, in quâ tuberculum minutum. *Oculi* parvi laterales. *Palpi* ut suprà descripti. *Antennæ* magnæ, obscuræ, castaneæ vel rufo-piceæ, apice subpiloso, articulo 1mo cylindrico, brevi, apice obliquo, articulo ultimo maximo, suprà subquadrato, inæqualiter elevato, basi paulò latiori, et obliquè truncato; latere interno tuberculis tribus minutis, apice citò valdè depresso, acuto et suprà reflexo. *Thorax* longior, quasi bipartitus, et in medio profundè excavato, rufo-piceus, portio antica obscura capite latior strangulo distincta, valdè et transversè elevata, illius margine supero acuto et in medio subemarginata, ejusdem angulis lateralibus acutis; portio postica nitida paulò angustior, lateribus rotundatis, vertice valdè depresso, depressione

pressione posticè bituberculatâ. *Scutellum* parvum concolor. *Elytra* thoracis parte antica paulò latiora, magìs rufescentia, nitida, subconvexa, linearia, apice truncata, abdomine paulò longiora. *Pedes* longi tenues, castanei, parùm compressi.

LINNÆO discipulus novissimus hanc speciem inscribit.

This species appears to agree in size, colour, and general structure with the next, if indeed it be not specifically identical. The chief *apparent* differences between its characters and the description of *P. ruber* being, 1st, the formation of the head and thorax of the two species, and which, as I have suggested below, may not perhaps *actually* exist; and, 2ndly, the formation of the terminal joint of the antennæ, which must I apprehend, on the other hand, be considered as indicative of a distinct species. The circumstance of this species being preserved in the Linnean cabinet and actually attached to the generic label in Linnæus's hand-writing,—the original Linnean species at the same time not being preserved in the cabinet,—renders it necessary to state that this is not the *P. microcephalus*. From Donovan's *P. pilicornis* it varies in colour, although when the antennæ are seen sideways, there appears to be some specific affinity.

Species 3. PAUSSUS RUBER. *Thunb.*

P. totus obscurè rufescens, elytris rufescentibus, capite in medio angustato et posticè utrinque spinoso, thorace anticè eroso, antennis clavâ latâ complanatâ basi cordatâ, apice eroso-sulcato.

Paussus ruber. *Thunb. Act. Holm.* 1781. *p.* 170. 1; *ed. Germ.* 21. *p.* 171. *Herbst. Syst. Ins.-Col.* 4. *p.* 101. 2. *Afzelius, Linn. Trans. vol.* iv. 272. 1. *Schonherr. Syn. Ins.* 1. *part* 3. *p.* 19.

Rees'

Rees' Encycl. vol. xxvi. *Genus* Paussus, *no.* 3. *Encycl. Londinensis, vol.* xix. *Genus* Paussus, *no.* 3.
Habitat Caput Bonæ Spei. *Dom. Thunberg.*
In Mus. —— ?
Magn. nat. *Notoxi Rhinocerotis.*

Corpus oblongum depressum, obscurè rufescens, læve, glabrum. *Caput* anticè margine elevato, in medio depressum et angustatum, posticè transversè elevatum et dilatatum, in spinam lateralem utrinque exstantem, suprà anticè in medio est ruga elevata bifida inter oculos. *Antennæ* antheriformes biarticulatæ, articulus infimus minor cylindricus, extimus latus complanatus basi cordato, apice eroso-sulcato, antheram bifidam referente. *Thorax* anticè erosus. *Scutellum* nigrum. *Elytra* magìs rufescentia, margine exteriori deflexo, abdomine breviora, truncata.

I am unacquainted with this insect, except through the description of Thunberg, which I have detailed above; consequently it is with some hesitation that I venture from analogy to place it in this section of the genus, and to suggest that that author may have fallen into an error in his description of its head, inasmuch as it appears to me not improbable that he has regarded the anterior portion of the thorax as the hinder part of the head, such hinder part, according to his description, appearing to me to have precisely the same formation as the anterior part of the thorax in the preceding species, with which, if I am correct in the above opinion, it seems to possess considerable affinity. It is greatly to be regretted that Thunberg did not figure the insect.

Species

Species 4. Paussus excavatus *mihi.*

Tab. XXXIII. Fig. 56, 57.

P. obscurè rufescenti-fuscus, capite thoraceque paulò obscurioribus, antennarum clavâ latâ latere interno acuto, externo crasso, excavatione oblongâ.

Paussus crepitans. *Dupont Mss.*

Habitat in Africa occidentali; Senegalia.

Long. corp. lin. 2.

Specimen unicum in Mus. Dupont, Parisiis.

Nova species. Parvus, subcylindricus, tenuissimè punctatissimus. *Caput* subquadratum suprà convexum, obscurè rufescenti-fuscum, posticè in collum breve contractum, margine antico emarginato, vertice impressione parvâ rotundatâ. *Oculi* mediocres. *Antennæ* rufo-fuscæ, clavâ magnâ latâ oblongo-trigonâ apice subrotundato, margine interno acuto, impressionibus nonnullis parvis transversis infra marginem, posticè multò crassiori, margine externo in naviculam vel cavitatem oblongo-ovalem longitrorsùm excavato, serieque impressionum transversarum in paginam inferiorem, quæ in marginem ipsum in denticulationibus 4 vel 5 desinunt: angulo basali subhamato, denteque parvo in medio marginis basalis. *Thorax* obscurè rufo-fuscus, longior, bipartitus, portione anticâ multò breviori et è posticâ, excavatione profundâ, separatâ, capite latiori, valdè et transversè elevatâ, illius margine supero acuto et in medio subemarginato, ejusdem angulis lateralibus acutis, portione posticâ longiori sed angustiori, anticè utrinque obliquè productâ, lateribus posticis subinflexis, disco valdè depresso, excavatione subheptangulari. *Scutellum* parvum concolor. *Elytra* thoracis parte anticâ latiora, fusco-rufescentia, sub lente forti punctatissima subconvexa, abdomine

domine paulò breviora. *Pedes* breves fusci, femoribus tibiisque valdè compressis.

I am indebted for a knowledge of this pretty and very distinct little species to the liberality of M. Dupont, who obligingly allowed me to describe and figure it from his rich Coleopterous collection at Paris. In size and the structure of the thorax it agrees with the two preceding species, especially *P. Linnæi;* whilst the antennæ resemble those of *P. thoracicus* and *Fichtelii.* It also agrees with the *P. Linnæi* in having the circular impression on the crown of the head; but it wants the small central tubercle.

I have already alluded to the alleged habits of this species, and the consequent change which I have been compelled to introduce in its specific name.

Species 5. Paussus rufitarsis.

Tab. XXXIII. Fig. 25—27.

P. flavescenti-fulvus; antennarum articulo basali, thoracis angulis posticis, elytrorum disco, pedibusque piceis; tarsis rufis, antennarum clavâ ovatâ, apice subacuto, basique in spinam externè producto.

Habitat ——?

Long. corp. lin. 3.

In Mus. Brit. Specimen unicum sub nomine Ms. "*rufitarsis*" conserv.

Nova species. Brevis, indè speciebus reliquis quasi latior et obtusior videtur, cylindricus, minutissimè punctatissimus et tenuissimè pubescens. *Caput* porrectum, ferè thoracis magnitudine, subtriangulare, anticè truncatum, emarginatumque, pallidè fulvo-flavescens, in vertice exstat excavatio parva rotundata inter quam et oculos utrinque excavatio alia minutissima.

nutissima. *Oculi* mediocres laterales. *Palpi* ut in congeneribus. *Antennæ* articulo 1mo cylindrico, piceo, articulo ultimo magno lividè flavescenti, ovali globoso, apice subacuto latere interno tenuè compresso, latere externo excavatione parvâ lineari-oblongâ vel carinâ in quâ lineæ 4 elevatæ tranversæ; basi externè in spinam obtusam producto. *Thorax* subquadratus capite vix major, bipartitus, flavescenti-fulvus, lateribus vel angulis portionis posticæ piceis, portio antica angusta et elevata, in medio culmen acutum efformans, hoc in medio subemarginatum, ejusdem angulis lateralibus acutis, portio postica major, lateribus subrotundatis disco irregulari. *Elytra* ferè cylindrica, abdomen tegentia, basi thorace ferè duplò latiora et illo quadruplò longiora, etiam posticè quàm anteriùs paulò latiora, nitida, basi fulvo-rufescentia, marginibus lateralibus posticisque rufis, disco piceo, obsoletissimè punctata, margine externo et apicali fasciculis aliquot setarum rigidarum rufarum. *Corpus* subtùs pallidè testaceum nitidum. *Pedes* nigro-picei, mediocres; *femoribus* cylindricis, posticis crassioribus; *tibiis* vix compressis; *tarsis* rufis.

Of this pretty nondescript species, which is nearly allied to *P. thoracicus*, I have seen only a single specimen contained in the cabinet of the British Museum, and which, solely in consequence of the wish expressed by me to describe and figure the new unnamed species of *Paussus* contained in that cabinet, was immediately designated by the manuscript name which I have adopted above, although I regret to state, that the species belonging to the neighbouring, and indeed I might add, to the majority of the genera of insects contained in that national repository, still for the most part remain unnamed and in confusion.

 The

The curious fascicles or bundles of short, rigid, red hairs which are observed on the margins of the elytra are peculiarly characteristic of the species.

Species 6. Paussus thoracicus. *Donovan.*
Tab. XXXIII. Fig. 28—30.

P. ferrugineo-testaceus, elytris disco lateribusque fuscis, antennarum clavâ oblongâ compressâ trigonâ, latere interno acuto, externo excavato, cavitate ovali, marginibus denticulatis.

Paussus thoracicus. *Donovan, Epitome Ins. Ind. t.* 4. *f.* ⁂. *Rees' Encycl.* Entomology, *pl.* 8. *fig.* 11. *&* 11*, sine descriptione.

Paussus trigonicornis. *Latreille, Genera Crustaceorum, &c. vol.* iii. *p.* 3. *pl.* 11. *f.* 8. *Schonh. Syn. Ins. vol.* i. *p.* 3. *p.* 19.

Habitat Indiâ Orientali; Bengal. *Dom. Fichtel.*

Long. corp. lin. $3\frac{1}{3}$.

In Mus. Brit., Soc. Linn. Lond., Kirby, Haworth, B. Clark, Latreille (nunc Dejean).

Subcylindricus, rufo-testaceus. *Caput* thorace antico subæquè latum, margine antico acuto, emarginato, vertice arcu duplici elevato, centroque variè impresso, et prominulo coronato. *Palpi* ut in congeneribus. *Antennæ* articulo apicali compresso, oblongo trigono, latere interno acuto, externo vel postico in naviculam vel cavitatem oblongo-ovalem longitrorsùm excavato, punctorum impressorum vel denticulationum serie ex illius utroque margine, angulo basali acuto. *Thorax* bipartitus, sulco postico; medio transversè profundèque excavato, parte anticâ et eminenti posticè in medio emarginatâ ejusdem angulis lateralibus acutis. *Elytra* nigra, basi et apice rubro-ferrugineis, margine externo setis aliquot rigidis hispido, ejusdem angulo apicali incrassato. *Pedes*

Pedes elongati; *tibiis* 4 anticis tenuibus; posticis compresso-sublatioribus ad apicem paulò angustioribus.

This species appears to be the least rare of the genus. It varies in size, one of the three specimens in the British Museum cabinet being considerably smaller than the others. The legs are longer and slenderer than in the majority of the species. The dark colour of the disk of the elytra is more suffused than in the next species, extending to the sides.

The observation of Latreille upon this species, (the name of which he has unnecessarily altered to '*trigonicornis*,') "*P. lineato* proximus et fortè varietas elytris latiùs nigris," appears to me to be incorrect, that species belonging, as I imagine, to the second section, and in structure being nearly allied to *P. affinis* and *Hardwickii*.

Species 7. Paussus Fichtelii. *Donovan.*
Tab. XXXIII. Fig. 31—33.

P. testaceus elytris fuscis, lateribus, basi apiceque testaceis, thorace subbipartito; antennarum clavâ oblongâ, latere interno acuto, externo excavato, cavitate pyriformi, marginibus denticulatis.

Paussus Fichtelii. *Donovan, Epit. Ins. Ind. pl.* 4. *f.* ***. *Rees' Encycl. vol.* xxvi. sub genere "*Paussus*," *pl.* 8. *fig.* 12. *&* 12*, sine descriptione.

Habitat Indiâ Orientali; Bengal. *Dom. Fichtel.*

Long. corp. (secundum figuram Donovani) lin. $2\frac{1}{2}$.

In Mus. Kirby.

Parvus subcylindricus. *Pausso thoracico* maximè affinis. Differt præcipuè magnitudine minori, antennarum articuli apicalis formâ diversâ et excavatione pyriformi nec ovali; thorace sub-bipartito, elytrorumque marginibus lateralibus basi apiceque testaceis, pubescentibus.

 Not

Not having seen this species, I have been compelled to deduce the character detailed above from Donovan's short specific description and figure; and I doubt not that they will be considered sufficient to have warranted him in regarding this as specifically distinct from *P. thoracicus,* although Donovan was inclined to think they might ultimately prove to be the sexes of the same species. Of these characters, the most material are the variation in the form of the excavation of the last joint of the antennæ, and in the thorax; and as it appears from Afzelius's description of *P. sphærocerus* that the sexes do not vary in the formation of these organs, I am induced with Donovan to regard them as distinct, rather than run the hazard of uniting what Nature has apparently separated*.

* Since the preceding observations were written, the Rev. William Kirby has, in the most obliging manner, brought up to London for my inspection his collection of *Paussidæ,* including two specimens which he purchased at the sale of Mr. Francillon's cabinet, one of them being the *P. thoracicus,* and the other a specimen which is decidedly the *P. Fichtelii.* From a minute comparison of these specimens, I now find that I did not err in considering the species as distinct. I have accordingly introduced into the plate several outline figures drawn from Mr. Kirby's specimen of *P. Fichtelii* in lieu of the tracing from Donovan's figure, which I had originally inserted. On comparing these with the original figures which I have given of *P. thoracicus,* other material specific differences will be perceived in addition to those stated above. The general shape of the antennæ and the number of elevations on the ridge of the excavation of those organs are different; the keel-like anterior margin of the clava is acute, and extends to the base in *P. thoracicus;* but in *P. Fichtelii* its anterior margin is obtuse and irregular. The front of the head is more emarginate in *P. thoracicus,* and is more distinctly quadrate behind the eyes than in *P. Fichtelii;* whilst the excavation on the crown of the head of the latter is oval and much deeper than in *P. thoracicus,* in which it is somewhat square behind. The difference in the formation of the thorax will at once be perceived; its posterior angles in *P. thoracicus* are dark piceous. The colouring of the elytra scarcely affords a specific character, neither of the species being so strongly marked as in Donovan's figures; but in *P. thoracicus* the lateral margins of those organs are furnished with strong bristles, whilst in *P. Fichtelii* they are simply pubescent.

Species 8. PAUSSUS PILICORNIS. *Donovan.*

TAB. XXXIII. Fig. 34.

P. testaceus, elytris piceis, thorace bipartito; antennarum clavâ oblongâ, apice attenuatâ, incurvâ, pilis longis sparsis.

Paussus pilicornis. *Donovan, Epit. Ins. Ind. pl.* Paussus, *fig.* *** .

Paussus pectinicornis. *Rees' Encycl.* Entomology, *pl.* 8. *fig.* 13. *&* 13*. sine descriptione.

Habitat Indiâ Orientali; Bengal. *Dom. Fichtel.*

Long. corp. (e fig. Donovani) lin. 2.

Parvus, tenuior, testaceus. *Caput* thoracis portione anticâ angustius. *Antennæ* articulo ultimo oblongo, apice attenuato, incurvo, pilis longis sparsis. *Thorax* bipartitus, portio antica lateribus acuta, portioque postica multò angustior lateribus rotundatis. *Elytra* thorace basi latiora, etiam posticè quàm anticè paulò latiora, picea. *Pedes* graciles.

I have never seen this species, and have therefore been compelled to draw the above description from Donovan's short specific character and figure; and, as that author remarks, it altogether differs in the formation of the terminal joint of the antennæ from the other species, being entire, not excavated, and slightly beset with hairs. It appears to be allied to *P. Linnæi.*

Sectio II. *Thorax subcontinuus.*

Species 9. PAUSSUS SPHÆROCERUS. *Afzelius.*

TAB. XXXIII. Fig. 35.

P. rufo-castaneus, nitidissimus, angustior, subcylindricus; capite vertice cornu parvo conico, erecto, pilis terminato, instructo;

structo; anticè subemarginato; antennarum clavâ sphæricâ, magnitudine capitis, vesicæ inflatæ simili, incarnatâ semi-pellucidâ sublividâ, carinâ minutâ, vertice tuberculo unico pilifero castaneo terminatâ, instructâ; etiam basi externè in hamulum conicum apice piloso, castaneum, producto. Palpis ut in speciebus reliquis, labio apice deflexo et ferè truncato, carinâ sulco destitutâ; thorace capitis latitudine, parùm inæquali, suprà subdepresso, et vix bipartito, parte anticâ subelevatâ, lateribus rotundatis, posticè subemarginatâ, parteque posticâ lateribus rectis, margine anteriori, signo medio quadrato, depresso, nigrescenti posteriorique parùm elevatâ; elytris abdomine brevioribus punctatis rufescentibus, pedibus longioribus gracilioribus subæqualibus.

P. sphærocerus. *Afzelius, Linn. Trans. vol.* iv. *p.* 270. *t.* 22. *f.* 1—6. *Weidem. Archiv.* 1—2. *p.* 297. 2. *Schonh. Syn. Ins.* 1. *pt.* 3. *p.* 18. *Sturm, Catalog. meiner Ins. Samml. pl.* 4. *fig.* 31. *Rees, Encycl. vol.* xxvi. genus *Pausus, sp.* 2. *Encycl. Lond. vol.* xix. genus *Paussus, sp.* 2. *pl. fig.* 4, 5, 6.

P. sphæroides. *Donovan, Ins. Ind.* sub genere *Pausso.*

Habitat Sierra Leone. *Dom. Afzelius.*

Long. corp. lin. $3\frac{1}{2}$.

In Mus. Smith. olim (nunc Soc. Linn.), Marsham olim, et Afzelius olim.

I have not thought it necessary to detail the specific description of this species, preferring rather to refer the entomologist to the original description of Afzelius of the six specimens stated by that author to have been brought by him from Sierra Leone: I have been able to inspect only that formerly contained in the cabinet of Sir J. E. Smith, and now belonging to the Linnean Society. To this insect is attached a label with the observations, " Novum genus S. Leone, Afzelius. Antennis apice

apice globoso lucentibus." From this specimen the accompanying sketch was taken. I may be here allowed to correct the reference to the parts of fig. 3. in the plate accompanying Afzelius's paper, in which *b.* represents the ball of the pedicle of the antennæ, and not the hook of the clava, which is represented by fig. *d*, and not, as stated in the description of the plate, by fig. *b*.

Species 10. PAUSSUS ARMATUS. *Dejean.*
TAB. XXXIII. Fig. 62—64.

P. oblongus, angustior, obscurè rufescenti-fuscus, capitis vertice spinâ erectâ acutâ lævi; antennarum clavâ subrotundatâ depressâ, basi externè in spinam producto, thorace posticè paulò angustiori et in medio valdè excavato.

Paussus armatus. *Dejean Mss.*

Habitat in Senegaliâ.

In Mus. Dejean (e Mus. D. Latreille), Dupont.

Long. corp. lin. 5.

Nova species. Oblongus, angustus, subdepressus, toto obscurè rufescenti-fuscus, punctatissimus, subpubescens, vix nitidus. *Caput* magnum thoracis latitudine ferè hexangulare, anticè emarginatum, subdepressum, ante oculos paulò plùs productum quàm in speciebus reliquis; vertice inter oculos spinâ erectâ acutâ parvâ lævi, lineâque tenui impressâ ante oculos e margine capitis ferè ad ejus verticem utrinque obliquè, ducta. *Oculi* magni. *Antennarum clava* thorace major, basi subemarginatè truncata, latè ovalis, margine externo prope basin emarginatè contracta, indè basis ipse externus in spinam acutam produci videtur; disco suprà subtùsque convexo, margine omni acuto setigero. *Thorax* paulò longior quàm latior, parte anticâ (tertiam thoracis partem occupante) utrinque obliquè rectèque dilatatâ indè posticè

posticè paulò latiori et elevatiori planâ, in duabus partibus lineâ impressâ longitudinali centralique divisâ; parte posticâ angustiori (præsertim ad ejus basin) in medio excavatione oblonga. *Elytra* thorace latiora, lineari-oblonga, subdepressa, abdominis apicem non tegentia. *Pedes* mediocres femoribus tibiisque subcylindricis hirsutis, tarsis tibiarum crassitudine hirtis.

This is a very remarkable species: the elongation of the body, the structure of the antennæ, thorax, tarsi, and spinous head at once distinguish it from all the other species, and are so remarkable, that I have no doubt, when the trophi are carefully examined, sufficient variation from the typical formation will be discovered to warrant the establishment of it as a distinct genus. I regret that I was unable to examine these organs in the specimen preserved in the collection of M. le Comte Dejean, from which the above description and accompanying drawing were made, and which originally formed part of that of M. Latreille. It is therefore only provisionally that I place it amongst the *Paussi* near to *P. sphærocerus*, to which in some respects it most nearly approaches.

Species 11. Paussus affinis *mihi.*

Tab. XXXIII. Fig. 36, 37.

P. castaneo-rufescens, elytrorum disco nigro, thorace suprà inæquali lateribus anticè rotundatis; antennarum clavâ subovatâ, subconvexâ, basi externè in spinam exeunte.

Habitat —— ?

Long. corp. lin. $3\frac{1}{2}$.

In Mus. Brit. (sub nomine Ms. "*lineatus*").

Nova species. Subcylindricus, nitidus, tenuissimè punctatissimus, et subpubescens. *Caput* thoracis latitudine, porrectum,

tum, subtriangulare, suprà subconvexum, castaneo-rufum, posticè in collo angustiori productum, margine antico paulò emarginato. *Oculi* magni laterales. *Palpi* ut in congeneribus rufo-castanei. *Antennæ* rufo-castaneæ, articulo 1mo brevi cylindrico, apice obliquo, ultimo magno subovato, subdepresso, basi truncato et externè in spinam obtusam producto, latere externo marginato. *Thorax* rufo-castaneus subcylindricus, anticè suprà paulò elevatus subdepressus, lateribus rotundatis et posticè parte anticâ angustior. *Elytra* subdepressa ex oblongo-quadrata, thorace ferè duplò latiora et abdominis longitudine tenuissimè pubescentia et punctatissima rufo-castanea, singuli disco nigro. *Pedes* rufo-castanei, longi, tenues, tibiis subcylindricis.

It will be seen that this species (which now stands in the cabinet of the British Museum under the name of *P. lineatus*,) agrees in the majority of its characters with the description given by Thunberg of that species. The variation in the formation of the clava of the antennæ and the rounded anterior margins of the thorax are, however, characters sufficient to distinguish it as a species. I have seen but one specimen, and I regret that I have not been able to obtain any information respecting its habitat, &c.

Species 12. Paussus lineatus. *Thunberg.*

Tab. XXXIII. Fig. 38.

P. rufescens, elytrorum disco nigro, thorace inæquali lateribus anticè unispinosis, antennarum clavâ magnâ, apice obtusâ, basi externè in spinam exeunte.

Paussus lineatus. *Thunb. Act. Holm.* 1781. *p.* 171. *pl.* 3. *fig.* 4. *&* 5. *Fabr. Syst. Eleuth.* 2. 75. 2. *Herbst, Syst. Ins. Col.*

vol. iv. *p.* 102. *t.* 39. *fig.* 7 *a. b.* *Afzelius, Linn. Trans.* iv. 272. *Schönh. Syn. Ins. v.* 1. *p.* 3. *pl.* 19. *Rees' Encycl. vol.* xxvi. Genus *Pausus, no.* 4. *Encycl. Londinensis, vol.* xix. Genus *Pausus, no.* 4.

Cerocoma lineata. *Fabr. Ent. Syst.* 1. 2. 82.

Habitat ad Caput Bonæ Spei. *Dom. Thunberg.*

In Mus. ——?

"Magnitudo Carabi 4-pustulati." *Thunb.* Long. corp. (e fig. Thunbergii) nunc $3\frac{1}{4}$.

Corpus oblongo-depressum, rufescens, glabrum. *Caput* suborbiculato-angulatum, punctis depressis, inæqualè marginatum, oculis nigris, collo cylindrico a thorace separatum. *Antennæ* biarticulatæ, articulus infimus sessilis subulatus, supremus duplò crassior (et e figurâ duplò longior), compressus, obtusus, basi truncatus, angulo exteriore in spinam exeunte. *Thorax* inæqualis, lateribus utrinque unispinosis, anticè elevatus; posticè rotundatus, foveis in medio tribus impressus. *Pedes* unguiculati.

I have been under the necessity of deriving the preceding characters from Thunberg's original description and figure, not having met with this species in any of the cabinets which I have examined; the insect thus named in the cabinet of the British Museum (although it agrees with it in the majority of the characters given above,) materially differing in the shortness and thickness of the club of the antennæ, and in the thorax, which has the anterior sides rounded and not spinose, with one and not three central foveæ. I am not convinced that this species ought not to be inserted in the first section of the genus; although I have, from its *apparent* general resemblance with the preceding and subsequent species, introduced it here.

Species

Species 13. PAUSSUS HARDWICKII *mihi.*
TAB. XXXIII. Fig. 39, 40.

P. castaneo-rufus, elytris plagâ longitudinali nigrâ, antennarum clavâ elongatâ lineari subconvexâ; basi externè in hamum producto, apiceque rotundato.

Habitat Nepaliâ, Ind. Orient. *Dom. Hardwicke.*
In Mus. Hardwicke, Haworth.
Long. corp. lin. $3\frac{7}{8}$.

Nova species. Castaneo-rufus, subdepressus, nitidus, tenuissimè punctatus, subpubescens. *Caput* porrectum, subtrigonum, thoracis latitudine, anticè subemarginatum, utrinque inter oculos longitudinaliter obsoletè canaliculatum, etiam impressione tenui, e clypeo ad verticem ductâ, posticè collo instructum. *Oculi* magni laterales. *Palpi* ut in congeneribus. *Antennæ* capite cum thorace paulò longiores, articulo basali nitido subcylindrico, apicali opaco punctatissimo elongato-lineari, utrinque tenuè marginato, posticè vel externè subconvexo, margine antico magìs depresso acuto recto; postico subrecto, antico subparallelo, tuberculis nonnullis rotundis minutis marginalibus, apice rotundato, basi obliquè truncato et in hamum subarcuatum obtusum, sub apicem setigerum, producto. *Thorax* capite paulò longior, posticè angustior; anticè subconvexus elevatus, lateribus rotundatis, lineâ tenuissimâ elevatâ longitudinali in medio, portio postica in medio in fossulam transversam excavata, ponè-versus convexa, lateribus posticis paulò divergentibus. *Scutellum* minutissimum. *Elytra* abdomine paulò breviora, thoraceque multò latiora et illo triplò longiora, posticè paulò latiora, basi utrinque transversè depressa, disco subdepresso, lateribus magìs convexis, marginibus deflexis, castaneo-rufa, singuli disco plagâ latâ longitudinali nigrâ,

 nitida

nitida punctissima subpubescentia. *Abdomen* segmento anali rotundato, marginato. *Pedes* longiores, tenuiores, subcompressi. *Subtus* testaceo-rufus.

Three individuals of this species were brought from Nepaul by Major-General Hardwicke, with whose name I have inscribed it All the specimens agree with each other in the formation of the antennæ and other essential organs; and I have therefore considered it as distinct from *P. affinis*, (to which in its general characters it is nearly allied, and of which or of *P. lineatus* it has been suggested that it may be one of the sexes,) for the reasons which induced me to regard the *P. thoracicus* and *Fichtelii* as distinct. From the *P. lineatus* it is distinguishable not only in the formation of its antennæ and thorax, but also from its geographical situation.

The Rev. F. W. Hope, in his "Synopsis of the new Species of Nepaul Insects in the Collection of Major-General Hardwicke," inserted in "Gray's Zoological Miscellany," has adopted my specific name for this insect (p. 27).

Species 14. PAUSSUS RUFICOLLIS. *Fabr.*

P. niger, thorace lævi ferrugineo, elytris strigâ mediâ, margineque omni a strigâ ad apicem ferrugineis antennis magnis, clavatis, irregularibus, ferrugineis, clavâ elongatâ integrâ.

Cerocoma ruficollis. *Fabr. Ent. Syst.* 3. 1. *part.* 2. *p.* 83.

Paussus ruficollis. *Afzelius, Linn. Trans. vol.* iv. *p.* 273. *Fabr. Syst. Eleuth.* 2. 75. *Schönh. Syn. Ins.* 1. *part.* 3. *Rees' Encycl. vol.* xxvi. Genus *Pausus*, *sp.* 5. *Encycl. Lond. vol.* xix. Genus *Pausus*, *no.* 5.

Habitat —— ?

"In Mus. Dom. Lund," *Fabr.*

Magn. ?

Parvus,

Parvus, statura *P. microcephali* et *lineati*, niger. *Caput* magnum. *Antennæ* magnæ, clavatæ, irregulares, ferrugineæ, biarticulatæ, clavâ elongatâ integrâ. *Thorax* lævis, ferrugineus, immaculatus. *Elytra* strigâ mediâ, margineque omni a strigâ ad apicem ferrugineis. *Pedes* nigri.

I have been compelled, in consequence of not having met with any specimen of the genus agreeing with the description given of this species by Fabricius in the *Entomologia Systematica*, (to which no additional description is given in the *Systema Eleutheratorum*,) to draw the above characters from the Fabrician specific description: I consequently place it in this section with doubt.

In addition to the preceding species, Latreille in the *Nouveau Dictionnaire d'Hist. Nat. vol.* xxv. *p.* 58. states, that "M. Gattoire en a trouvé une espèce à l'Ile de France." The species is not, however, mentioned, but from its geographical habitat it would appear to be a distinct species: indeed, in his new work, *Cours d'Entomologie*, *vol.* i. *p.* 298, Latreille mentions this as "une espèce inédite."

Genus 3. Hylotorus. *Dalman*, *Latr.*

Paussus. *Gyll.*, *Schönh.*

Type of the Genus, *Pausus Bucephalus*, Gyll., Schönh.

Corpus subdepressum, breve, obtusum, capite lato, in thoracem posticè immerso; elytris vix thorace latioribus, apice truncatis. *Caput* magnum, convexum, rotundatum, thoracis latitudine et in illo posticè ferè ad oculos immersum; collo nullo, foveâ magnâ, ovata, impressione profundâ inter oculos et antennarum basin, pro receptione clavæ antennarum; ocellis vel tuberculis duobus, verticalibus, mamillatis.

latis. *Oculi* parvi depressi oblongi. *Trophi* nondum descripti. *Antennæ* capite vix longiores, articulo 1mo brevi, lato, in medio emarginato, 2do? parvo subgloboso, emarginaturæ prioris inserto; ultimo magno (magnitudine capitis dimidio,) ovato-lanceolato, compresso, subtùs vel posteriùs convexo, suprà vel anteriùs concavo, apice acuto antrorsùm flexo. *Thorax* brevis, transversus, anticè multò latior, capiti æqualis et illud ambiens, basi apiceque truncatus, suprà inæqualis, præsertim pone medium. *Scutellum* mediocre, triangulare. *Elytra* thoracis antico vix latiora, oblongo-quadrata, basi ipsâ transversim impressa, lateribus inflexo-sinuata, apice truncata, anum occultantia, suprà convexa. *Alæ* amplæ. *Abdomen* breve, retusum. *Pedes* breves, validi, femoribus tibiisque valdè compressis, dilatatis, tarsis brevibus, cylindricis, ut videtur 4-articulatis, primis tribus brevissimis, coarctatis, pilosis; 4to longiore, nudo, unguibus duobus parvis arcuatis armato.

The detailed specific description of *Paussus Bucephalus* given by Gyllenhal in the Appendix to Schönherr's *Synonymia Insectorum*, and the accompanying figure, together with the observations upon the species by Dalman in the *Analecta Entomologica*, and those by Latreille in the new edition of the *Règne Animal, vol.* v. *p.* 93. have enabled me to draw the preceding characters of this otherwise undescribed genus. Dalman observes, " Hanc speciem a reliquis *Pausis* nimis distare et vix ejusdem esse generis, facile sibi persuasius habebit, qui, in Schœnherri Syn. iii. App. tab. 6. figuras hujus et *Pausi denticornis*" (*Platyrhopalus unicolor* mihi) " comparare voluerit. Etenim in illo et ceteris veris *Pausis*, caput thorace multò est minus, oculi verò magni, et prominentes; cum in *Pauso Bucephalo*, caput thoracis latitudine, oculi minuti, et os etiam alis modo

modo conformatum videatur, alias minoris momenti discrepantias, ut prætermittam. Accedunt characteribus suprà recusitis, ocelli, in paragrapho præcedenti laudati; undè satis ratio apparet quare hoc insectum proprii sit habendum generis, quod *Hylotorus* nobis nominatur; intermedium fortè inter *Pausos genuinos* et *Platypodes*:" And the following is the paragraph referred to in the preceding extract; " De ocellis Coleopterorum :—ocellos quosdam me observasse in *Pauso Bucephalo*, eosque satis accuratè depinxisse in Appendice ad Schœnherri *Syn. Ins.* i. tab. 6, 2, c etsi cl. Gyllenhal speciem describens non ocellos sed tubercula verticalia mamillata dixerit."

Bearing in mind the observations upon the affinities of the family given above, I cannot consider the remark made by Dalman upon the situation of the genus as founded upon actual affinity. It is indeed to be regretted, that Gyllenhal has omitted to give any account of the structure of the trophi, which might have afforded some additional information upon the subject; and the magnified figure given by Schonherr of the head is very obscure in regard to the structure of these organs.

In addition to the distinguishing characters mentioned by Dalman may also be noticed the immersion of the head nearly to the eyes in the anterior cavity of the thorax, without the intervention of any neck,—a character not found in the two preceding or two subsequent genera, and sufficient of itself to show that the genus, if here placed, unnaturally separates *Paussus* and *Platyrhopalus*. To both these genera, however, and especially to the latter, it is evidently allied, from the subbipartite formation of the thorax, which is evidently traceable in the deeply impressed transverse striga.

Species

Species 1. Hylotorus Bucephalus. *Gyll., Schönh.*
Tab. XXXIII. Fig. 41, 42.

H. totus pallidè testaceus, glaber, oculis nigris, thorace posticè transversè sulcato.

Pausus Bucephalus. *Gyllenhal in Schönh. Syn. Ins. vol.* i. *p.* 3. *App. p.* 15. *tab.* 6. *f.* 2. *& f.* 2 c. caput magn. auct.

Hylotorus Bucephalus. *Dalman, Analect. Ent. p.* 103. *Latreille, Règne Animal, 2nde edit. vol.* v. *p.* 93.

Habitat Sierrâ Leone, Africâ. *Dom. Afzelius.*

In Mus. Schönherr.

Long. corp. (e figura Schœnherri) lin. $2\frac{1}{3}$.

Magnitudine *Anobii mollis* æqualis, et colore similis, pallidè testaceus, glaber, nitidus. *Caput* fronte lineâ impressâ, posticè bifidâ, ramulis in tuberculis duobus vel ocellis desinentibus. *Oculi* nigri. *Antennæ* corpore concolores, articulis ut suprà dictum. *Thorax* suprà inæqualis, paulò pone medium strigâ angulatâ, valdè profundâ, et anticè posticèque aliis obsoletissimis, transversim impressus. *Scutellum* concolor. *Elytra* testacea, nitida, lævia. *Alæ* fusco-hyalinæ. *Corpus* subtùs testaceum, punctulatum. *Pedes* pallidè testacei.

The specific characters given above are derived from Gyllenhal's description. I have not seen the species, which is the only one with which I am acquainted belonging to the genus.

Genus 4. Platyrhopalus* *mihi.*

Paussus. *Donovan, Gyll., Schönh., Dalm.*

Type of the Genus, *Paussus denticornis*, Don.

Corpus depressum. *Caput* thorace minus, porrectum, subquadratum, posticè in collum breve angustatum. *Oculi* magni,

* *Πλατὺς, latus;* and *ῥοπαλὸν, clava;* in allusion to the broad flat terminal point of the antennæ.

prominuli,

prominuli, laterales. *Labrum* breve, subtriangulare, anticè rotundatum. *Mandibulæ* corneæ, tenuissimæ, valdè arcuatæ, apice in dentem acutissimum terminato,釈 internè uni- vel bi-dentatæ. *Maxillæ* parvæ, lobo basali crustaceo, processu terminali vel interno plano, acuto, corneo, valdè compresso, mandibuliformi, latere interno uni- vel bidentato. *Palpi maxillares* ut in *Paussis*. *Mentum* breve, transversum, crustaceum, angulis anticis in spinam longam productis, etiam in medio, anticè, paulò, subrotundè producto. *Palpi labiales* eâdem longitudine ut in *Paussis*, in lobos vel scapos duos, articuliformes, crassiores, internè connexos, insidentes, et inter *mentum labium*que inserti, 3-articulati, porrecti, articulis longitudine subæqualibus, articulo 1mo crassiori, 3tio tenuiori, apice acuto. *Labium* subquadratum, externè planum, anticè integrum, angulis anticis rotundatis. *Antennæ* magnæ, articulis quasi duobus, priori minori, compresso, apice obliquè emarginato, angulo interiori suprà producto, ferè conico; tunc articulus? parvus, subglobosus, emarginaturæ prioris immersus; cui insidet articulus ultimus, maximus, planus, valdè depressus, et in priorem subtransversè impositus, margine omni compresso, acuto, basi truncatus, et externè incisus, vel dentatus, etiam juxta basin supernè transversìm impressus, (articulorum divisionem referens,) nec basi uncinatus. *Thorax* planus, brevis, transversus, latior, lateribus anticis rotundatis. *Elytra* thorace multò latiora, posticè subtruncata, oblongo-quadrata, depressa. *Pedes* breviusculi, crassi, tibiis dilatatis; posticis externè in spinam parvam productis. *Tarsi* breves, articulis 4, (si articulus alius basalis ut in *Pausso* minutissimus est et vix discernendus,) articulis tribus basalibus, compressis, intùs pilosis; articulo ultimo longiori,

longiori, lævi, tenuori, cylindrico, unguibus duobus. *Abdomen* elytris paulò longius.

I have considered myself warranted in regarding the characters of the *Paussus denticornis* of Donovan and its affinities as indicative of a genus distinct from that of the true *Paussi,* not only in consequence of their dissimilar general external appearance or habit, but also of the variation exhibited in the lower parts of the mouth.

The typical species appears to have been inserted in the genus *Paussus* by Donovan with a feeling of suspicion, since he states that, according to Afzelius's characters, it should not come into that genus, the number of joints in the tarsi being only, as he incorrectly states, 3: whereas, in the other species, the tarsi are 5-jointed, although, if not closely inspected, they appear 4-jointed. The essential generic characters of the insect were however omitted in Donovan's short specific description.

Gyllenhal, in the *Synonymia Insectorum* of Schönherr, vol. i. part 3; App. p. 14. tab. 6. fig. 1. (by a singular coincidence, evidently arising from similarity of structure,) described and figured a distinct species nearly allied to Donovan's *P. denticornis,* under the same name. He, however, regarded it as a true *Paussus,* and thus shortly described its trophi: "Os inflexum brunneum, palpis crassis, pilosis, conicis vel extrorsùm attenuatis," evidently without noticing the peculiar structure of the latter organs.

Dalman also in his observations upon the *Paussus Bucephalus* mentioned above, regarded the *P. denticornis* of Gyllenhal as a true *Paussus,* "Etenim in illo et in *ceteris veris Pausis,* &c."

From the true *Paussi,* however, these insects appear sufficiently generically distinct; since the flat, depressed body and thorax; the

the regular shape of the latter, scarcely exhibiting any appearance of the bipartite structure observable in *Paussus;* the extreme flatness and breadth of the antennæ; the broad legs; the very hairy basal joints of the tarsi; and, above all, the formation of the lower lip (*labium*) and its equal-jointed palpi, and the scapes upon which they are inserted,—cannot be regarded otherwise than as intimating a group generically distinct from the true *Paussi*.

It may also be noticed, that the transverse impression near the base of the clava of the antennæ appears to exhibit a tendency to an articulate structure, which is confirmed by the denticulations of its outer margin. This circumstance is particularly noticeable in *P. aplustrifer*, in which there are two of these impressions with their corresponding contractions or denticulations.

The situation of the genus in the family appears to be between the species composing my second section of *Paussus*, and *Cerapterus*. In their biarticulate antennæ and the formation of their maxillary palpi they approach the former; and in the general habit of their bodies, as well as in the formation of the basal joints of their tarsi, and in the tendency to articulation exhibited in the clava of their antennæ, they approximate to *Cerapterus*.

Species 1. Platyrhopalus denticornis. *Don.*

Tab. XXXIII. Fig. 43—48.

P. brunneo-rufescens, elytris dorso fuscis, suturâ, latè ad basin, maculâque utrinque posticè, rufescentibus; antennarum clavâ magnâ, latere omni acuto, juxta basin externè incisâ; thorace anticè utrinque rotundato-dilatato.

Paussus denticornis. *Donov. Epit. Ins. Ind.* Paussus, *no.* 1. *tab.* 5. *fig.* 1. *Rees' Encycl.*, Entomology, *pl.* 8. *fig.* 10. & 10*. sine descriptione.

 Habitat

Habitat in Indiâ Orientali. (Bengal. *Dom. Fichtel.*)
In Mus. Brit.—Mus. Soc. Linn., Haworth, Vigors, Clark, Dejean, et Kirby.
Long. corp. lin. $3\frac{7}{8}$ ad lin. 5.

Brunneo-rufescens, suprà subdepressus, tenuiter pubescens, nitidus. *Caput* porrectum, subquadratum, transversum, anticè emarginatum, et paulò deflexum; longitudinaliter tenuè canaliculatum, posticè in collum breve contractum. *Oculi* magni, laterales, prominuli, glauci. *Palpi* rufescentes, porrecti. *Antennæ* brunneo-rufescentes, pilosæ, articulo 1mo difformi, lato; apicali maximo, thorace majori, ferè ovato, basi tamen subemarginatè truncato, suprà in disco parùm convexo, subtùs magìs gibboso, margine omni compresso acuto, supernè juxta basin (et cum eo parallelo) impressione transversâ, quæ, margine superiori vel externo in incisionem profundam at angustiorem, desinit, angulo basali vel postico (dentem formante) externè subrotundato, incisione internè ferè rectâ, indè dentis apex subobtusus apparet. *Thorax* brevis, transversus, basi apiceque truncatus, anticè multò latior et elevatior, lateribus rotundato-dilatatis, juxta vel paulò ante basin, subemarginatis, ibique depressus et utrinque foveâ transversâ brevi parvâ; totus brunneo-rufescens, obsoletè et parcè punctatus, pubescens. *Elytra* thoracis antico latiora, et illo quadruplò longiora, oblongo-quadrata, subdepressa, basi transversè impressa, abdomine breviora, fusco-rufescentia, disco nigro, suturæ dimidio basali latè, maculâque posticâ rotundâ utrinque rufescentibus, subnitida, obsoletissimè punctata. *Abdomen* elytris paulò longius, segmento anali rotundato. *Pedes* breviusculi, dilatati, tibiis latis, valdè compressis, apice exteriore subspinosis.

This

This species (which is easily characterizable from the maculation of its elytra) varies upwards of a line in length: the smallest individual which I have seen is contained in the cabinet of the Linnean Society, and is somewhat darker-coloured than the larger specimens.

In consequence of the priority in the nomenclature of this species employed by Donovan, I have considered it proper to retain his specific name for it.

The dissections of the genus represented in the plate were made from a duplicate specimen of this species contained in the cabinet of the Linnean Society, in which the various parts figured are deposited.

The peculiar form of the external incision of the base of the antennæ is carefully represented in the plate.

Species 2. PLATYRHOPALUS UNICOLOR *mihi.*

TAB. XXXIII. Fig. 49.

P. totus brunneo-castaneus, antennarum clavâ magnâ ovatâ compressâ juxta basin externè incisâ, thorace anticè utrinque rotundato-dilatato.

Pausus denticornis. *Megerle, Illig. Mag.* 3. *p.* 113. not. (absque descript.) *Gyllenhal in Schönh. Syn. Ins. tab.* 1. *p.* 3. *App. p.* 14. *tab.* 6. *fig.* 1. *Schönh. id. p.* 19. *no.* 5. *Dalman, Anal. Ent. p.* 103. sub *Hylotoro Bucephalo.*

Habitat in Indiâ Orient. *Dom. Prof. Schumacher.*

Long. corp. (sec. fig. Schönherri) lin. $4\frac{1}{3}$. Magn. nat. *Clero formicario* latior sed in elytris brevior.

In Mus. Schönherr, Gyllenhal, et Dejean.

Totus brunneo-castaneus, suprà subdepressus, tenuè pubescens, nitidus, obsoletè punctatus, *P. denticorni* Don. structurâ valdè affinis. *Caput* subquadratum, brunneum, nitidum, suprà

suprà subdepressum, obsoletè canaliculatum, et, e figurâ Schönherri, vix anticè emarginatum. *Oculi* glauci. *Antennæ* articulo apicali maximo, ferè plano, vel multùm compresso, ovali, in margine superiori vel externo profundè incisus. *Thorax* brevis, transversus, anticè multò latior, lateribus rotundato-dilatatis, pone medium citò coarctatus, anteriùs convexus, posteriùs depressus, et strigâ mediâ transversâ, abbreviatâ, impressus. *Elytra* humeris antrorsùm prominentibus, castanea, subnitida. *Corpus* subtùs brunneo-castaneum, nitidum. *Pedes* breviusculi, pallidiùs castanei, valdè compressi, tibiis dilatatis.

The chief differences observable between this species (the material characters of which, in consequence of not having met with a specimen, I have abridged from Gyllenhal's detailed specific description,) and Donovan's *P. denticornis* are, the uniformity of colour in the former, the apparently rounded front of its head, the sudden coarctation of the base of its thorax, and its "striga media transversa, abbreviata."

In consequence of the priority of Donovan's specific name *denticornis*, applied to the preceding species, I have considered it expedient to give this a name referring to the uniformity of its colour.

Amongst the insects brought from Nepaul by Major-General Hardwicke, is a mutilated specimen of an insect intimately allied to the two preceding species, but apparently distinct from either of them. As the elytra, legs, and abdomen of the specimen are wanting, I am unable satisfactorily to ascertain its specific identity. The head and thorax, however, are smaller and darker-coloured than in *P. denticornis* Don.; the thorax is proportionably rather longer; the eyes are black; the head is rounded and subdepressed in front and not emarginate; the internal

internal margin of the clava of the antennæ exhibits a stronger contraction at the base than in that species, and the incision on its outer edge is much wider, and the basal tooth very acute. (Tab. nostr. Fig. 50.) If ultimately found distinct, the species may receive the name of *acutidens*.

I provisionally place in this genus the two following insects, not having had an opportunity of minutely examining their trophi: their general flattened appearance and the apparent indication of a rudimental notch at the base of the clava of their antennæ approach the true *Platyrhopali;* whilst in some respects they agree with some of the *Paussi*, such as *P. affinis*, *&c.* I obtained a knowledge of them, as well as of the *Paussus excavatus* and *P. armatus*, during my visit to Paris in September 1830, subsequent to the reading of the commencement of this paper.

Species 3. Platyrhopalus? lævifrons. *Dejean.*
Tab. XXXIII. Fig. 65—67.

P. latus subdepressus toto obscurè rufo-castaneus, antennarum clavâ ferè ovatâ depressâ basi truncatâ, externè in unguem parvum producto, margineque externo quadri-subdentato, thorace utrinque anticè rotundato-dilatato.

Paussus lævifrons. *Dejean, Mss.*

Habitat in Africâ occidentali, Senegaliâ. *Dom. Dumolin.*

In Mus. Dejean, et Dupont.

Long. corp. lin. 5.

Species nova magnaque. Latus, subdepressus, punctatus, obscurè rufo-castaneus, subhirsutus, lævis, nitidus. *Caput* porrectum, subquadratum, vertice convexo, lævi, anticè rotundatum, posticè in collum breve productum. *Oculi* mediocres. *Antennarum clava* magna ferè ovata depressa sc. suprà disco parùm convexo, subtùs etiam parùm convexo sed

sed in medio disci subacutiùs producta, basi subemarginatè truncata, angulo postico basali in dentem parvum producto latereque postico impressionibus 4 brevibus transversis, quæ in dentibus minutissimis in marginem desinunt, margineque omni subacuto. *Thorax* ferè quadratus, subdepressus, bipartitus, portio antica e posticâ lineâ impressâ separata, elevatior et latior, lateribus rotundato-dilatatis, portio postica in medio elevationi transversâ, lateribus rectis, at in medio utrinque paululùm subacutè productis. *Elytra* thoracis antico latiora, oblongo-quadrata, subdepressa, abdomine paulò breviora, lævia, nitida, evidenter punctata. *Pedes* breves femoribus tibiisque dilatato-compressis.

This fine species is unique in the magnificent collection of M. le Comte Dejean, who informs me that he now possesses between 20,000 and 21,000 species of *Coleoptera*. It is therefore with the greatest pleasure that I take the present opportunity of acknowledging my thanks to that distinguished entomologist for the kindness with which he allowed me to make use not only of this, but of various other valuable portions of his collections.

Species 4. Platyrhopalus? dentifrons. *Dejean.*

Tab. XXXIII. Fig. 68—70.

P. subcylindricus, ferrugineo-testaceus, antennarum clavâ, brevi, latâ, basi truncatâ et in spinam obtusam externè productâ, apiceque rotundato; vertice spinâ erectâ setigerâ; thorace lateribus anticis rotundatis et dilatatis.

Paussus dentifrons. *Dejean, Mss.*

Habitat in Senegaliâ. *Dom. Dumolin.*

In Mus. Dejean, et Dupont.

Long. corp. lin. $3\frac{3}{4}$.

Nova

Nova species. Subcylindricus, toto ferrugineo testaceus, punctatissimus, nitidus, subpubescens. *Caput* latum, thorace paulò minus, suprà convexum, spinâ erectâ verticali, acutâ, setigerâ; margine antico vix emarginato; post oculos in collum contractum. *Oculi* magni laterales. *Antennæ* articulo basali crasso, dilatato, clavâque brevi latâ thorace paulò majori, subovatâ, basi latiori, truncatâ et externè in spinam productâ, suprà parùm convexâ irregulari, eminentiis duabus (sc. basi et post medium,) subtùs multò convexiori præsertim in regionem basalem, margine omni acuto. *Thorax* capite paulò latior, subconvexus et quasi bipartitus, portio antica major elevatior, latior, lateribus rotundatis et e portione posticâ impressione transversâ tenui (at in medio profundiori, anticè posticèque paulò productâ) separata, portio postica brevis depressa, lateribus ferè rectis vel posticè paululùm obliquè protensis. *Elytra* thorace latiora, subcylindrica, abdominis apicem non tegentia, oblongo-quadrata, nitida, evidenter punctatissima. *Pedes* breves, femoribus tibiisque compressis.

I am indebted to M. le Comte Dejean for permission to describe and figure this species from his cabinet. It is with considerable doubt that I place it in the genus *Platyrhopalus*, (although the structure of the thorax and the flatness of the antennæ approach the typical species of that genus,) the cornuted head appearing to give it an affinity with the *Paussi*, such as *P. sphærocerus*, *&c.*: but from a note made in Paris, I have a slight idea that the labial palpi have the joints of equal length.

Species 5. Platyrhopalus? aplustrifer *mihi.*
Tab. XXXIII. Fig. 51.

P. depressus, totus rufo-fulvus, antennarum clavâ latâ, planâ, externè spinis duabus acutis, thorace brevi plano, marginibus anticis rotundatis, posticis dilatato-acutis, lobo transverso basali.

Habitat —— ?

In Mus. Brit. (sub nomine Mss. "*Paussus tridenticornis*").

Long. corp. lin. $3\frac{2}{5}$.

Species nova insignisque. Depressus, lævis, testaceo-fulvus, subpubescens. *Caput* subtriangulare, anticè vix emarginatum, convexum, basi in collum citò contractum. *Oculi* laterales, mediocres, prominuli. *Mandibulæ* tenues, arcuatæ, acutæ. *Palpi labiales* breviores, triarticulati? articulis subæqualibus? *Antennæ* pubescentes, articulo basali subcompresso, angulo superiori producto; apicali magno, valdè compresso, subovato, in articulum priorem subtransversè inserto, margine interno paulò rotundato-dilatato, apice rotundo, margineque externo ad basin impressionibus vel excisionibus duabus minutis subcontracto, (ad articulorum duorum basalium divisiones referentibus,) etiam ad medium marginis postici, spinis vel dentibus duobus longis acutissimis, basi latioribus, validis, instructo; inter quos spatium valdè emarginatum. *Thorax* planus, capite latior, brevis, lateribus dilatatis, marginibus anticis rotundatis posticisque acutè productis et quasi truncatis, angulis paulò elevatis, foveâ utrinque basi minimè profundâ, lobo basali transverso brevi e thoracis basi, foveâ transversâ tenuissimâ, separato (ut in genere *Lebiâ*). *Elytra* subdepressa, oblongo-quadrata, basi thorace paulò latiora et illo ferè quadruplò longiora lævia, basi transversim impressa,

capite

capite thoraceque colore fulviori. *Pedes* longiores, subtenues, tibiis apice compressis, et utrinque spinâ minutâ armatis. *Tarsi* ut videtur 4-articulati.

This remarkable species exhibits in its antennæ and thorax a structure totally unlike that of any other individual in the family. At the base of the terminal joint of the former organs we perceive two transverse depressions with small corresponding contractions on its outer edge, evidently indicative of two basal rudimental joints. The singular acute horns which arm the clava of the antennæ, as well as the rounded anterior margins and acutely dilated posterior angles of the thorax with its short transverse basal lobe,—similar to that found in the genus *Lebia*,—will not fail to attract the attention. I regret that the only specimen with which I am acquainted, and which is contained in the cabinet of the British Museum, has unfortunately been pierced through the centre of the head, so that I cannot state so accurately as I could have wished the formation of the trophi; one of the mandibles, however, which is visible, is slender, acute, and bent at the tip. The maxillary palpi appear to resemble those of this genus, and the labial palpi seem (at least as well as I could examine them,) shorter than in the typical species, and composed of three subequal joints. In this uncertainty, therefore, I place the species in the present genus with doubt, although from its general appearance, depressed form, and the flatness and size of its antennæ and thorax, it seems to be referable to this rather than to the genus *Paussus*. The specimen stands in the British Museum cabinet under the manuscript name of "*Paussus tridenticornis*," a name so inappropriate, that I have not hesitated to alter it to that employed above, in allusion to the resemblance which the antennæ bear to a small military double-tongued banneret. From the manner in which

 the

the antennæ are situated upon the head, it appears to me that when alive the insect carries them with the spines pointing upwards, so that, probably, their flat inner surfaces may be applied to each other. I regret not having been able to obtain any information respecting its habitat.

Genus 5. Cerapterus. *Swed., Don., Latr., &c.*

Corpus depressum, capite minori, thorace majori, abdomine latiori. *Caput* thorace angustius, depressum, subtriangulare, posticè collo brevi, cylindrico, instructum. *Oculi* mediocres, globosi, laterales, valdè prominuli. *Antennæ* capitis fronte insertæ, pubescentes, perfoliatæ, 10-articulatæ, capite cum thorace paulò longiores, articulo 1mo compresso, apice concavo clypeato, transverso; articulis reliquis depressis, latis, articuli 2—9 equalibus depressis, brevibus, latissimis, parallelis, et transversaliter impositis, ultimo in eodem cum reliquis plano, ferè quartam partem antennæ constituente, apice rotundato. *Labrum, mandibulæ, maxillæ*que minutæ. *Palpi* elongati, inæquales; *maxillares* (*maxilla*, Swed. fig. 4. *a, b.*) longi, cornei, 4?-articulati, articulo penultimo apice crassiori, ultimo tenui acuto; *labiales* crassiores, articulo ultimo longiori, latiori, depresso, truncato. *Thorax* planus, immarginatus, lateribus dilatatis. *Scutellum* mediocre, triangulare. *Elytra* lata, planiuscula, elongato-quadrata, marginibus lateralibus, inflexo-convolutis, apice subtruncata. *Abdomen* elytris paulò longius. *Pedes* breves, valdè compressi, lati. *Tarsi* angusti, filiformes, breves, articulis basalibus ciliatis, articulo ultimo longo, simplici.

This genus was established by Swederus in the Transactions of the Swedish Academy, vol. ix. 1788, p. 203, for the reception of an insect which he had received from General Davies of Blackheath.

Blackheath. The genus, however, remained unnoticed until Donovan described a second species in his Natural History of the Insects of New Holland, and also recorded the existence of a third, which had been consigned by Fichtel to the Imperial Cabinet at Vienna. The generic characters were not detailed by Donovan, with the exception of those drawn from the antennæ. Latreille in his *Genera Crustaceorum, &c.*, evidently guided by Donovan's work, and unacquainted with the original description of Swederus, gave the genus with characters drawn merely from the antennæ, and with Donovan's species as the type: and it is through this slight description alone that the French entomologists appear to be acquainted with the genus, since in the *Encyclopédie Méthodique* the genus *Cerapterus* was entirely omitted in the Letter *C.*; and the only notice of it in the later volume of that work, under the article *Paussus*, omits all mention of the original species. It is with pleasure that I now give the characters of the genus in detail, which I have drawn from the generic and specific description of *Cer. latipes* given by Swederus, from the characters exhibited by Donovan's figure of *Cer. MacLeaii*, and from an examination of the insect contained in the cabinet of the East India House subsequently mentioned. This examination, although merely external, has enabled me to state the formation of the terminal joints of the palpi, and thus to exhibit their resemblance in general formation with the *Paussi*, thereby also proving that the disagreement appearing in the figures of these organs given by Swederus (tab. 6. f. 2, 3 & 4.) is produced by the incorrectness of the delineation of the maxillary palpi in the two former figures. In the latter figure (to which the detailed generic description of these organs alone refers) they are, however, correctly represented, although we find that description, which is as follows, to be incorrect: "Os maxillis palpisque. Palpi *quatuor* inæquales, ultimo

ultimo articulo longiori, latiori, depresso, truncato, tab. 6. f. 4. *c, d, e.*" (In the figure referred to, which is generally correct, there are, however, only *two* organs thus formed.) "Maxilla (Mandibula *Fabr.*) brevis, apice cornea, arcuata, subulata, fig. 4. *a, b.*" (although the figure exhibits a pair of organs thus formed, which are, in fact, the maxillary palpi). The large size of the labial palpi compared with the maxillary, and their general structure, are singular characters. In respect to the former character they approach *Pentaplatarthrus.* The *Cerapterus MacLeaii* might indeed be considered as the connecting species between *Paussus* and *Cerapterus;* but, at the same time, the flattened thorax and antennæ of *Platyrhopalus* evidently exhibits great affinity between that genus and *Cerapterus*, although the joints of the palpi are comparatively much larger. Swederus and Donovan were silent as to the number of joints in the tarsi; and I regret not being able to supply the deficiency, from the circumstance of the only individual which I have been enabled to examine being the single specimen in the Javanese collection, which I consequently was unable to investigate so minutely as I could have wished, as also from the basal joints being retracted within the hollowed tip of the tibia; the terminal joint is, however, longer and flattened, and apparently broader at the base than at the tip. The basal joint of the antennæ is broad and compressed, with the tip emarginate, and the second joint is inserted in the centre of this emargination at right angles. The second and following joints are flat, broad, and depressed, and exhibit as singular an appearance as any antenna with which I am acquainted, and which together with the other characters will instantly distinguish this genus not only from the rest of the family, but from every other known genus.

In the formation of the underside of the body this genus does not

not materially disagree from *Pentaplatarthrus* and *Paussus*; and as both Swederus and Donovan have given figures of the undersides of their respective species, I have not thought it material to add a similar representation of the Javanese specimen. Of the habits of the species nothing is recorded.

Species 1. CERAPTERUS LATIPES. *Swederus.*

C. latus, depressus, "piceus, elytris macula flavescente," apicali majuscula, "pedibus latissimis, tarsis intra tibias, retractilibus."

C. latipes. *Swed. Kongl. Vetensk. Acad. &c. T.* 9. 1788. *p.* 203. *pl.* 6. *fig.* 1. *Don. Ins. New Holland* (sub *Cerapt. MacLeaii*). *Schönh. Syn. Ins. vol.* i. *p.* 3. *part.* 19. *no.* 1.

Habitat, ... vid. infrà.

Long. corp. e figura Swederi, lin. 6. Magn. nat. Silphæ 4-maculatæ. *Swed.*

Corpus latum, depressum. "*Caput* nigrum subpunctatum. *Oculi* albescentes. *Antennæ* ferrugineo-piceæ, hirtæ; *palpi* ferruginei, parùm hirti. *Thorax* planiusculus, anticè et posticè truncatus, lateribus dilatatis, rotundatis, ferrugineo-piceus, hirtus, posticèque utrinque foveolatus. *Scutellum* majusculum, triangulare, glabrum, nigro-piceum. *Elytra* glabra, punctis minutissimis excavatis, inordinatis, apice truncata," singula "macula versus apicem majuscula, sutura, margineque postico, flavescentibus. *Pectus* et *Abdomen* ferrugineo-picea, parùm hirta. *Pedes* piceo-ferruginei, femoribus tibiisque brevissimis, latissimis, compressis, elevato-punctatis, parùm hirtis, tibiis intra femora retractilibus. *Tarsi* angusti, filiformes, breves, ciliati, intra tibias retrahi et celari possunt."

Obs. 1. Primum pedum par abfuit.

Obs. 2. In delineatione insecti Swederi (fig. 1 & 2.) maculæ elytrorum

trorum apicales quasi (at indistinctè) quadratæ, apparent. Fig. 1. Insectum magnitudine naturali suprà visum. Fig. 2. Idem, magnitudine auctum, laterè visum. Fig. 3. Caput et thorax magn. plùs auct., laterè visa, antennarum formationem exhibens. Fig. 4. Idem, palpos exhibens. Fig. 5. Insectum magn. auct., subtùs visum. *f*. Antenna aucta, laterè visa. *g*, *h*. Pedes aucti.

Obs. 3. In figura 5, pedes 4 postici, multùm contracti, delineantur, indè perbreves videntur.

Obs. 4. In figuris 1 & 5. apex elytrorum subrotundatus nec truncatus apparet.

This species was described by Swederus as an inhabitant of Honduras in central America, from the Collection of General Davies of Blackheath in Kent. Mr. Donovan however states, upon the authority of that gentleman, that it came from Bengal. The specific characters introduced above in inverted commas, I have copied from the original description of the species, adding thereto such observations as appear necessary from a comparative consideration of the characters of the other species.

Amongst the Javanese insects collected by Dr. Horsfield, and now deposited in the cabinet of the Museum of the East India Company, there is an individual belonging to this genus, of which, through the kindness of that gentleman, I am enabled to give the following description and accompanying figure.

Tab. XXXIII. Fig. 52—56.

C. latus, depressus, piceus, thorace brevi transverso, elytris maculâ apicali, majusculâ, irregulari, fulvâ, pedibus latissimis, antennisque piceo-rufis.

Habitat in Javâ. *Dom. Horsfield.*

Long.

Long. corp. lin. $5\frac{1}{3}$. Lat. corp. $2\frac{1}{2}$.
In Mus. Soc. Merc. Ind. Orient.

Corpus latum, depressum, nitidum, hirtum. *Caput* porrectum, suprà transversum, piceum, subnitidum, pilosum, subpunctatum. *Oculi* mediocres, prominuli, laterales. *Os* inflexum; *palpis* porrectis, crassis; *maxillaribus* piceo-rufis; *labialibus* pallidioribus. *Antennæ* magnæ, hirtæ, piceo-rufæ, articulorum 2—9 lateribus subparallelis. *Thorax* brevis, transversus, planus, capite latior, basi apiceque truncatus, anticè latior, lateribus dilatatis, rotundatis, obscurè rufo-piceus, obsoletè punctatus, hirtus, posticè utrinque subfoveolatus. *Scutellum* mediocre, triangulare, piceum. *Elytra* thorace latiora, et illo quadruplò longiora, oblongo-quadrata, basi e thorace paulò remota, lateribus inflexis, apice subtruncata, abdominis longitudine, suprà subdepressa, picea, nitida, singula maculâ versus apicem majusculâ irregulari (sc. anticè obtusè tridentata) fulva, sutura rufescenti, basi hirta, nec nisi obsoletissimè punctata. *Corpus* subtùs rufo-piceum, nitidum, hirtum. *Abdomen* piceum. *Pedes* similes, breves, piceo-rufi, valdè compressi, femoribus tibiisque dilatatis, brevibus, latissimis, subpunctatis, parùm hirtis, tibiis intra femora retractilibus. *Tarsi* rufo-picei, breves, ciliati, intra tibiarum apices excavatos retractilibus.

The chief characters in which the insect last described appears to disagree with the original description and figure of *C. latipes*, are the irregular form of the spot at the apex of the elytra, the apparently slight increase in the length of the legs, and in the suture being rufescent, and the apex of the elytra piceous.

These differences may, however, be considered merely as apparent, since Swederus, as above observed, is not explicit as to the form of the apical spot in his species; and the legs appear very short in his figure in consequence of their being very much retracted. Should, however, these differences actually exist, I can scarcely consider them otherwise than as indicative of a variety, and not of a distinct species; since in form, colour, and indeed in all other essential specific characters, Dr. Horsfield's insect certainly appears to agree with that of Swederus. If, on the contrary, it should ultimately be ascertained that this insect is specifically distinct from the *C. latipes*, I propose that a specific name should be given to it commemorative of its learned capturer, by whose researches so many interesting novelties have been added to our zoological treasures, designating it consequently *Cerapt. Horsfieldii*, Westw.

Species 2. Cerapterus MacLeaii. *Donovan.*
Tab. XXXIII. Fig. 57.

C. angustior, subdepressus, integrè brunneus, thorace subquadrato, pedibus simplicibus.

C. MacLeaii. *Donovan, Insects of New Holland,* Genus *Cerapterus, tab.* 3. *Latr. Genera Crustaceorum, &c. vol.* iii. *p.* 4. *Schönherr, Syn. Ins. vol.* i. *part.* 3. *p.* 19. *Encycl. Méthod.* sub art. "*Paussili*".

Habitat in Novâ Hollandiâ.

Long. corp. (e figura Donovani) lin. $5\frac{1}{4}$.

In Mus. D. Francillon olim.

Corpus angustius, subdepressum, nitidum, integrè brunneum. *Caput* latum, porrectum, rotundatum; *oculi* magni prominuli. *Antennæ* majores, articulo ultimo permagno, punctato, apice rotundato. *Thorax* subquadratus, capite vix latior, angulis anticis rotundatis, posticis acutis. *Elytra* oblongo-quadrata, thorace paulò latiora, apice subtruncata, abdomine

abdomine paulò breviora. *Pedes* longiores, femoribus tibiisque simplicibus.

This species was received by the late Mr. Francillon from New Holland, and was figured by Donovan in his work upon the insects of that country.

I am not aware in whose possession the original specimen is at present. It differs materially from the *C. latipes* not only in its uniform brunneous colour, but also in its narrow form and more slender legs. The preceding specific characters are chiefly derived from Donovan's figure of the species, his description being very short.

Mr. Donovan also speaks of another species of this genus brought from Bengal by M. Fichtel, who consigned it to the Imperial Cabinet at Vienna, of which, however, he has unfortunately omitted to give the characters, and, as far as I have been enabled to ascertain, the entomologists of that city have not yet supplied the deficiency.

Genus 6. TROCHOIDEUS* *mihi.* PAUSUS, *Dalman.*

Corpus subovatum, subconvexum. *Caput* subtriangulare, apice tamen truncato, collo postico nullo. *Os* aliquantùm productum. *Labrum* integrum. *Mandibulæ* breves, labro ferè tectæ. *Palpi maxillares* filiformes, crassiusculi, 3-articulati, articulis æqualibus, 1mo 2doque breviter obovatis, apicali conoideo. *Palpi labiales* brevissimi. *Antennæ* spadiceæ, clavâ magnâ obovatâ, in capitis apice insertæ, supra os, ab oculis aliquantùm remotæ, longitudine circiter capitis cum thorace, artîculus 1mus sat longus obovatus vel pyriformis, 2dus parvus breviter obconicus (ad articuli 2di basin, certo situ, articulus alius minutissimus apparere

* Τροχοειδής, *rotundus;* in allusion to the rounded apex of the elytra.

videtur,

videtur, qui vero, vix nisi præcedentis radicula,) tota quæ restat antennæ pars, clavam format permagnam, crassam, parùm compressam, obovatam, summo apice tamen tumescenti. Hæc clava, sub oculo armato, articulata attamen videtur, scilicet articulo basali brevi, semilunari, 2do maximo clavam veram constituente, apicali brevi submamillari tumido, his omnibus tamen sic intimè connatis, ut difficilè distinguuntur. *Clava* subtùs visa, ferè instar cochleæ duplicatæ. *Oculi* laterales, parvi, rotundati, integri, parùm prominuli. *Ocelli* nulli. *Thorax* quàm longus latior, marginatus, subcordatus, basi apiceque tamen truncatus, angulis anticis rotundatis posticis subrectis, suprà convexus, (canalicula dorsali ?). *Scutellum* parvum triangulare. *Elytra* ferè obovata, scilicet, jam ad basin thorace manifestè latiora, versus medium aliquantùm dilatata, posteriùs angustata, apici rotundata dorso convexa. *Pedes* breviusculi, mutici, antici basi approximati, postici verò insertione a se invicem valdè distantes, femoribus subclavatis, elytrorum apicem haud attingentibus. *Tibiæ* muticæ, compressæ, posticæ paulò curvatæ. *Tarsi* graciles, longitudine dimidiæ tibiæ, 4-articulati, articuli 1, 2, 3 minuti, brevissimi, apicalis longitudine præcedentium conjunctim, biunguiculatus. *Abdomen* planiusculum, segmentis 6, 1mo reliquis multò majore, anali minuto.

The preceding are the generic characters of an extremely interesting insect described by Dalman in his paper "Om Insekter unneslutne i Copal, &c." published in the Transactions of the Swedish Royal Academy for 1825; but regarding which (notwithstanding Dalman has observed that the antennæ are of the "forma singularis *Pauso* propria," adding, "De genere *haud dubito*, attamen characteres insecti genus propriè designantes, adjungere licet"), I feel convinced that no one, considering

ing its form and characters with reference to any of the preceding genera, will be disinclined to admit that we should be sacrificing the principles adopted by all modern entomologists, were we to regard it as congenerous with the true *Paussi*. Indeed I cannot but think that its peculiar form, together with the structure of its palpi, clearly prove not only the correctness of such a step, but also show that, if we even consider it as belonging to the family, a very aberrant situation must be assigned to it, since it appears to me clearly to point the way to some other group. And I likewise feel convinced that every friend of entomological science will rejoice that Dalman's "specimen unicum," although "copalo inclusum," was "optimè conservatum et examinatu sat facile, nisi quod attinet ad pedes anteriores sub corpore retractos."

The generic characters given above are selected from Dalman's detailed specific description, and exhibit several peculiar variations in structure. The general habit or facies of colouring of the insect, the form of the head, thorax and elytra, the length and slenderness of the legs, the formation of the maxillary, and the extreme minuteness of the labial palpi, are characters which evidently intimate a connexion with other families; while at the same time the antennæ (although the increased size of the second joint, and the rudimental articulations in the clava are worthy of notice,) evidently, as Dalman has remarked, exhibit the general "forma singularis *Pauso* propria."

Species 1. TROCHOIDEUS CRUCIATUS. *Dalman.*

TAB. XXXIII. Fig. 58, 59.

T. ferrugineus, elytrorum basi apiceque fuscis, suturâ fasciâque mediâ brunneis.

Pausus cruciatus. *Dalman, Kongl. Vetensk. Acad. Handl.* 1825. *p.* 400. *sp.* 3. *tab.* 5. *fig.* 9—11.

Habitat

Habitat ——.

Long. corp. vix lin. $1\frac{1}{2}$ Paris.

Caput fusco-brunneum, læve. *Os* cum palpis lutescens, mandibulæ pallidæ. *Antennæ* geniculis apiceque rufescentibus, oculo armato subtilissimè pubescentes. *Oculi* albi cum macula rufa. *Thorax* fusco-brunneus, margine laterali dorsoque dilutioribus, rufo-ferrugineis, subtilissimè pubescens. *Scutellum* ferrugineum. *Elytra* flavo-ferruginea, margine obscuriori et regione scutelli infuscata, per elytrorum medium fascia transversa, dorso brunnea, ad latera nigricans; et versus apicem iterùm fascia nigro-fusca, relicto tamen ipso apice rufo-piceo, suturâ rufo-piceâ cum fasciâ mediâ crucem formante. In singulo elytro stria obsoleta juxta suturam, de cetero elytra omninò lævia, nec punctata videntur, sed pube brevissima obducta. *Corpus* subtùs rufo-ferrugineum, immaculatum, læve, pectoris postici canaliculâ tenui. *Pedes* ferruginei femoribus obscurioribus; *tarsi* pallidè testacei.

In addition to the foregoing insects belonging to the family, Schönherr has included amongst his species of *Paussus*, but placed at the end of the genus with an expression of doubt, the *Hispa bihamata* of Linnæus (*Syst. Nat. ed.* 12. 1. *p.* 604. *no.* 3.). This insect, from the Linnean description of its 3-jointed antennæ (the third joint of which is longer than the thorax), and the truncation of its elytra, appears to belong to the family; but as I am not aware that anything further is known respecting its characters, except the original description, it is impossible to speak with precision upon the subject*. It is an inhabitant of India, and is stated to be of the size of *Chrysomela cuprea.*

* The singular hooks which arm the exterior angles of the posterior part of the elytra (" singula elytra posticè truncata sed angulo exteriore terminato spina magna incurva ") are characters not to be met with in any of the *Paussidæ.*

It

It only remains for me to add a few observations upon the only remaining insect which has been introduced into the family, but which does not appear referable thereto.

Fabricius, in his *Systema Eleutheratorum*, comprised in the genus *Paussus* an insect under the name of *P. flavicornis*, with the remark, "Animalculum singulare vix hujus generis." Latreille is the next author who mentions this insect, in his *Histoire Naturelle &c. tab.* 11. 209. *no.* 4. with the following "*Nota:* Cet insecte, que nous n'avons pas été à même d'examiner, doit sans doute former un autre genre, c'est aussi le sentiment de Fabricius." Schönherr, however, in his *Syn. Ins. vol.* i. *p.* 3. *no.* 9, notwithstanding these observations of Fabricius and Latreille, and evidently overlooking the specific description of the terminal joints of the antennæ, has placed it amongst the species of *Paussus* without any expression of doubt. Dalman, in the notes inserted at the end of his *Analecta Entomologica*, agrees with Fabricius and Latreille, observing " De *Pauso flavicorni* Fabr.: Hoc insectum minime *Pausi* est generis, tarsi enim omnes evidenter 5-articulati, elytris molliusculis, toto habitu atque colore ad *Malachios* nimis accedere videtur, et ipsa antennarum singularis forma sat bene congruit cum earundem structura in masculis *Malachii ænei* et specierum affinum. *Pausi flavicornis* fœmina nobis haud est visa, quare de ejus antennarum structura sumus inscii, sed insectum ad ulteriorem indagationem in musæo nostro, sub nomine *Malachii flavicornis*, militat."—pp. 103, 104.

Latreille, profiting by these observations, adds the following note at the foot of his family *Melyrides* in the *Familles Naturelles:* " Le *Pausus flavicornis* de Fabricius paraît devoir en former un nouveau genre près des précedens."—p. 353.

The preceding remarks, added to an examination of a congenerous insect in Mr. Haworth's cabinet, under the manuscript name of *Cerocoma marginata*, subsequently mentioned, have sufficiently

sufficiently convinced me that the *Paussus flavicornis* does not belong to the *Paussidæ*, but that it is referable to the *Telephoridæ;* since Dalman's observations upon the tarsi clearly prove that it is not allied to the *Cerocomæ*. I therefore propose for the insects in question, the generic name of

Megadeuterus*.

Corpus parvum, villosum. *Antennæ* articulo 1mo incurvo, elongato; 2do magno rotundato compresso; articulis reliquis brevibus, filiformibus. *Elytra* molliuscula. *Tarsi* 5-articulati.

Species 1. Megadeuterus flavicornis. *Fabr.*

M. corpore nigro, elytris cyaneis, antennarum articulis duobus basalibus flavis.

Habitat in Java.

Mus. Dom. de Sehestedt.

Paussus flavicornis. *Fabr. Syst. Eleuth.* 2. 75. 4. *Dalman loc. cit. Sch. Syn. Ins. vol.* 1. *part.* 3. *p.* 19.

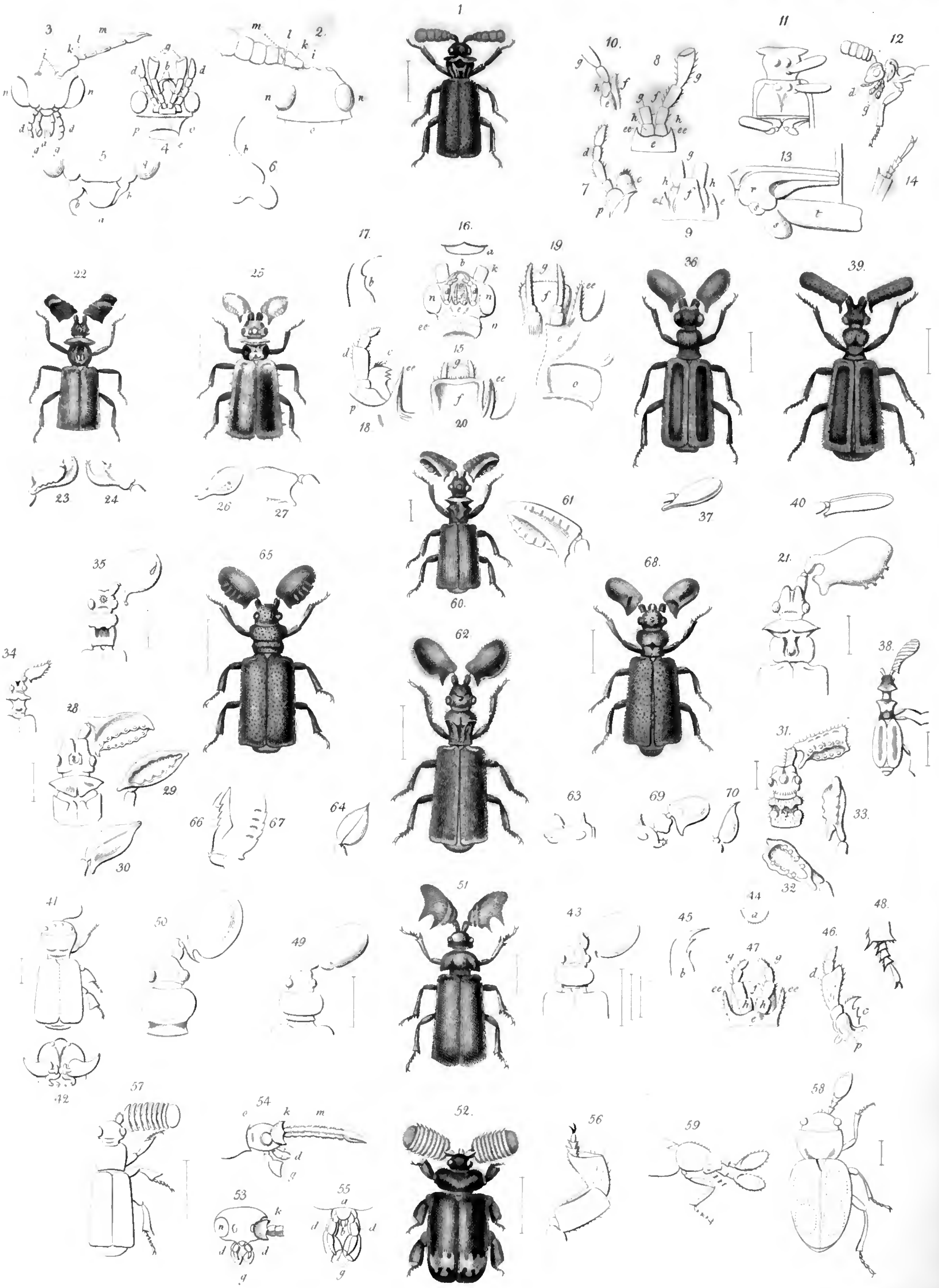
Corpus nigrum. *Caput* et *thorax* cinereo-villosa. *Antennæ* articulis duobus basalibus flavis, reliquis nigris. *Elytra* cyanea, nitida.

Species 2.

My friend A. H. Haworth, Esq., F.L.S., &c. possesses in his cabinet an undescribed insect, evidently congenerous with the above, under the manuscript name of *Cerocoma marginata*. A casual examination of this insect enables me merely to state that it appears to agree with the Fabrician description of *M. flavicornis* in all respects, except that the suture and margins of the elytra are rufous.

* μέγας, *magnus;* and δεύτερος, *secundus;*—in allusion to the large second joint of the antennæ.

EXPLA-



J. O. Westwood del.

Engraved by J. Swaine.

EXPLANATION OF TAB. XXXIII.

Note.—The Figures are all more or less magnified. The lines near the Insects figured represent their natural size. The same *small* letters refer to the corresponding or analogous parts throughout the dissections, as follows:

a. The labrum.
b. The mandibles.
p. The basal part of the maxilla.
c. The apical lobe of ditto.
d. The maxillary palpi.
e. The mentum.
e e. The produced lateral angles of ditto.
f. The labium.
g. The triarticulate labial palpi.
h. The basal scapes.
i. The place of insertion of the antenna; with the exposed part of the circular moveable ball above mentioned, upon the upper surface of which,
k. The basal joint of the antennæ is inserted.
l. The small articulation? between the basal and terminal joints of the antennæ.
m. The apical portion or clava of the antennæ.
n. The eyes.
o. The neck.

Fig. 1. to 14. *Pentaplatarthrus paussoides* and details.
Fig. 1. The insect magnified.
2. The head, seen above; exhibiting the formation and insertion of the antennæ.
3. The same, seen from the front, showing the elongation of the palpi and the flatness of the antennæ.

 Fig. 4.

Fig. 4. The same, seen from below, exhibiting the structure of the lower parts of the mouth.
5. The labrum, mandibles, and lower part of the face, more highly magnified.
6. The mandible, ditto.
7. The maxilla and its palpus.
8. The mentum, labium, palpi, and their scapes, seen from below.
9. The same, seen from within the mouth.
10. The same, seen sideways.
11. The under-side of the trunk (*thorax* Linn.)
12. The head and prothorax, seen sideways.
13. The coxa (*r*), the biarticulate trochanter (*s* & *s*), and the femur of the hind leg.
14. The tarsus.
15. to 20. Details of a species of the genus *Paussus* of the 2nd section.
15. Under-side of the head.
16. The labrum.
17. The mandible.
18. The maxilla, showing its insertion on the outside of the produced lobe of the mentum.
19. The instrumenta labialia *mihi*, or lower organs of the mouth, seen from beneath: half of the mentum and neck is removed, to show the insertion of the labial palpi.
20. The lower organs of the mouth, seen from within, with one of the lobes of the mentum.
21. Head, thorax and base of the elytra of *Paussus microcephalus*.
22. *Paussus Linnæi*.
23. Antenna of ditto, seen from the front.

Fig. 24.

Fig. 24. Antenna of *Paussus Linnæi*, seen from behind.

60. *Paussus excavatus.*

61. Antenna of ditto, seen rather obliquely from above.

25. *Paussus rufitarsis.*

26. Antenna of ditto, seen from behind.

27. Ditto, seen from above.

28. Head and thorax of *Paussus thoracicus.*

29. Clava of antenna of ditto, seen from behind.

30. Ditto, seen from the front.

31. Head and thorax of *P. Fichtelii.*

32. Antenna of ditto, seen from behind.

33. Ditto, seen obliquely in front.

34. Head, thorax, and base of elytra of *P. pilicornis*. (From Donovan).

35. Ditto of *Paussus sphærocerus.*

62. *Paussus armatus.*

63. Portion of the head of ditto, seen sideways.

64. Antenna, seen sideways.

36. *Paussus affinis.*

37. Antenna of ditto, seen from behind.

38. *Paussus lineatus.* (From Thunberg.)

39. *Paussus Hardwickii.*

40. Antenna of ditto, seen from the front.

41. *Hylotorus Bucephalus.* } (From Schönherr.)

42. Head of ditto, more highly magnified. }

43. Head, thorax, and base of elytra of *Platyrhopalus denticornis.*

44. to 48. Details of ditto.

44. The labrum.

45. The mandible.

46. The maxilla and its palpus.

47. The instrumenta labialia.

 Fig. 48.

Fig. 48. The tarsus.

49. Head, thorax, and base of elytra of *Platyrhopalus unicolor.* (From Schönherr.)
50. Head and thorax of the specimen of *Platyrhopalus* brought from Nepaul by Major-General Hardwicke, previously mentioned.
65. *Platyrhopalus? lævifrons.*
66. Antenna of ditto, seen sideways.
67. The outer margin of ditto, showing the slight impressions and teeth.
68. *Platyrhopalus? dentifrons.*
69. Portion of the head, and one of the antennæ, seen sideways.
70. The antenna of the same, seen obliquely.
51. *Platyrhopalus? aplustrifer.*
52. *Cerapterus latipes*, drawn from the specimen in the East India Company's Collection previously mentioned.
53. to 56. Details of ditto.
53. Head of ditto, seen from the front.
54. Ditto, exhibiting the flattened terminal joints of the antennæ, the two maxillary, and one of the labial palpi.
55. The parts of the mouth, seen from the front.
56. The anterior leg of ditto.
57. *Cerapterus MacLeaii.* (From Donovan.)
58. *Trochoideus cruciatus.* } (From Dalman.)
59. Head, thorax, base of the elytra, and fore-leg of ditto. } (From Dalman.)

POSTSCRIPT.

POSTSCRIPT.

Since the preceding sheets were printed, Mr. Melley of Manchester, the possessor of a very fine collection of exotic *Coleoptera*, has liberally submitted to my examination a remarkable new species of this family; and I am happy in being enabled to add the following description of it, although I regret that, in consequence of the Plate having been completed, I cannot add a figure of it, and the more especially, since the insect in question is one of the most extraordinary in the family. From the formation of the antennæ and palpi it is clearly referrible to my new genus *Platyrhopalus*, and in the former of those organs most nearly resembles *Pl. lævifrons;* but in the extraordinary breadth of its elytra (which considerably exceed, in proportion to its size, even those of the *Cerapterus Horsfieldii*), and in its very broad and flat retractile legs, it evidently approaches *Cerapterus*. Mr. Melley informs me that a description and figure of it will shortly appear in M. Guerin's *Magazin de Zoologie*. I am not, however, aware of the specific name which he is about to propose for it, and am consequently restricted from introducing it in the ordinary manner with a *nomen triviale*, unless indeed its liberal possessor will allow me the honour of applying to it the name of

Platyrhopalus Melleii, *Westw.*

Pl. piceus, elytris castaneis, latissimis, ferè quadratis, antennarum clavâ latâ compressâ margine ferè circulari basi externè angulum efformante, pedibus latissimis.

Habitat in Malabariâ.

In Mus. Melley.

Long. corp. (antennis exclusis) lin. 4½, lat. elytr. lin. 2½.

Species nova et valdè insignis. Latissimus, subconvexus, rufopiceus, tenuissimè punctatus, nitidus, subhirsutus, thorace capiteque declivibus. *Caput* parvum, parùm nitidum, anticè

ticè emarginatum, posticè in collum breve contractum. *Oculi* magni, prominuli, laterales. *Antennæ* articulo basali sat magno, depresso, apice externè obliquè emarginato, clavâ in emarginationis medium insidente, hæc clava permagna est, ferè circularis et compressa scil. facie anticâ vel superâ parùm concavâ; posticâque vel externâ parùm convexâ præsertim in medio, margine omni acuto; tres tuberculæ minutissimæ ciliatæ in marginem circuli externum, paulò ante apicem exstant, et clavæ basis interna subquadratè producitur. *Palpi maxillares* maximi, articulo antepenultimo permagno, lato, et ad apicem internè valdè producto. *Palpi labiales* cylindrici, hirsuti, articulo penultimo quàm terminali paulò majori. *Thorax* brevis, declivis, transversus, capite ferè duplò latior subopacus, marginibus lateralibus, rotundatis, portio postica brevissima, sed distincta et multò angustior est, et e portione anticâ, lineâ transversâ ferè rectâ, minimè elevatâ, separata. *Elytra* castanea, tenuissimè punctata, nitidissima, parùm hirsuta, subconvexa, et thorace e tertiâ parte conjunctim latiora; ferè quadrata, longitudine latitudinem conjunctam paulisper superante; in angulo postico externo, tuberculum parvum mamillatum utrinque adest, et apex ipse elytrorum subobliquè utrinque producitur. *Abdomen* elytris vix longius. *Pedes* breves, latissimi, depressi, *femoribus* excisione elongatâ internâ pro tibiarum receptione efformatâ. *Tibiæ* latissimæ, apice interno bicalcaratæ. *Tarsi* tibiis breviores, subcylindrici, subtùs ciliati, articulis 5 distinctis, articulo 1mo crassiori, 4to breviori, 5toque longiori et tenuiori, unguibus 2 acutis instructo; sed in pedibus 2 anticis articulus basalis brevior est quàm in 4 posticis.

June 9, 1832.

XXXV. *On*

XXXV. *On the Organs and Mode of Fecundation in Orchideæ and Asclepiadeæ.* *By Robert Brown, Esq., V.P.L.S., &c.*

Read November 1 *and* 15, 1831.

In the Essay now submitted to the Society, my principal object is to give an account of some observations, made chiefly in the course of the present year, on the structure and economy of the sexual organs in Orchideæ and Asclepiadeæ,—the two families of phænogamous plants which have hitherto presented the most important objections to the prevailing theories of vegetable fecundation.

But before entering on this account, it is necessary to notice the various opinions that have been held respecting the mode of impregnation in both families: and in concluding the subject of Orchideæ, I shall advert to a few other points of structure in that natural order.

ORCHIDEÆ.

The authors whose opinions or conjectures on the mode of impregnation in Orchideæ I have to notice, may be divided into such as have considered the direct application of the pollen to the stigma as necessary: and those who,—from certain peculiarities in the structure and relative position of the sexual organs in this family,—have regarded the direct contact of these parts as in many cases difficult or altogether improbable,

bable, and have consequently had recourse to other explanations of the function.

In 1760, Haller, the earliest writer of the first class, in describing his Epipactis, states that the antheræ or pollen masses, after leaving the cells in which they are originally inclosed, are retained by the process called by him sustentaculum, the rostellum of Richard, from which they readily fall upon the stigma*. He adds, that both in this genus and in Orchis the stigma communicates by a fovea or channel with the ovarium.

But as in 1742 he correctly describes the stigma of Orchis†, and in his account of Epipactis‡ notices also the gland derived, as he says, from the sustentaculum, and which is introduced between and connects the pollen masses, his opinion on the subject, though not expressed, is distinctly implied even at that period: or as indeed it may be said to have been so early as 1736§, when he first described the channel communicating with the ovarium, and considered it as being in the place of a style.

In 1763, Adanson|| states that the pollen masses are projected on the stigma, of which his description is at least as satisfactory as that of some very recent writers on the subject. He also describes the flower of an Orchideous plant as being monandrous, with a bilocular anthera, containing pollen which coheres in masses (a view of structure first entertained, but not published, by Bernard de Jussieu¶); and he correctly marks the relation both of the stamen and placentæ of the ovarium to the divisions of the perianthium.

In 1777, Curtis, in the Flora Londinensis in his figure and

* *Orchid. class. constitut. in Act. Helvet.* iv. p. 100.

† *Hall. Enum.* p. 262.

‡ *Id.* p. 274.

§ *Meth. stud. bot.* p. 21.

|| *Fam. des Plant.* ii. p. 69.

¶ *Juss. gen. pl.* p. 66.

account

account of *Ophrys apifera*, correctly delineates and describes the pollen masses, called by him antheræ, the glands at their base inclosed in distinct cuculli or bursiculæ, and the stigma, with the surface of which he represents the masses as coming in contact.

In his second volume, the two lateral adnate lobes of the stigma, and the auriculæ of the column of *Orchis mascula*, are distinctly shown; and these auriculæ, now generally denominated rudimentary stamina, are also delineated in some other species of Orchis afterwards figured in the same work.

In 1793, Christian Konrad Sprengel* asserts that the pollen masses are applied directly to the secreting or viscid surface on the front of the column, in other words to the stigma, and that insects are generally the agents in this operation.

In 1799, J. K. Wachter† supports the same opinion, as far as regards the necessity of direct contact of the pollen masses with the female organ; and this observer was the first who succeeded in artificially impregnating an Orchideous plant, by applying the pollen to the stigma of *Habenaria bifolia*.

In 1799 also, or beginning of 1800, Schkuhr‡ takes the same view of the subject, and states that the pollen masses, which resist the action of common moisture, are readily dissolved by the viscid fluid of the stigma.

In 1800 Swartz§, in adopting the same opinion, notices various ways in which the application of the pollen may be effected in the different tribes of this family, repeats the statement of Schkuhr on the solvent power of the stigma, and in *Bletia Tankervilliæ* describes ducts which convey the absorbed fluid from that organ to the ovarium.

In 1804, Salisbury|| asserts that he had succeeded in im-

* *Entd. Geheim.* p. 401.
† *Römer Archiv.* ii. p. 209.
‡ *Handbuch* iii. p. 192.
§ *Act. Holm.* 1800 p. 134.
|| *Linn. Soc. Transact.* vii. p. 29.

pregnating many species belonging to different tribes of Orchideæ, by applying the pollen masses to the stigma, whose channel communicating with the cavity of the ovarium, and first noticed by Haller, he also describes.

In 1827, Professor L. C. Treviranus* published an account of several experiments made by him in 1824, which satisfactorily prove that impregnation in this family may be effected by the direct application of the pollen to the stigma.

About the end of 1830 a letter from Professor Amici† to M. Mirbel was published, in which that distinguished microscopical observer asserts that in many phænogamous plants the pollen tubes, or *boyaux*, penetrate through the style into the cavity of the ovarium, and are applied directly to the ovula.

In this important communication Orchideæ are not mentioned, but M. Adolphe Brongniart in a note states that he himself has seen the production of *boyaux* or pollen tubes even in this family; that here, however, as well as in all the other tribes in which he had examined these tubes, he found them to terminate in the tissue of the stigma.

Of the second class of authors the earliest is Linnæus‡, who, in 1764, not satisfied either with his own or any other description then given of the stigma, inquires whether the influence of the pollen may not be communicated internally to the ovarium.

In 1770, Schmidel§, in an account which he gives of a species of Epipactis, describes and figures the upper lip of the stigma, the rostellum of Richard, with its gland both before and after the bursting of the anthera; and as he denominates that

* *Zeitschrift f. Physiol.* ii. p. 225. † *Annal. des Sc. Nat.* xxi. p. 329.

‡ *Prælect. in Ord. Nat. ed. Giseke.* p. 182.

§ *Gesn. Op. Bot. hist. plant.* fasc. ii. p. 15. tab. 19.

part,

part, before the pollen masses are attached to it, "stigma virgineum," he may be considered as belonging to the same class.

Koelreuter, the next writer in point of time, and whose essay was published before Linnæus's query appeared, states, in 1775*, that the pollen masses, which he denominates naked antheræ, impart their fecundating matter to the surface of the cells of the true anthera, regarded by him consequently as stigma, and that through this surface it is absorbed and conveyed to the ovarium.

In 1787, Dr. Jonathan Stokes† conjectures that in Orchideæ, as well as in Asclepiadeæ, the male influence, or principle of arrangement, as it is termed by John Hunter, may be conveyed to the embryo without the intervention of air: a repetition certainly of Linnæus's conjecture, with which however, as it was not published till 1791, he could not have been acquainted.

In 1791, Batsch‡ states that in Orchis and Ophrys,—and his observation may be extended at least to all Satyrinæ or Ophrydeæ,—the only way in which the mass of pollen can act on the ovarium, is by the retrogradation of the impregnating power through the pedunculus or caudicula of the pollen mass to the gland beneath it, which he is disposed to refer rather to the stigma than to the anthera.

The late Professor Richard, in 1802§, expressly says that fecundation is operated in Orchideæ and Asclepiadeæ without a change of place in the stamina; his opinion therefore must be considered identical with that of Batsch, and extended to the whole order.

It might perhaps be inferred from the description which I gave of Orchideæ in a work published in 1810||, that my opi-

* *Act. Phys. Palat.* iii. p. 55.

† *With. Bot. Arrang.* 2nd ed. ii. p. 964.

‡ *Botanische Bemerk.* i. p. 3.

§ *Dict. de Botan. par Bulliard* ed. 2. p. 56.

|| *Prodr. Flor. Nov. Holl.* i. p. 310.

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nion respecting the mode of impregnation agreed with that of Batsch and Richard, though it is not there actually expressed, nor indeed very clearly in another publication of nearly the same date*, in which I had adverted to this family. But I have since on several occasions more explicitly stated that opinion, which, until lately, I always considered the most probable hypothesis on the subject. At the same time its probability in this family appeared to me somewhat less than in Asclepiadeæ. For in Orchideæ a secreting surface in the female organ, apparently destined to act on the pollen without the intervention of any other part, is manifest; and some direct evidence of the fact existed, though not then considered satisfactory. In Asclepiadeæ, however, I entertained hardly any doubt on the subject; the only apparently secreting surface of the stigma in that family being occupied by the supposed conductors of the male influence, and no evidence whatever, with which I was acquainted, existing of its action through any other channel.

In 1816 or 1818 I received from the late celebrated Aubert du Petit Thouars some printed sheets of an intended work on Orchideæ, which, with a few alterations, was completed and published in 1822†.

From the unfinished work, as well as that which was afterwards published, it appears that this ingenious botanist considered the glutinous substance connecting the grains or lobules of pollen as the "aura seminalis" or fecundating matter; that the elastic pedicel of the pollen mass, existing in part of the family, but according to him not formed before expansion, consists of this gluten; and that in the expanded flower the gluten which has escaped from the pollen is, in all cases, in communication with the stigma.

He describes the stigma as forming on the surface of the column

* *Linn. Soc. Transact.* x. p. 19. † *Hist. des Orchid.* p. 14.

column a glutinous disk, from which a central thread or cord of the same nature is continued through the style to the cavity of the ovarium, where it divides into three branches, and that each of these is again subdivided into two. The six branches thus formed, are closely applied to the parietes of the ovarium, run down one on each side of the corresponding placenta to its base, each giving off numerous ramuli, which spread themselves among the ovula, and separate them into irregular groups.

Hence, according to this author, a communication is established between the anthera and the ovula, which he adds are impregnated through their surface, and not, as he supposes to be the case in other families, through their funiculus or point of attachment to the placenta.

The remarkable account of the stigma here quoted, though coming from so distinguished and original an observer, and one who had particularly studied this family of plants, seems either to have been entirely overlooked, or in some degree discredited by more recent writers, none of whom, as far as I can find, have even alluded to it. And I confess it entirely escaped me until after I had made the observations which will be stated in the present essay, and which confirm its accuracy as to the existence and course of the parietal cords, though not as to their nature and origin.

In 1824 Professor Link* expresses his opinion that the rostellum of Richard is without doubt the true stigma.

In 1829 Mr. Lindley†, who for several years has particularly studied and has lately published part of a valuable systematic work on Orchideous Plants, states that in this family impregnation takes effect by absorption from the pollen masses through their gland into the stigmatic channel.

In 1830, in his Introduction to the Natural System of Botany, the

* *Philos. Bot.* p. 298.

† *Synops. Brit. Flor.* p. 256.

the same statement is repeated; and in this work it also appears that he regards the glands to which the pollen masses become attached in Ophrydeæ as derived from the stamen, and not belonging to the stigma*, as in 1810 I had described them. It would even appear, from a passage in his systematic work† published in the same year, that he considers the analogous glands, existing in most other tribes of Orchideæ, as equally belonging to the stamen: in his "Introduction," however, he refers them to the stigma in all cases except in Ophrydeæ.

Towards the end of 1830 the first part of Mr. Francis Bauer's Illustrations of Orchideous Plants, edited by Mr. Lindley, was published.

From this work, of the importance and beauty of which it is impossible to speak too highly, it may be collected that Mr. Bauer's opinion or theory of impregnation in Orchideæ does not materially differ from that of Batsch, Richard, and other more recent writers. From one of the figures it appears that this theory had occurred to him as early as 1792; and in another figure, bearing the same date, he has accurately represented the structure of the grains of pollen in a plant belonging to Ophrydeæ, a structure which I had not ascertained in that tribe till 1806. Although Mr. Bauer's theory is essentially the same as that of Batsch and Richard, yet there are some points in which it may be considered peculiar; and chiefly in his supposing impregnation to take effect long before the expan-

* "The pollen is not less curious. Now we have it in separate grains, as in other plants, but cohering to a mesh-work of cellular tissue, which is collected into a sort of central elastic strap; now the granules cohere in small angular indefinite masses, and the central elastic strap becomes more apparent, has a glandular extremity, which is often reclined in a peculiar pouch especially destined for its protection."—*Introduct. to Nat. Syst. of Bot.* p. 263.

† *Gen. and Sp. of Orchid.*, Part I. p. 3.

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sion of the flower, at a time when the sexual organs are so placed with relation to each other that the fecundating matter, believed by him to pass from the pollen mass through its caudicula, where that part exists, to the gland attached to it, may be readily communicated to the stigma, with which the gland is then either in absolute contact or closely approximated. The more important points of this account may be extended to nearly the whole order, but it is strictly applicable only to Satyrinæ or Ophrydeæ, a tribe in which Mr. Bauer seems, with Mr. Lindley, to consider the glands as belonging to the stamen and not to the stigma*. In those genera of this tribe in which the glands are included in a pouch or bursicula, he describes and figures perforations in the back of the pouch, through which the fecundating matter is communicated from the glands to the stigma; and one of the figures is intended to represent a gland in the act of parting with the fecundating matter.

It is impossible to judge correctly of Mr. Bauer's theory until all the proofs and arguments in its favour are adduced. I may observe, however, that those already published are by no means satisfactory to me.

* In the second part of Mr. Bauer's Illustrations, which has appeared since this paper was read, the explanation of Tab. 3. fig. 6. is corrected in the following manner:

"*For* 6. A pollen mass with its caudicula and gland taken out of the anther;

"*Read* 6. A pollen mass with its caudicula and the internal socket of the stigmatic gland."

It is evident, indeed, in the second part of the Illustrations, from figures 8, 9, 11, and 12, of Tab. 12. representing details of *Satyrium pustulatum*, and the drawings of which were made in 1800, that Mr. Bauer must, from that time at least, have correctly understood the origin of the glands in Ophrydeæ. There is nothing, however, in any of the figures in Tab. 3. of the first part at variance with their explanations, from which I judged of his opinion. It may therefore be concluded that Mr. Bauer had not examined these explanations before their publication.

For,

For, in the first place, in the very early stage in which, according to this theory, impregnation is supposed to be effected, it appears to me that the pollen is not in a state to impart its fecundating matter, nor the stigma to receive it; and it may be added, though this is of less weight, that the ovula have neither acquired the usual degree of development, nor that position which they afterwards take, and which gives the apex of the nucleus or point of impregnation the proper direction, with regard to the supposed impregnating surface.

Secondly, in the figure which may be said to exhibit a demonstration of the correctness of the theory,—in that, namely, representing the gland in the act of parting with the fecundating matter,—the magnifying power employed (which is only fifteen times,) is surely insufficient for the establishment of a fact of this kind; while the disengagement of minute granules, which no doubt often takes place when the gland is immersed in water, may readily be accounted for in another way*.

Thirdly, I have never been able to find those perforations, represented by Mr. Bauer, in the bursiculæ of Orchis and Ophrys, and the existence of which in these genera is essential to his hypothesis.

And, lastly, the appearance of the stigma in *Bletia Tanker-*

* This second observation ought not now to be taken into account, as in the second part of Mr. Bauer's Illustrations the following correction occurs respecting the figure alluded to (Tab. 3. fig. 8.)

"This is in some measure an ideal figure to represent in what way the fecundating matter is supposed to leave the caudicula and stigmatic gland; for this reason there has been no attention paid to preserving a proportion between the pollen mass and the fecundating matter."

I may here, however, remark, that it was evidently not my intention, in the observation in question, to throw any doubt on the correctness of Mr. Bauer's figure, being aware that very minute granular matter, separating from the gland when immersed in water, is actually visible with a lens of about half an inch focus. I objected to it only as a satisfactory proof of the theory referred to.

villiæ,

villiæ, after impregnation, as he believes, according to my view of the subject would rather prove that it was in a state capable of acting upon, but had not yet received the fecundating matter from, the anthera.

In thus venturing to differ from so accurate and experienced an observer as Mr. Bauer on a subject which he has for many years minutely studied and so beautifully illustrated, I am well aware how great a risk I incur of being myself found in error.

I am very desirous, however, that the perusal of this sketch of the various statements that have appeared on the question of impregnation, with the greater part of which he is at present probably unacquainted, should induce him to reexamine the facts and arguments by which his own opinion on this subject is supported. He will thus either succeed in establishing his theory on more satisfactory grounds, or, if the examination should prove unfavourable, he will, I am persuaded, from his well known candour, as readily abandon it.

The notice here given of the opinions of botanists on impregnation in Orchideæ brings the subject down to the spring of the present year, when from circumstances, which I may hereafter have occasion to advert to, my attention was directed to this family of plants, the particular study of which I had for a long time discontinued.

In reviewing notes respecting them, made many years ago, I found some points merely hinted at, or imperfectly made out, which seemed deserving of further examination; and in the course of these inquiries, other observations of at least equal importance suggested themselves.

I now proceed to state, in some cases briefly, in others at greater length, the results of this investigation.

The first question that occupied me was, the relation which

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the lateral and generally rudimentary stamina bear to the other parts of the flower.

Into this subject I had in part entered in my Observations on Apostasia, published by Dr. Wallich in his "Plantæ Asiaticæ Rariores*," and had then considered it probable that in all cases these Stamina, in whatever state of development they were found, belonged to a different series from the middle and usually fertile stamen; in other words, were placed opposite to the two lateral divisions of the inner series of the perianthium. In 1810, however, when I first advanced my hypothesis of the true nature of these processes of the column, I supposed, though the opinion was not then expressed, that they formed the complement of the outer series of stamina; a view which has been since very generally adopted, especially by Dr. Von Martius, who has given it in a stenographic formula, and by Mr. Lindley, who has exhibited the relative position of parts in this family in a diagram†. A careful examination of the structure of the column in various tribes of the order, chiefly by means of transverse sections, has fully confirmed the opinion I entertained when treating of Apostasia; and more particularly established the fact in Cypripedium, in which these lateral stamina are perfectly developed.

On the hypothesis of rudimentary stamina I may remark, that it presented itself to me some time before the publication of the Prodromus Floræ Novæ Hollandiæ; and my belief is, that until the appearance of that work this view had not been taken by any other observer in England. Mr. Bauer at least, in a recent conversation on the subject, readily admitted, with his usual candour, that although acquainted with a case of accidental development, the general view had not occurred to him until stated by me.

* Vol. i. p. 74. † *Introduct. to Nat. Syst.* p. 264.

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In my mind it arose from contrasting the structure of Cypripedium with those genera of New Holland Orchideæ—Diuris, Prasophyllum, and others—in which the lateral processes or appendages of the column are so remarkably developed; and I afterwards, in searching for additional confirmations of the hypothesis, believed I had found such in the more minute lateral auriculæ of the column present in most Ophrydeæ.

These auriculæ however, though they might serve to confirm, would hardly have suggested the hypothesis, at the period especially of which I speak. They had indeed until then been altogether overlooked, except by Malpighi*, by Curtis in his Flora Londinensis, perhaps in Walcott's Flora Britannica, and by Mr. Bauer, whom they were not likely to escape.

In my recent observations on Apostasia, referred to, I noticed a singular monstrosity of *Habenaria bifolia*, which, if such deviations from ordinary structure are always to be trusted, would throw great doubt on the hypothesis being applicable to these auriculæ of Ophrydeæ. For in this case, in which three antheræ are formed, auriculæ not only exist on the middle or ordinary stamen, but one is also found on the upper side of each of the lateral antheræ, which are here opposite to two divisions of the outer series of the perianthium. I have lately met with another instance of a similar monstrosity equally unfavourable; and I may add that this doubt is still further strengthened by my not being able to find vascular cords connected with these auriculæ in the only plants of Ophrydeæ in which I have carefully examined, with this object, the structure of the column, namely, *Orchis Morio*, *mascula*, and *latifolia*.

I do not indeed regard the absence of vessels as a complete proof of these auriculæ not being rudimentary stamina. But I may remark, that in the other tribes of Orchideæ, in many of

* *Op. Om.* tab. 25. fig. 142.

 whose

whose genera analogous processes are found, and in which tribes alone cases of their complete development have hitherto been observed, vessels not only generally exist in these processes, but may often be traced to their expected origins, namely, into those cords which also supply the inner lateral divisions of the perianthium.

Although not necessarily connected with my subject, I may here advert to the remarkable monstrosity in the flowers of an *Ophrys* described and figured by M. His* upwards of two years before the appearance of my Prodromus. This account I did not meet with till after that part of the volume relating to Orchideæ was printed; and I have here only to observe respecting it, that neither the monstrosity itself, consisting of the conversion into stamina of the three inner divisions of the perianthium, nor the author's speculation founded on it, has any connexion with my opinion which relates to the processes of the column.

M. His's paper, however, and the remarkable structure of *Epistephium* of M. Kunth, have together given rise to a third hypothesis, whose author, M. Achille Richard†, considers an Orchideous flower as generally deprived of the outer series of the perianthium, which is present only in Epistephium. He consequently regards the existing inner series of perianthium, or that to which the labellum belongs, as formed of metamorphosed stamina.

This hypothesis, although apparently sanctioned by the structure of Scitamineæ, I consider untenable; the external additional part in Epistephium, which I have examined, appearing to me rather analogous to the calyculus in some Santalaceæ, in a few Proteaceæ, and perhaps to that of Loranthaceæ.

* *Journal de Physique,* lxv. (1807), p. 241.

† *Mém. de la Soc. d'Hist. Nat. de Paris,* iv. p. 16.

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With reference to the support the hypothesis may derive from the monstrosity described by M. His, I may add that I have met with more than one case of similar conversion into stamina of the inner series of the perianthium, or at least of its two lateral divisions, with a manifest tendency to the same change in the labellum: and in one of these cases, namely *Neottia picta*, in addition to the conversion of the two lateral divisions of the perianthium, the lateral processes of the column were also completely developed.

The next point examined was the composition of the Stigma with the relation of its lobes or divisions to the other parts of the flower, and especially to the supposed component parts of the ovarium. On this subject very little information is to be obtained from the writings of botanists, most of whom have contented themselves with describing the stigma as a disk, a fovea glutinosa, a secreting surface, or viscid space in front of the column. The late celebrated Richard however, who adverts to the occasional existence of two lateral processes of his gynizus, may be supposed to have had more correct notions of its composition: and it may also be observed, that in Curtis's plate of *Ophrys apifera* already referred to, and still more distinctly in Mr. Bauer's figure of *Orchis mascula*, the two lateral lobes are represented as distinct, corresponding very exactly with Haller's description, in 1742, of the stigma in this genus.

The result of my examination of this point satisfied me that Orchideæ have in reality three stigmata, generally more or less confluent, but in some cases manifestly distinct, and two of which are in several instances even furnished with styles of considerable length.

These stigmata are placed opposite to the three outer divisions of the perianthium, and consequently terminate the axes of the supposed component parts of the ovarium, always regarded by

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me as made up of three simple ovaria united by their ovuliferous margins; a structure in which the ordinary relation of stigmata to placentæ is that here found.

In Mr. Bauer's "Illustrations" already referred to, a very different account is given of the composition of the ovarium, which is there said to be formed of six pieces.

This view of its composition seems to be founded on the existence of six vascular cords, on the apparent interruptions in the cellular tissue, and on the singular dehiscence of the capsule. But the mere number of vascular cords, which, being destined to supply all parts of the flower, may be said rather to indicate the divisions of the perianthium than those of the ovarium, cannot be considered as affording an argument of much importance, and, if it were, would equally apply to many other families having trilocular ovaria, as Irideæ; while the interruptions or inequalities of cellular tissue may be viewed as only the preparation for that dehiscence which, though very remarkable in this order, is in a great degree analogous to that taking place in most Cruciferæ, in several Leguminosæ, and in other families of plants. It may also be objected to Mr. Bauer's view of the composition of ovarium, that the arrangement of the parietal placentæ, which on this hypothesis would occupy the axes of the three alternate component parts, is contrary to every analogy; while the position of the stigmata, if my account should prove to be correct, affords evidence nearly conclusive of the ovarium being formed of only three parts.

In those genera of Orchideæ in which the lateral stamina are perfect, and the middle stamen without anthera, namely, Cypripedium and Apostasia, all these lobes or divisions of stigma are equally developed, are of nearly similar form and texture, and, as I have proved by direct experiment in Cypripedium, are all equally capable of performing the proper function of the organ.

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In most other cases the anterior lobe, or that placed opposite to the perfect stamen, and deriving its vessels from the same cord, manifestly differs both in form and texture from the other two. To this anterior, or upper lobe, as it generally becomes in the expanded flower, the glands always belong to which the pollen masses become attached, but from which they are in all cases originally distinct, as may be proved even in Ophrydeæ.

According to my view, therefore, of the mode of impregnation, its office is essentially different from that of the two lateral lobes or stigmata, which in various degrees of development are always present, and in all cases, when the ovarium is perfect, are capable of performing their proper function.

The greatest development of these lateral stigmata takes place in the tribe of Satyrinæ or Ophrydeæ, as in many species of *Habenaria*, those especially which are found near or within the tropics; and still more remarkably in *Bonatea speciosa*, a plant hardly indeed distinguishable from the same extensive genus.

It would seem that in *Bonatea* the extraordinary development and complete separation of these lateral stigmata, have effectually concealed their true nature; and accordingly they have uniformly been considered as forming parts or appendages of the labellum, with which indeed their bases cohere. That they are really stigmata, however, I have proved by a careful examination of the tissue of their secreting surface, by the action of the pollen artificially applied to this tissue, by the descent of its tubes, hereafter to be described, along the upper surface of the styles which is destitute of epidermis, and by the consequent enlargement of the ovarium. *Diplomeris* of Mr. Don*, which may also be regarded as a species of Habenaria, is another example of nearly the same kind; and the

* *Prodr. Flor. Nepal.* p. 26.

description

description of stigma which, in 1813, I introduced into the character of *Satyrium**, implies an analogous development in that genus.

On the relative position of stamina and stigmata in the column of an Orchideous plant, it may be remarked that there is hardly an instance of a perfectly developed stamen and stigma placed opposite to each other, and consequently deriving their vessels from the same cord.

For, in the ordinary structure of the family in which only one perfect stamen is produced, the corresponding stigma loses entirely or in great part its proper function, which it recovers, so to speak, in those cases where this stamen becomes imperfect, or is destitute of an anthera: and hence, perhaps, it may be said that to obtain in any case the complete development of the lateral stamina, and, what is of greater importance, to ensure in all cases the perfection of the lateral stigmata, these organs are never placed opposite, but uniformly alternate with each other.

The general conformation of the ovarium, with regard to the number and relative position of the parietal placentæ, and the arrangement of their numerous ovula, has long been well understood. But the early structure and evolution of the unimpregnated ovulum have not yet, as far as I know, been in any degree attended to.

In its gradual development, the ovulum exhibits a series of changes nearly agreeing with those which M. Mirbel† has described and illustrated as taking place in other families.

In the earliest state in which I have examined the ovulum in Orchideæ, it consists merely of a minute papilla projecting

* *Ait. Hort. Kew.* ed. 2. vol. v. p. 196.

† *Annal. des Sc. Nat.* xvii. p. 302.;—and in *Mém. de l'Acad. des Sc. de l'Instit.* ix. p. 212.

from

from the pulpy surface of the placenta. In the next stage the annular rudiment of the future testa is visible at the base of the papilliform nucleus. The subsequent changes, namely, the enlargement of the testa, the production of a funiculus, which is never vascular, and the curvature or inversion of the whole ovulum, so as to approximate the apex of its nucleus to the surface of the placenta, take place in different genera at different periods with relation to the development of the other parts of the flower. In general when the flower expands, the ovulum will be found in a state and direction proper for receiving the male influence. But in several cases, as in Cypripedium and Epipactis, genera which in many other respects are nearly allied, the ovulum has not completed its inversion, nor is the nucleus entirely covered by its testa until long after expansion, and even after the pollen has been acted on by the stigma, and its tubes have penetrated into the cavity of the ovarium.

The tissue of the perfect stigmata in Orchideæ does not materially differ from that of many other families. In the early state the utriculi composing it are densely approximated, having no fluid interposed. In the more advanced but unimpregnated state, these utriculi enlarge, and are separated from each other by a copious and generally viscid secretion. The channel of the style, or stigma, whose parietes are similarly composed, undergoes the same changes. Both these states are represented in one of Mr. Bauer's plates, who however considers the more advanced stage as subsequent to impregnation.

In the advanced but still unimpregnated state of the ovarium, the upper portions, which are in continuation with the axes of the three placentæ, but do not produce ovula, are of a texture somewhat different from that of the greater part of the cavity, but still more obviously different from that of the cavity of the style, being neither apparently secreting nor consisting of

 similar

similar utriculi. A narrow line of like surface is found extending on each side of every placenta nearly as far as it is ovuliferous. The three lines occupying the upper part of the axes, and the six lines marginal to the three placentæ, may, for a reason which will hereafter appear, be called the conducting surfaces of the ovarium.

The female organ, as now described, is in a proper state to be acted upon by the pollen applied to the stigma, and for the transmission of the fecundating matter into the cavity of the ovarium, in a manner and form which I shall presently attempt to explain.

In reflecting on the whole evidence existing in favour of the direct application of the pollen mass to the stigma, and especially on the recent experiments of Professor Treviranus*, I could no longer doubt that in this manner impregnation was actually effected in Orchideæ; and the sole difficulty in my mind to its being the only way arose from adverting to a circumstance that must have been remarked by every one who has particularly attended to this family, either in Europe or in tropical regions; namely, that all the capsules of a dense spike are not unfrequently ripened: a fact which at first seems hardly reconcileable with this mode of fecundation, at least on the supposition that the pollen mass is applied to the stigma by insects.

Without going fully into the question at present, I shall here only remark, that in several such cases I have satisfied myself, by actual examination of the stigmata belonging to capsules taken at many different heights in the spike, that pollen, by whatever means, had actually been applied to them†.

* *Zeitschrift, f. Physiol.* ii. p. 225.

† It may also be observed, that the same difficulty applies to many other cases of dense inflorescence, as to the female spikes or strobili of Coniferæ, Zamia, and Zea; in all of which the symmetry of the ripe fruit is generally perfect, although partial failures of impregnation might be at least equally expected.

Believing,

Believing, therefore, this to be the only mode in which impregnation is effected, I proceeded to examine the immediate changes produced by the application of the pollen masses to the stigma.

From numerous observations and experiments made with this view, chiefly in Satyrinæ or Ophrydeæ, and Arethuseæ, not however confined to these tribes, it was ascertained that the grains of pollen, soon after being applied to the stigma, either in the entire mass or separately, produce tubes or *boyaux* analogous to those first observed in one case by Professor Amici*, and afterwards in numerous others, and in many families, by M. Adolphe Brongniart†.

In Orchideæ one tube only is emitted from the absolutely simple grain, while the number of tubes generally corresponds with that of the divisions or cells of the compound grain. These tubes are of extreme tenuity, their diameter being generally less than 1-2000th of an inch, and they acquire a great length, even while adhering to the grains producing them. From these, however, they separate generally while still involved in the secretion and mixed with the utriculi of the stigma; and I have never observed an instance of a tube with its grain attached to it lower than the tissue of the stigma. In form they are perfectly cylindrical, or of equal diameter, neither dilated at the apex nor sensibly contracted in any part of their course. I have never found them either branched or jointed; but have frequently observed apparent interruptions in the tube, probably caused by partial coagulations of the contained fluid. Even in their earliest stage, while in length hardly equal to the diameter of the grain, I have not been able to observe them to contain distinct granules in employing a magnifying

* *Atti della Soc. Ital.* xix. par. 2. p. 254. *Annal. des Sc. Nat.* ii. p. 66.

† *Annal. des Sc. Nat.* xii. p. 34.

power of 150. With a power of 300 or 400 indeed, extremely minute and very transparent granular matter may be detected; but such granules are very different from those which have been supposed to belong to the grains of pollen.

As an entire pollen mass is usually applied to the surface of the stigma, and as a great proportion of the mass so applied is acted upon by the fluid in which it is immersed, the tubes produced are generally very numerous, and together form a cord which passes through the channel of the stigma or style.

On reaching the cavity of the ovarium this cord regularly divides into three parts, the divisions being closely applied to those short upper portions of the axes of the valves which are not placentiferous; and at the point where the placenta commences each cord again divides into two branches. These six cords descend along the conducting surfaces already described when speaking of the unimpregnated ovarium, and generally extend as far as the placentæ themselves, with which they are thus placed nearly but perhaps not absolutely in contact.

The cords now described, both general and partial, seem to me to be entirely composed of pollen tubes, certainly without any mixture of the utriculi of the stigma, or, as far as I can ascertain, of the tissue of the conducting surfaces.

In two cases, namely *Ophrys apifera* and *Cypripedium spectabile*, I at one time believed I had seen tubes going off laterally from the partial cords towards the placentæ and mixing with the ovula; but I am not at present entirely satisfied with the exactness of these observations, and I have never been able to detect similar ramifications in any other case*.

That the existence of these tubes in the cavity of the ovarium is essential to fecundation in Orchideæ, can hardly be questioned. But the manner in which they operate on, or whether they come

* See Additional Observations.

actually

actually in contact with, the ovula, are points which still remain undetermined.

I am aware that Professor Amici*, who discovered in several plants the remarkable fact of the penetration of the pollen tubes into the cavity of the ovarium, and who regards this economy as being very general, likewise believes that in all cases a pollen tube comes in contact with an ovulum. M. Du Petit Thouars also, in his account already quoted of these cords, supposed by him to belong to the stigma of Orchideæ, describes their ultimate ramifications as mixing with the ovula.

I do not however consider myself so far advanced as these observers in this very important point†; and what I shall have to adduce on the subject of Asclepiadeæ, makes me hesitate still more to adopt their statements.

I may also remark that in Orchideæ the six cords are to be met with even in the ripe capsule, in which, allowance being made for the effect of pressure, they are not materially reduced in size; and the statement by M. Du Petit Thouars, of the lateral branches separating the ovula into irregular groups, is certainly not altogether correct; these groups being equally distinct before the existence of the cords.

With regard to the question of the origin of the pollen tubes, several arguments might be adduced in favour of M. Brongniart's opinion; which is, that they belong to the inner membrane of the grain, the intimate cohesion of the two membranes being assumed in most cases, and the no less intimate union of the constituent parts of compound grains in some others. That an inner membrane does occasionally exist is manifest in the pollen of several Coniferæ, in which the outer coat regularly bursts and is deciduous; and it will hereafter appear, that the structure in Asclepiadeæ confirms the correctness of this view.

* *Annal. des Sc. Nat.* xxi. p. 329.

† See Additional Observations.

But

But whatever opinion may be entertained as to the origin of the tube, it can hardly be questioned that its production or growth is a vital action excited in the grain by the application of an external stimulus. The appropriate and most powerful stimulus to this action is no doubt contact, at the proper period, with the secretion or surface of the stigma of the same species. Many facts, however, and among others the existence of hybrid plants, prove that this is not the only stimulus capable of producing the effect; and in Orchideæ I have found that the action in the pollen of one species may be excited by the stigma of another belonging to a very different tribe.

The elongation of the tubes, so remarkable in this family, and their separation from the grain long before their growth is completed, render it probable that they derive nourishment either from the particles contained in the grain, or from the conducting surfaces with which they are in contact.

The first visible effect of the action of the pollen on the stigma is the enlargement of the ovarium, which, in cases where it was reversed by torsion in the flowering state, generally untwists and resumes its original position.

Of the changes produced in the ovulum consequent to impregnation, the first consists in its enlargement merely; and in the few cases where the nucleus is at this period still partially exposed, it becomes completely covered by the testa, the original apex, but now the lower extremity of which continues open. The next change consists in the disappearance of the nucleus, probably from its acquiring greater transparency, and becoming confluent with the substance of the testa. Soon after, or perhaps simultaneously with, the disappearance of the original nucleus, and while the enlargement of the whole ovulum is gradually proceeding, a minute opake round speck, generally seated about the middle of the testa, becomes visible. The

opake

opake speck is the commencement of the future embryo. At this period, or until the opake corpuscle or nucleus has acquired more than half the size it attains in the ripe seed, a thread may be traced from its apex very nearly to the open end of the testa, or as it may be supposed, to the apex of the original nucleus of the unimpregnated ovulum.

This thread consists of a simple series of short cells, in one of which, in a single instance only however, I observed a circulation of very minute granular matter; and in several cases I have been able to distinguish in these cells that granular areola so frequently existing in the cells of Orchideous plants, and to which I shall have occasion hereafter to advert.

The lowermost joint or cell of this thread is probably the original state of what afterwards, from enlargement and deposition of granular matter, becomes the opake speck or rudiment of the future embryo.

The only appreciable changes taking place in this opake rudiment of the embryo are its gradual increase in size, and at length its manifest cellular structure.

In the ripe state it forms an ovate or nearly spherical body, consisting, as far as I have been able to ascertain, of a uniform cellular tissue covered by a very thin membrane, the base of which does not exhibit any indication of original attachment at that point; while at the apex the remains of the lower shrivelled joints of the cellular thread are still frequently visible.

This cellular body may be supposed to constitute the Embryo, which would therefore be without albumen, and whose germinating point, judging from analogy, would be its apex, or that extremity where the cellular thread is found; and consequently that corresponding with the apex of the nucleus in the unimpregnated ovulum.

The description here given of the undivided embryo in Orchideous

deous plants as forming the whole body of the nucleus, and consequently being destitute of albumen, agrees with the account first I believe published by M. Du Petit Thouars*, and very soon after by the late excellent Richard†.

The only other remark I have to make on the fructification of this family, is, that the seed itself, as well as its funiculus, is entirely without vessels, and that the funiculus, which in the ripe seed is inserted into the testa close to one side of its open base, can hardly be traced beyond that point.

I shall conclude my observations on Orchideæ with a notice of some points of their general structure, which chiefly relate to the cellular tissue.

In each cell of the epidermis of a great part of this family, especially of those with membranaceous leaves, a single circular areola, generally somewhat more opake than the membrane of the cell, is observable. This areola, which is more or less distinctly granular, is slightly convex, and although it seems to be on the surface is in reality covered by the outer lamina of the cell. There is no regularity as to its place in the cell; it is not unfrequently however central or nearly so.

As only one areola belongs to each cell, and as in many cases where it exists in the common cells of the epidermis it is also visible in the cutaneous glands or stomata, and in these is always double,—one being on each side of the limb,—it is highly probable that the cutaneous gland is in all cases composed of two cells of peculiar form, the line of union being the longitudinal axis of the disk or pore.

This areola, or nucleus of the cell as perhaps it might be termed, is not confined to the epidermis, being also found not only in the pubescence of the surface, particularly when jointed, as

* *Hist. des Orchid.* p. 19.

† *Mém. du Mus. d'Hist. Nat.* iv. p. 41.

as in Cypripedium, but in many cases in the parenchyma or internal cells of the tissue, especially when these are free from deposition of granular matter.

In the compressed cells of the epidermis the nucleus is in a corresponding degree flattened; but in the internal tissue it is often nearly spherical, more or less firmly adhering to one of the walls, and projecting into the cavity of the cell. In this state it may not unfrequently be found in the substance of the column, and in that of the perianthium.

The nucleus is manifest also in the tissue of the stigma, where, in accordance with the compression of the utriculi, it has an intermediate form, being neither so much flattened as in the epidermis, nor so convex as it is in the internal tissue of the column.

I may here remark, that I am acquainted with one case of apparent exception to the nucleus being solitary in each utriculus or cell, namely in *Bletia Tankervilliæ*.

In the utriculi of the stigma of this plant I have generally, though not always, found a second areola apparently on the surface, and composed of much larger granules than the ordinary nucleus, which is formed of very minute granular matter, and seems to be deep seated.

Mr. Bauer has represented the tissue of the stigma in this species of Bletia, both before and as he believes after impregnation; and in the latter state the utriculi are marked with from one to three areolæ of similar appearance.

The nucleus may even be supposed to exist in the pollen of this family. In the early stages of its formation at least a minute areola is often visible in the simple grain, and in each of the constituent parts or cells of the compound grain. But these areolæ may perhaps rather be considered as merely the points of production of the tubes.

 This

This nucleus of the cell is not confined to Orchideæ, but is equally manifest in many other Monocotyledonous families; and I have even found it, hitherto however in very few cases, in the epidermis of Dicotyledonous plants; though in this primary division it may perhaps be said to exist in the early stages of development of the pollen. Among Monocotyledones the orders in which it is most remarkable are Liliaceæ, Hemerocallideæ, Asphodeleæ, Irideæ, and Commelineæ.

In some plants belonging to this last-mentioned family, especially in *Tradescantia virginica* and several nearly related species, it is uncommonly distinct, not only in the epidermis and in the jointed hairs of the filaments*, but in the tissue of stigma, in

* The jointed hair of the filament in this genus forms one of the most interesting microscopic objects with which I am acquainted, and that in three different ways:

1st. Its surface is marked with extremely fine longitudinal parallel equidistant lines or striæ, whose intervals are equal from about 1-15,000th to 1-20,000th of an inch. It might therefore in some cases be conveniently employed as a micrometer.

2ndly. The nucleus of the joint or cell is very distinct as well as regular in form, and by pressure is easily separated entire from the joint. It then appears to be exactly round, nearly lenticular, and its granular matter is either held together by a coagulated pulp not visibly granular,—or, which may be considered equally probable, by an enveloping membrane. The analogy of this nucleus to that existing in the various stages of development of the cells in which the grains of pollen are formed in the same species, is sufficiently obvious.

3rdly. In the joint when immersed in water, being at the same time freed from air, and consequently made more transparent, a circulation of very minute granular matter is visible to a lens magnifying from 300 to 400 times. This motion of the granular fluid is seldom in one uniform circle, but frequently in several apparently independent threads or currents: and these currents, though often exactly longitudinal and consequently in the direction of the striæ of the membrane, are not unfrequently observed forming various angles with these striæ. The smallest of the threads or streamlets appear to consist of a single series of particles. The course of these currents seems often in some degree affected by the nucleus, towards or from which many of them occasionally tend or appear to proceed. They can hardly however be said to be impeded by the nucleus, for they are occasionally observed passing between its surface and that of the cell; a proof in the cells of the ovulum even before impregnation, and in all the stages of formation of the grains of pollen, the evolution of which is so remarkable in those species of Tradescantia*.

The few indications of the presence of this nucleus, or areola, that I have hitherto met with in the publications of botanists, are chiefly in some figures of epidermis, in the recent works of Meyen and Purkinje, and in one case in M. Adolphe Brongniart's memoir on the structure of leaves. But so little importance seems to be attached to it, that the appearance is not always referred to in the explanations of the figures in which it is represented. Mr. Bauer however, who has also figured it in the utriculi of the stigma of *Bletia Tankervilliæ*, has more particularly noticed it, and seems to consider it as only visible after impregnation.

proof that this body does not adhere to both sides of the cavity, and also that the number and various directions of the currents cannot be owing to partial obstructions arising from the unequal compression of the cell.

* In the very early stage of the flower bud of *Tradescantia virginica*, while the antheræ are yet colourless, their loculi are filled with minute lenticular grains, having a transparent flat limb, with a slightly convex and minutely granular semi-opake disk. This disk is the nucleus of the cell, which probably loses its membrane or limb, and, gradually enlarging, forms in the next stage a grain also lenticular, and which is marked either with only one transparent line dividing it into two equal parts, or with two lines crossing at right angles, and dividing it into four equal parts. In each of the quadrants a small nucleus is visible; and even where one transparent line only is distinguishable, two nuclei may frequently be found in each semicircular division. These nuclei may be readily extracted from the containing grain by pressure, and after separation retain their original form.

In the next stage examined, the greater number of grains consisted of the semicircular divisions already noticed, which had naturally separated, and now contained only one nucleus which had greatly increased in size.

In the succeeding state the grain apparently consisted of the nucleus of the former stage considerably enlarged, having a regular oval form, a somewhat granular surface, and originally a small nucleus. This oval grain continuing to increase in size, and in the thickness and opacity of its membrane, acquires a pale yellow colour, and is now the perfect grain of pollen.

 The

The second point of structure in Orchideæ to which I shall at present more briefly advert, is the frequent existence, particularly in the parasitical tribes, of fibrous or spirally striated cells in the parenchyma, especially of the leaves, but also in the white covering of the radical fibres.

In the leaves, they are either short spirally striated cells whose longer diameter is at right angles to the surface, as in *Stelis* and *Pleurothallis*, and whose fibres or striæ are connected by a broader membrane; or, being greatly elongated and running in the direction of the leaf, resemble compound spiral vessels of enormous diameter, and consisting entirely of the spiral fibres with no visible connecting membrane: the real spiral vessels in the same species being, as they generally are in the family, very slender and simple. In the white covering of the radical fibres the shorter striated cell is met with in many genera, especially I think in Oncidium and Epidendrum, in one species of which they have been remarked and figured by Meyen*.

My concluding observation on Orchideæ relates to the very general existence and great abundance, in this family, of Raphides or acicular crystals in almost every part of the cellular tissue.

In each cell where they exist these crystals are arranged in a single fasciculus, which is generally of a square form.

The individual crystals,—which are parallel to each other,—are cylindrical, with no apparent angles, and have short and equally pointed extremities.

The abundance of these fasciculi of crystals in the cellular tissue of the auriculæ of the column or supposed lateral stamina in Ophrydeæ, is very remarkable, giving these processes exter-

* *Phytotomie*, tab. 11. f. 1 & 2.

nally

nally a granular appearance, which has been noticed though its cause seems to have been overlooked.

In the recent work of Meyen*, also, some examples of these crystals in Orchideæ are given.

ASCLEPIADEÆ.

The various statements and conjectures on the structure and functions of the sexual organs in this family were collected, and published in 1811, by the late Baron Jacquin, in a separate volume, entitled, "Genitalia Asclepiadearum Controversa."

To this work, up to the period when it appeared, I may refer for a complete history, and to the tenth volume of the Linnean Society's Transactions, along with the first of the Wernerian Natural History Society's Memoirs, published somewhat earlier, for a slight sketch, of the subject.

I shall here therefore only notice such statements as Jacquin has either omitted or imperfectly given, and continue the history to the present time.

In 1763, Adanson correctly describes the stamina in Asclepias as having their filaments united into a tube surrounding the ovaria, their antheræ bilocular and cohering with the base of the stigma, and the pollen of each cell forming a mass composed of confluent grains as in Orchideæ. He is also correct in considering the pentagonal body as the stigma; but he has entirely overlooked its glands and processes, nor does he say anything respecting the manner in which the pollen masses act upon or communicate their fecundating matter to it.

In 1779, Gleichen†, although he expressly says that in young flower buds the pollen masses are distinct from those glands of the pentagonal central body to which they afterwards are at-

* *Phytotomie.*

† *Microscop. Entd.* p. 73, et seq.

tached,

tached, yet considers both masses and glands as equally belonging to the anthera, the mass being the receptacle of the pollen. He further states that before the masses unite with the glands they are removed from the cells in which they were lodged, and are found firmly implanted by their sharp edge into the wall of the tube which surrounds the ovaria; that in this state a white viscid substance hangs to them, which when highly magnified appears to consist of very slender tubes containing minute globules; and these tubes with their contents he considers as constituting the early preparation for the formation of pollen. He also asserts that the tops of the styles are not originally connected with the pentagonal body to which the glands belong, —the stigma of Adanson, Jacquin, and others; and that therefore the true stigmata are those extremities of the styles on which, he adds, vesicles and threads are observable. And lastly, he supposes that impregnation, which he says is of rare occurrence in this family, does not usually take place until those stigmata have penetrated through the substance of the pentagonal body, and are on a level with its apex; at the same time he is disposed to believe that insects may occasionally assist in this function, by carrying the fecundating matter directly to the stigmata, if I understand him, even before they enter the pentagonal body. His conclusion therefore is, that in Asclepiadeæ impregnation may be effected in two different ways.

This description, in several respects so paradoxical, and of which Jacquin has overlooked some of the most important parts, is too remarkable to be here either omitted or abridged. It is not indeed strictly correct in more than two points, namely, in the pollen masses being originally distinct from the glands, and in the masses, when found implanted in the membrane surrounding the ovarium, having minute tubes filled with granular

nular matter hanging to them. The remaining statements, however, though essentially erroneous, are so far founded in fact, that had Gleichen either opened or rather dilated the opening which must have existed in the pollen mass when these tubes were found hanging to it, and more carefully attended to the state of the other parts of the flower when the mass was seen implanted in the tube, he must necessarily have obtained a correct view of the whole structure, and consequently have greatly advanced,—by at least half a century,—not only our knowledge of this particular family, but also the general subject of vegetable impregnation.

In 1793, Christian Konrad Sprengel, who adopts the opinion of Jacquin both with respect to the pollen masses and pentagonal stigma, further states, that this stigma has a secreting upper surface or apex, and is formed of two united bodies, each of which conveys to its corresponding ovarium the fecundating matter, consisting of the oily fluid which exudes from the surface of the pollen mass. He also considers insects as here essentially necessary in impregnation, which they effect by extracting, in a manner particularly described, the pollen masses from the cells, and applying them to the apex of the stigma. And lastly, as extraordinary activity of the insect is necessary, or at least advantageous in the performance of this operation, that activity is, according to him, produced by the intoxicating secretion of the nectaria*.

In 1809, an essay on Asclepiadeæ was published in the first volume of the Memoirs of the Wernerian Natural History Society, in which one of my principal objects was to establish the opinion, more or less conjectural, of Adanson, Richard, Jussieu,

* It may here be remarked, that the prevailing form of inflorescence in Asclepiadeæ is well adapted to this economy; for the insect so readily passes from one corolla to another, that it not unfrequently visits every flower of the umbel.

and

and Schreber, respecting the structure of the stamina and stigma. With this view I appealed to the remarkable fact, that in the early state of the flower-bud the pollen masses are absolutely distinct from the glands and processes of the stigma, to which they in a more advanced stage become attached. This proof of the real origin of parts I then believed to be entirely new. It has however been already seen that the fact was noticed by Gleichen, and it will presently appear that it was also well known to another original observer.

In the essay referred to, I had not very minutely examined the texture of the pollen mass, and in true Asclepiadeæ I had failed in ascertaining its real internal structure; not having been then aware of the existence of the included grains of pollen, but believing, until very lately, that the mass in its most advanced state consisted of one undivided cavity, filled with minute granular matter mixed with an oily fluid; and hence concluded that the fecundating matter was conveyed from the mass through the arm and gland to the stigma.

In the month of April last I saw, for the first time, drawings of several Asclepiadeæ made between 1805 and 1813 by Mr. Bauer, who, aware of the interest I took in this subject, with his accustomed liberality and kindness, offered me any part of them for publication.

Among these drawings, exceeding perhaps in beauty and in the completeness of the details all the other productions with which I am acquainted even of this incomparable artist, an extensive series, exhibiting the gradual development of the parts of the flower in *Asclepias curassavica*, were the most important.

In this series, made in 1805, and commencing when the pollen is just separable in a pulpy mass from its cell, the glands of the undivided stigma being still invisible, the fact of of the distinct origins of these parts is very satisfactorily shown, in accordance with my observations in the essay referred to*.

But in these drawings Mr. Bauer has gone further than I did, having also represented the internal structure of the pollen mass as cellular; each cell in the flower-bud just before expansion being filled with a grain of pollen, marked with lines indicating its quaternary composition; while in the expanded flower this grain is exhibited as shrivelled, having discharged its contents, which consist of a mixture of an oily fluid and minute granules. From this, the concluding stage of the series, it may be inferred that Mr. Bauer's opinion respecting the mode of impregnation in Asclepiadeæ agrees with that which I had adopted, and which, though probably originating with Richard in 1779†, and briefly stated by him in 1802‡, was first distinctly expressed as a conjecture in 1789 by M. de Jussieu.

In 1817, Mr. Stephen Elliott states that he observed, in his *Podostigma*§,—a genus nearly allied to Asclepias,—a fibre or cord extending through the centre of the corpuscular pedicel or attenuated base of the stigma, and communicating from the anthera to the ovarium. He adds, that Dr. Macbride has since seen it in some species of Asclepias.

There can be no doubt that the cord here noticed is of the same nature with that which Gleichen has described in a different state, and of which I shall presently have occasion to speak.

* In a flower-bud much earlier than the commencement of Mr. Bauer's series I have found the pistilla to consist merely of two distinct very short semicylindrical bodies, the rudiments no doubt of the future stigma.

In this stage also the antheræ are flat, nearly orbicular or ovate, greenish, rather thick and opake, but petal-like, with no inequality of surface, or any other appearance of the future cells, which in a somewhat more advanced stage are indicated by two less opake areolæ, and at the same time the two semicylindrical bodies unite to form the stigma. (Pl. 36. fig. 7—11.)

† *Encycl. Botan.* i. p. 212.

‡ *Bulliard, Dict. de Bot.* ed. 2. p. 56.

§ *Bot. of Carol. and Georg.* i. p. 327.

In

In 1824, Professor Link *, while he admits the distinct origins of the pollen masses and glands or corpuscula seated on the angles of the stigma, yet considers both these parts as equally belonging to the anthera. In this respect his opinion is identical with that of Gleichen. The pollen mass, he adds, is composed either of a cellular tissue, or manifestly of grains of pollen: the former part of the description being no doubt meant to apply to true Asclepiadeæ, the latter to Periploceæ.

Professor L. C. Treviranus in 1827 † published some observations on this family, in which his account of the structure of the pollen differs in several points from that exhibited in Mr. Bauer's drawings, which he states he had seen three years before this publication.

In *Asclepias curassavica*, the species more particularly examined by Treviranus, he describes the pollen mass as filled with compressed, nearly round but obtusely angular, colourless, simple grains, containing minute granules; the pressure of the external grains, or those in contact with the general covering, giving it the appearance of being cellular.

In speaking of the mode of impregnation, he says, that the pollen mass, at the time when its connexion is established with the process or arm of the gland, which is then very viscid, undergoes manifest changes, from being ventricose and opake becoming flat, hard, and transparent. These changes he thinks are probably owing to the extraction of its fecundating matter by the process through which it passes to the glands, and by them to the angles of the stigma, whence it may be easily communicated to the styles and ovaria. His opinion, therefore, in every respect agrees with that which originated with Richard and Jussieu, and which I had adopted.

The celebrated traveller and naturalist, Dr. Ehrenberg, in

* *Phil. Bot.* p. 300. † *Zeitsch. f. Physiol.* ii. p. 230.

1829* has given a very interesting account of the structure of the pollen masses in Asclepiadeæ, from observations commenced in 1825, and others made in 1828.

In this account he describes the pollen mass as consisting of a proper membrane bursting in a regular manner, the cavity being not cellular but undivided and filled with grains of pollen, each grain having a cauda or cylindrical tube often of great length, and all these tubes being directed towards the point or line of dehiscence. This appendage or cauda he considers analogous to the *boyau* of Amici and Brongniart, differing however in its forming an essential part of the grain in Asclepiadeæ; whereas in other families the application of an external stimulus is necessary for its production.

He is entirely silent as to the manner in which these caudate grains communicate with or act upon the stigma; and does not in any case remark,—what must, I think, have been the fact, at least in several of the plants in which this structure was observed, and especially in those with pendulous pollen,—that the mass examined was no longer in the cell of the anthera, but had been removed and probably applied to some part of the stigma.

In the month of July last I examined several species of Asclepias, with reference to Mr. Bauer's drawings and Dr. Ehrenberg's account of the pollen;—the first object, therefore, was to ascertain the structure of the pollen mass.

Although on this subject my earliest observations essentially agreed with Mr. Bauer's figures of the mass, which represent it as having a subdivided cavity with a grain of pollen in each cell; yet a further examination had led me to adopt the opinion of Treviranus and Ehrenberg, who describe its cavity as being undivided and filled with distinct grains.

* *Linnæa* iv. p. 94.

 I was

I was confirmed in this opinion on considering the state of the mass after the production of the pollen tubes: for it appeared very improbable that the cells, unless they were of extreme tenuity, could be either suddenly removed or sufficiently ruptured to admit of the passage of the tubes from its more distant parts to the point or line of dehiscence.

The appearance however occasionally met with, of lacerated membranes proceeding, as it seemed, from the margins of the areolæ of the inner surface of the mass, added to the facts which had originally led me to adopt Mr. Bauer's view, determined me to re-examine the subject.

The result of this examination, made on specimens of *Asclepias phytolaccoides* and *purpurascens*, but especially the former, proved that the mass in these species is really cellular in all stages, as Mr. Bauer has represented it in *A. curassavica*, and that in the advanced flower-bud, as in the expanded flower, the cells may be seen, though not without difficulty, after their grains are removed.

The pollen mass in several species of Asclepias, particularly in *Asclepias phytolaccoides** (and in *A. curassavica*, as figured by Mr. Bauer), consists of cells disposed in three series parallel to its sides, the middle series being often more or less interrupted.

The cells of the outer layer of each side have their opposite walls very unequal both in colour and thickness. The outer wall of each of these cells, which is formed by one of the areolæ of the surface, is of a deep yellow colour, nearly opake, and of such thickness as to prevent external bursting; the inner is of a paler yellow, semi-transparent, and so much thinner as to determine internal rupture, which in these cells, after the production of the tubes, seems to take place without regularity, and to such an extent, that after the removal of the

* Tab. 35. fig. 8.

the grain the remains of the inner wall are not very readily distinguishable.

Sections of the mass indeed, both transverse and longitudinal, exhibit an appearance of cellularity; but there is here a source of fallacy, unless the contained grains are also visible in the section: and the best proof of its being cellular is derived from the state of the central or middle series after the bursting of the mass.

The cells of this central layer are of equal thickness throughout, and on the production of the tubes burst in a definite manner towards the convex edge of the mass, and at the same time generally separate from each other. They continue however to inclose the grain, or, as it may be considered, the inner membrane of the grain of pollen, whose outer membrane is formed by the cell itself; and the tenacity of this outer membrane is such that it may easily be removed from the inner without further apparent rupture.

These central grains, thus covered by their respective cells, may readily be distinguished, by their pale yellow colour and a certain degree of opacity, from the naked grains or inner membranes, which, like their tubes, are entirely colourless, and transparent*.

In Asclepiadeæ, therefore, it may be said that the greatest development of the pollen grain exists; namely, a grain having an undivided cavity, whose membranes are entirely distinct, and the pollen tubes of which seem to possess the highest degree of vitality yet met with.

In the perfectly developed state of the pollen mass, the grain, considered as distinct from its outer membrane or containing cell, is nearly round, but slightly and obtusely angular, much compressed, with an undivided cavity, and exhibiting no indication of its being composed of four or any other number of united

* Tab. 35. fig. 9.

cells.

cells. Its membrane is transparent and colourless, made up of two united coats, and the cavity is filled with spherical granules of nearly uniform size, among which a few oily particles are occasionally observable*. In this state no appearance or indication of the tubes or appendages described by Dr. Ehrenberg is found.

On the 16th of July, in repeating my examination of *Asclepias purpurascens*†, I observed in several flowers one or more pollen masses removed from their usual place, namely the cell of the anthera, and no longer fixed by the descending arm to the gland of the stigma, but immersed in one of the fissures formed by the projecting alæ of the antheræ, and in most cases separated from the gland, a small portion of the arm or process, generally that only below its flexure, remaining attached to the mass‡.

In the cases now described, the mass, which in general is entirely concealed by the alæ, was so placed in the fissure, that its inner or more convex edge was in contact with the outer wall of the tube formed by the united filaments, and the gibbous part of the edge closely pressed to that point where this tube is joined to the base of the corresponding angle of the stigma§.

These masses, at the point of contact, in most cases adhered firmly to the tube or base of the stigma, and on being separated, a white cord or fasciculus of extremely slender threads or tubes, issuing from the gibbous part of the edge, which had then regularly burst, came into view.

On laying open the pollen mass,—which in this state was easily done, by first dilating the aperture that gave issue to the cord,—each of the tubes composing it was found to proceed from a grain of pollen. These grains retained nearly their original form, but were become more transparent, and had generally lost a great portion of their granules; and these

* Tab. 34. fig. 6; and Tab. 56. fig. 3, & 13.

† Tab. 34.

‡ Tab. 35. fig. 2, 3, 4, & 7.

§ Tab. 34. fig. 7.

granules

granules were not often to be found even in the tube, especially after it had acquired considerable length*.

Almost every grain in the mass had produced its tube, and the tubes were directed from all parts of it towards the point of dehiscence. In this state the mass had become more convex from the increased bulk of its contents.

The tube so produced from each grain of pollen cannot be said to be emitted from it, but is manifestly an elongation of its membrane. These tubes are transparent, cylindrical, about 1-2000th of an inch in diameter, neither branched nor jointed, with no apparent interruption in their cavity, and when of great length, which they often attain, are frequently without granular matter.

I next proceeded to examine the course of the cord, which in most cases,—and indeed in all where the mass had remained a sufficient length of time in the fissure,—had opened a passage for itself through the membrane, or rather had separated the upper edge of this membrane from the base of the stigma, to which it was before united. Having effected this separation, it was found to proceed along the surface of the base of the stigma in a line exactly opposite to the glands seated on the apex of the same bevelled angle. The cord having passed along the surface of the attenuated base of the stigma until it arrives at its articulation with the two styles, then inclines towards the inner side of the apex of the style nearest to it, and actually introduces itself, wholly or in part, into the hollow of the apex, which in this stage is in some degree exposed†. But as the partial separation of the styles from the stigma, then taking place, is not always sufficient for the free admission of the whole cord, a few of the tubes not unfrequently become bent, in some cases even zigzag, doubtless in consequence of

* Tab. 35. fig. 7, & 10; and Tab. 34. fig. 12.

† Tab. 34. fig. 7—9; and Tab. 35. fig. 4, & 10.

the

the obstacles opposed to them; and such tubes very seldom enter the style, but along with others hang down externally below the joint. This introduction of part of the tubes into the apex of the style is soon followed by a manifest enlargement of the ovarium, and of the style itself, which, in *Asclepias purpurascens*, then exhibits a discoloured blackish line, visible even on the surface of its inner side. On opening the cavity or body of the style in this stage, a fasciculus of tubes was constantly seen passing down the centre, which was originally pulpy, and the walls of the cavity formed by the passage of these tubes was always found indurated and blackened, having every appearance of being absolutely killed.

I have never been able hitherto to follow these tubes further than the commencement of the placenta, where they really appear to terminate*. I have not at least yet succeeded in tracing any of them either on the surface or in the substance of the placenta, though with this object I have examined it not only in its first degree of enlargement, but also in some of its more advanced stages.

The same series of appearances, with very slight modifications only, were observed in all the species of Asclepias (not indeed more than seven in number) which I had opportunities of examining during the summer. For in those species in which the pollen mass was not found transferred from its original position to the fissure, and in contact with the base of the style, no doubt by means of insects, it was not difficult to place it there; and in doing so I never failed to obtain the same results.

I now turned my attention to the base of the stigma, expecting to find there such a modification of surface as might serve to account for the rupture and production of the tubes in the mass brought in contact with it. I have, however, in no case been

* Tab. 34. fig. 10, & 11; and Tab. 35. fig. 5, & 6.

able

able to observe the slightest appearance of secretion, or any difference whatever in texture, between that part and the general surface of the stigma.

The bursting of the mass in Asclepias is uniformly on the more rounded edge; and this, it may be observed, is the inner edge or margin of the mass, with reference to the cell of the anthera in which it is formed; and I may further remark, that in the only case in which I have hitherto observed dehiscence in an erect pollen mass, namely, in *Hoya carnosa*, it also takes place along the inner margin.

In Asclepias the bursting always commences at the most prominent point of the convex edge, and to this part it is generally confined: it is sometimes however found extending through the greater part of its length.

On carefully examining the convex edge, and more particularly its most prominent portion, I have not been able to observe in it any change or peculiarity of texture, or even any obvious difference in the form of the meshes of the reticulated surface. Notwithstanding this apparent want of secretion in the base of the stigma, and of difference of texture in the covering of the mass of pollen at the point where it comes in contact with that organ, it must still be supposed that there is some peculiarity both in the surface of the stigma and in the prominent edge of the mass, on which the effects in question depend.

These effects are indeed very remarkable; the stimulus here supposed to be derived from the surface of the stigma, and applied to the prominent point of the convex edge of the pollen mass, producing its appropriate action not only in those cells or grains of pollen in immediate contact with that point, but generally in every grain in the mass. But as there are no visible conductors of this stimulus within the mass, it must either be supposed to be propagated from one cell to another, or conveyed from the prominent point of the edge to every other part of the surface of the covering itself.

To ascertain whether contact of the convex edge of the pollen mass with this point of the stigma was absolutely necessary for the rupture of the mass and the production of tubes, I in the first place introduced a mass into the fissure, but with its convex edge outwards. In this position no change whatever took place.

I next removed one of the glands of the angles of the stigma, and applied the convex edge of a mass to the surface thus exposed, which even in this stage—to facilitate the removal of the gland by insects—continues to secrete. In this case, dehiscence and protrusion of pollen tubes did follow, more slowly however, and less completely, than when brought in contact with the non-secreting base.

On applying the pollen mass of one species of Asclepias to the base of the stigma of another, the usual changes generally took place; but still, as it seemed, less perfectly, and only after a longer interval.

Pollen masses of *Asclepias purpurascens* being applied to the stigma of *Epipactis palustris*, and immersed in its viscid secretion, the dehiscence, contrary to expectation, not only took place, but even more speedily than usual, that is within twenty-four hours. Some of the grains were also found discharged from the mass unchanged, while others, both discharged and still inclosed, had begun to produce tubes.

The greater number of these observations were also made with *A. phytolaccoides*, which, on account of the greater size of its flower, I at first preferred. I found, however, with reference to such experiments, an objection to employing this species, arising from the great excitability, so to speak, of its mass, which in some cases produced its tubes merely on continued immersion in water. I even found that in this species, in the

gradual

gradual decay of the flower, where the parts remain soft, the rupture and protrusion of tubes took place while the mass was still in its original position, immersed in the cell of its anthera*. The tubes produced in this situation often acquire a great length, but coming, immediately on their protrusion from the mass, in contact with the membrane of the anthera, their course is necessarily altered; and in their new direction, which is generally upwards, they not unfrequently arrive at the top of the cell, or even extend beyond it.

In addition to the several species of Asclepias already referred to, *Cynanchum* (*Vincetoxicum*) *nigrum* is the only plant of this family in which I have observed the whole of the appearances; namely, the rupture of the mass, the production and protrusion of the pollen tubes, their union into a cord, with the course and entrance of this cord into the cavity of the style.

The present essay therefore, as far as regards this family, might with greater propriety have been entitled, "On the mode of impregnation in the genus Asclepias." It seems, however, allowable to conclude, that in all the genera having pendulous pollen masses, the same economy, slightly modified perhaps in some cases, is likely to be found. But among those with erect pollen masses, there are several in which more considerable differences may be expected. Of this section of the family I have hitherto had the opportunity of submitting only one plant to careful examination, namely, *Hoya carnosa;* and even here my observations are incomplete.

In *Hoya carnosa* I have never found the pollen tubes produced, or masses ruptured, while remaining in their original position; but I have succeeded in producing these effects by bringing them in contact with certain parts of the corona.

The rupture and protrusion of pollen tubes, then, take place

* Tab. 35. fig. 11.

 through

through the whole length of the inner edge of the mass, which, as in all the genuine species of Hoya, is truncated and pellucid*. But I have not yet been able so to place the mass as to produce a cord of tubes communicating with the stigma, nor can I at present conjecture how this is to be effected.

I shall conclude with some observations equally relating to both the families that have been treated of.

It is in the first place deserving of remark, that while Asclepiadeæ and Orchideæ so widely differ in almost every other respect, there should yet be an obvious analogy between them in those points in which they are distinguished from all other Phænogamous plants.

It is unnecessary here to state the numerous and important differences existing between these two families: but it may be of some interest to make a few remarks on their points of agreement or analogy.

These are chiefly two: The first being the presence of an

* In the tubes of *Hoya carnosa* I have been able to confirm Professor Amici's observation with respect to circulation taking place in the *boyaux* of the grains of pollen. In this case the membrane being very transparent, and the granules, before the tube has acquired any considerable length, not being so numerous as to obscure the view of the opposite currents, they were very distinctly seen.

I have also observed circulation in the pollen tubes in a few other cases; especially in *Tradescantia virginica*, in which, while the tube was still very short, the circle partly existing in the tube was completed in the body of the grain. The circular current in grains of pollen before the production of the tube may likewise, in some cases, but not very readily, be distinguished, as in *Lolium perenne*.

It might perhaps be supposed that the molecular motion, which in a former essay I stated I had seen within the body of the grain of pollen, might have been merely an imperfect view of the circulation of granules, and such I am inclined to think it really was in *Lolium perenne*.

I have however also very distinctly seen within the membrane of the grain of pollen in some species of Asclepias, vivid oscillatory motion of granules without any appearance of circulation.

apparently

apparently additional part, not met with in other families; the second, the cohesion of the grains of pollen, and their application in masses to the female organ.

With regard to the first peculiarity it may be observed, that there is no real addition made to the number of organs in either family, and that in both families the apparent addition consists in a modification or production of the stigma; the modified part of which loses the proper function of that organ.

This production of the stigma,—which is generally present, and wanting only in certain Orchideæ, where its place is sometimes supplied by an analogous modification of the male organ,—though differing very remarkably in appearance in the two families, agrees in being originally distinct from the pollen masses, and in the advanced stage becoming firmly attached to them; in adhering but slightly to the point of its formation after the attachment to the pollen takes place; and in being so constructed as to be readily removed by insects from its original position along with the pollen masses.

As to the second point of agreement; namely, the cohesion of the grains of pollen into masses of considerable size, and the application of these masses to the stigma,—it is obviously connected with that which might perhaps be termed a third peculiarity; the apparent necessity for an unusual number of pollen tubes which are to act in concert; in the one family to penetrate to and regularly arrange themselves in the cavity of the ovarium*; in the other, to open a communication with the stigma, and then to pass along a non-secreting surface, until they arrive at a distant point, where they are to be introduced into the cavity or body of the style.

With respect to the agency of Insects in fecundation in those two orders, there can be no doubt that it is very frequently employed in Orchideæ; at the same time there are evidently cases

* See Additional Observations.

in

in that family in which, from the relative position of the organs, the interposition of these agents is not always required. But in those Asclepiadeæ at least that have been fully examined, the absolute necessity for their assistance is manifest.

Two questions still remain.

The first regards the proof of the actual penetration of the pollen tubes into the cavity of the ovarium in both families.

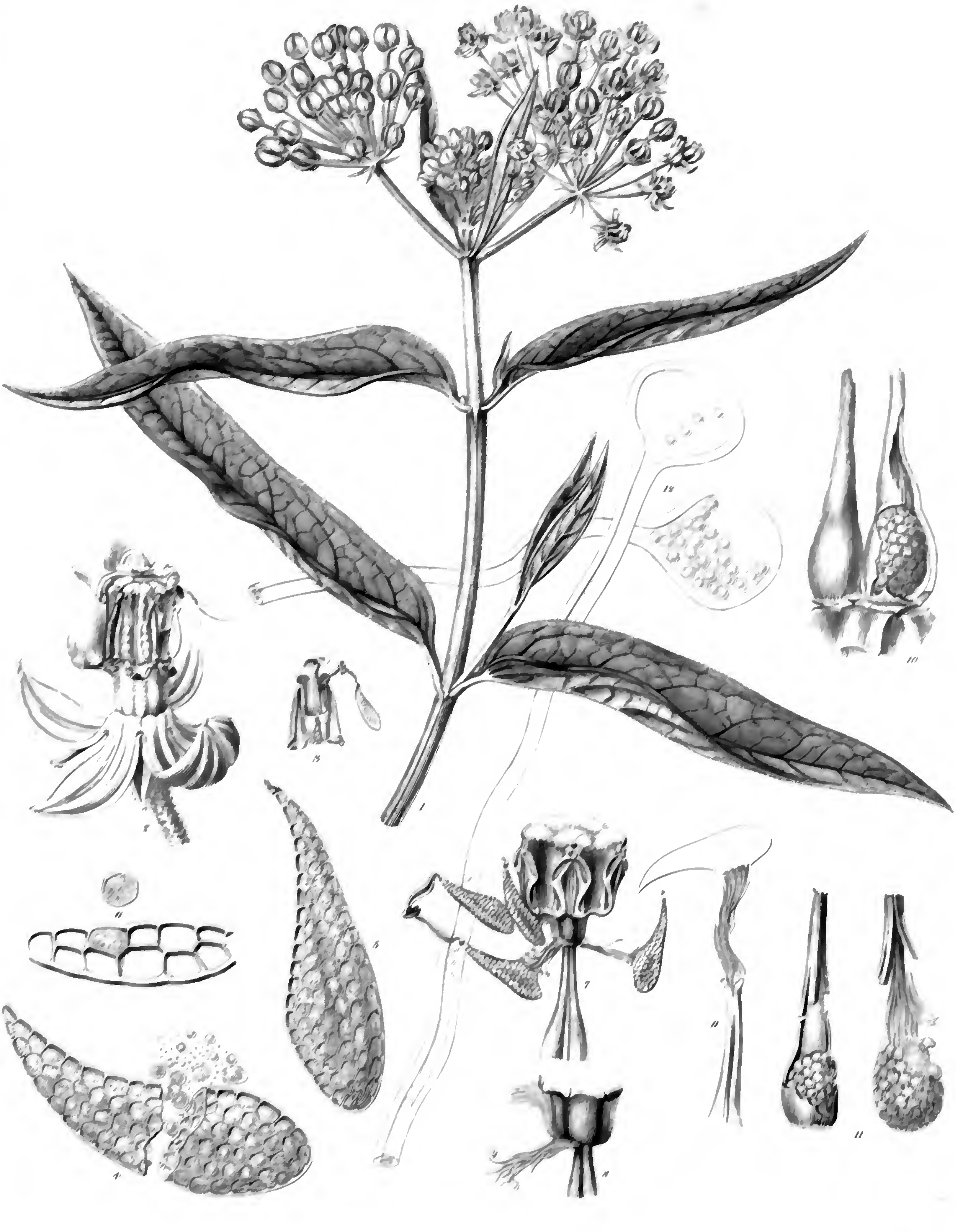
In Asclepiadeæ I shall only observe, that I consider the evidence complete; but in Orchideæ it may be admitted that it is not altogether so satisfactory. Of the descent of pollen tubes through the cavity of the stigma in Orchideæ, the evidence appears to me unquestionable. With respect, however, to the origin of the cords formed of similar tubes, so numerous and so regularly arranged in the cavity of the ovarium, and which are in contact with surfaces not altogether incapable of secretion, it might perhaps be alleged, either that they wholly originate from the supposed conducting surfaces, or that they consist of a mixture derived from both sources.

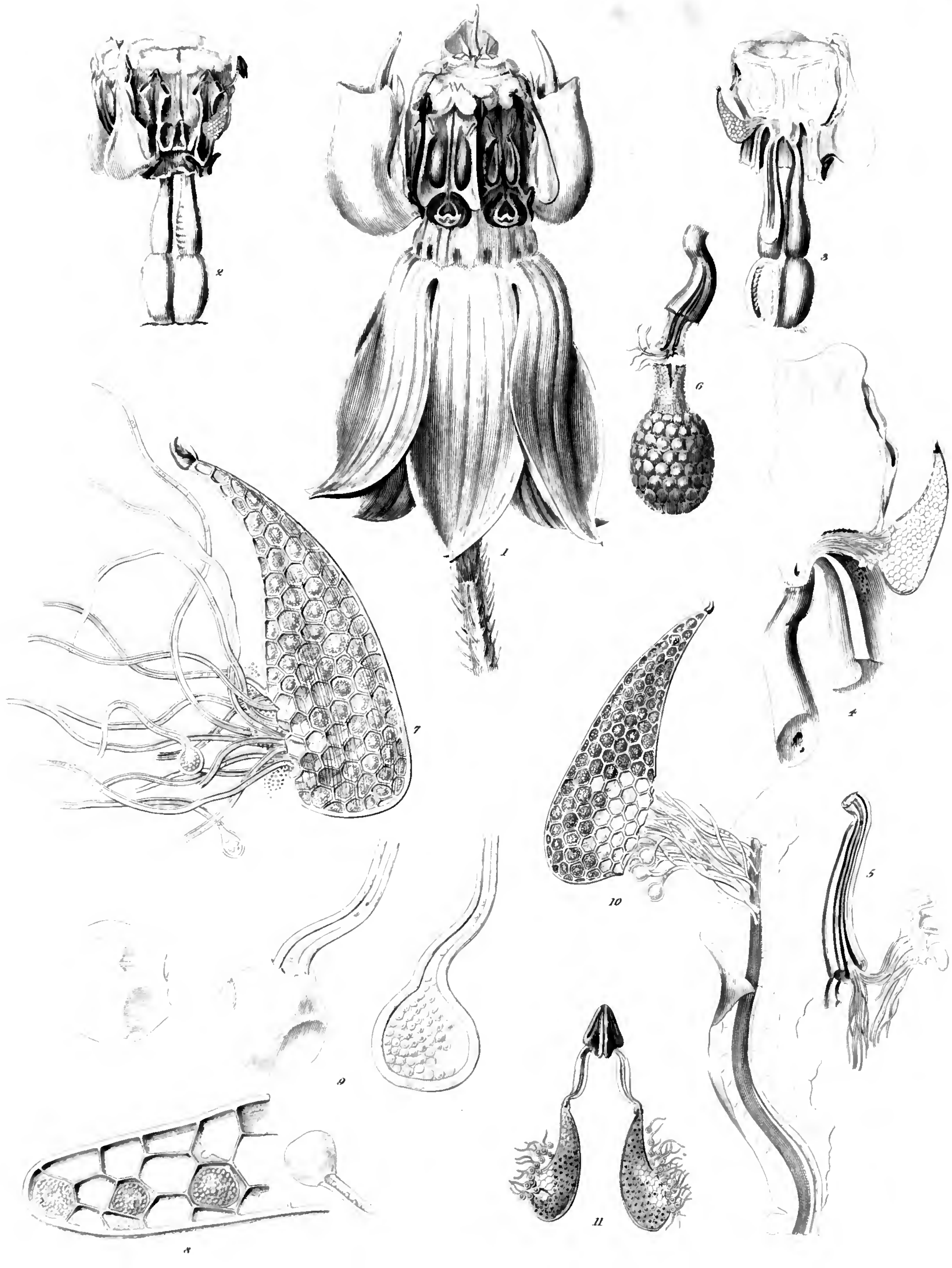
That mucous threads, or capillary tubes, in most respects similar to pollen tubes, and certainly altogether belonging to the style, exist in some plants, there is no doubt; and such I have observed in Didymocarpus, Ipomopsis, and in Allamanda, before the application of the pollen to the stigma. I am still, however, of opinion, that those found in the cavity of the ovarium in Orchideæ are really derived from the pollen*; an opinion which receives some confirmation from the manifest descent of the pollen tubes in the style in many other families, as in several Scrophularinæ, Cistineæ, Viola, and Tradescantia.

The second question is, Whether the granules originally filling the grain of pollen, and which may often be found in the tubes, especially in their nascent state, both in these and in many other families, are the essential agents in the process

* See Additional Observations.

of

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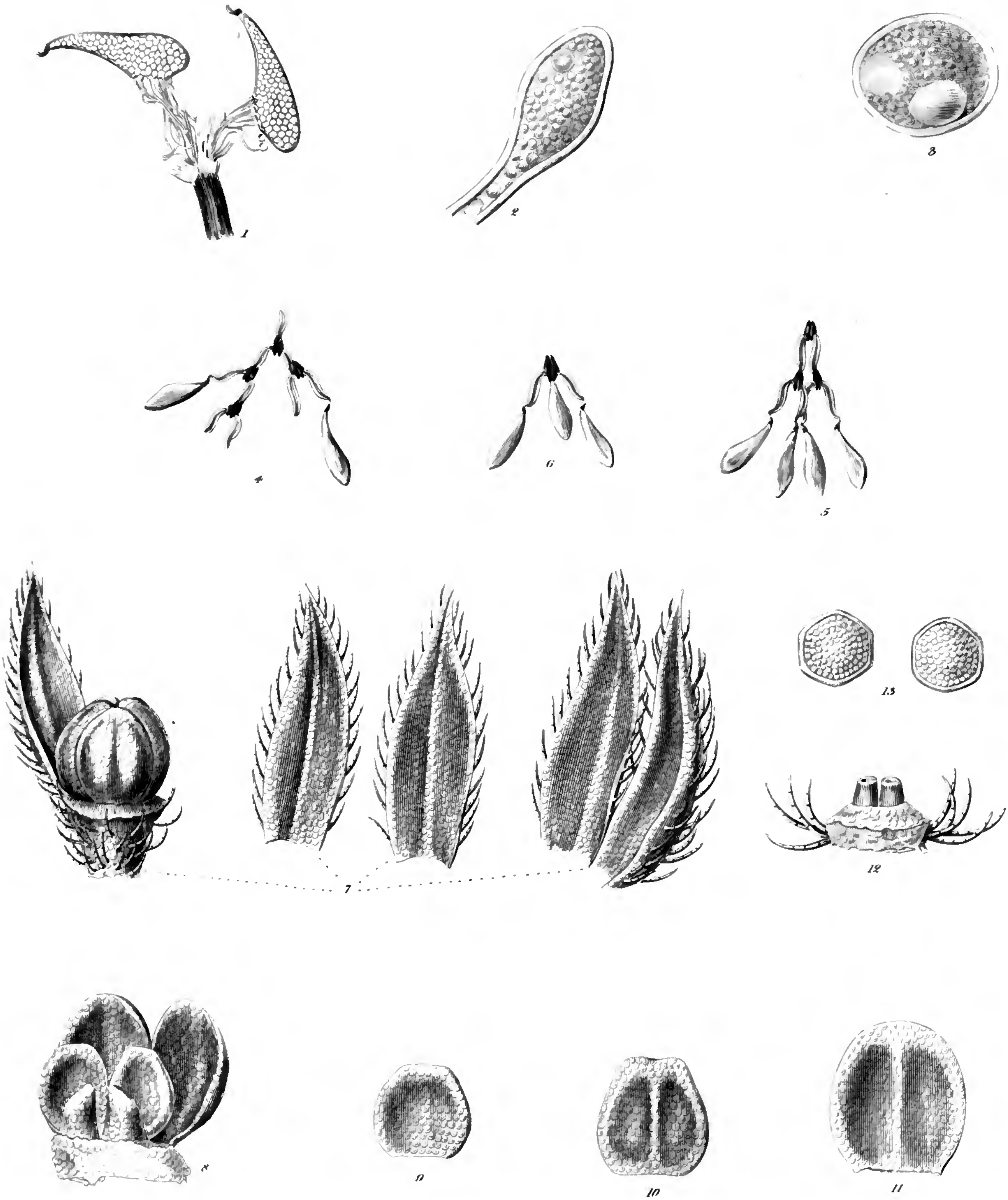
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of fecundation; the tubes being merely the channels conveying them to the organ or surface on which they are destined to act.

The arguments which might be adduced in favour of this, the generally received, opinion, would probably be the variety in the form and size of the granules in different plants, with their great uniformity in these respects in the same species; added to the difficulty of conceiving in what manner the tubes themselves can operate. On the other hand, their great diminution in number, or even total disappearance, in Asclepiadeæ and Orchideæ, long before the tubes have finished their growth, would afford an argument of some weight at least against their essential importance in any case; and it may be added, that in Asclepiadeæ there appears to be no other source of nourishment for the tube until it has penetrated into the style, than these granules. Nor is it necessary to suppose that the tubes themselves act directly, it being even probable that they also contain a fluid or granular matter much more minute than that originally filling the cavity of the grain*.

Our knowledge indeed appears to me not yet sufficient to warrant even conjectures as to the form of the immediate agent derived from the male organ, or the manner of its application to the ovulum in the production of that series of changes constituting fecundation. I may however be allowed to observe, that at present, with respect to this function, we are at least as far advanced in these two families, hitherto considered so obscure, as we are in any other tribe of Phænogamous plants: and I even venture to add, that in investigating the obscure subject of generation, additional light is perhaps more likely to be derived from a further minute and patient examination of the structure and action of the sexual organs in Asclepiadeæ and Orchideæ, than from that of any other department either of the vegetable or animal kingdom.

* See Additional Observations.

EXPLANATION OF THE PLATES.

Tab. 34. Asclepias purpurascens.

Fig. 1. A branch in flower:—natural size.

2. An expanded flower, of which two of the foliola coronæ and one of the antheræ are removed:—moderately magnified.

3. A front or inner view of an anthera, to show the extent of bursting, particularly with relation to the pollen mass, of which the greater part is included in the non-dehiscent portion:—magnified as fig. 2.

4. A pollen mass, more highly magnified, separated from its gland and arm, and divided transversely, to show its cellular structure (first discovered in *Asclepias curassavica* in 1805 by Mr. Bauer), with grains of pollen, their granules, and some drops of an oily fluid.

5. A pollen mass entire, with a small portion of the arm adhering to its apex:—magnified as fig. 4.

6. A transverse section of a pollen mass, still more highly magnified, in one of the cells of which is seen the single grain (or inner membrane), also separately exhibited to show that it is simple and slightly angular.

7. The pistillum with pollen masses, that have burst and protruded their tubes, applied to the base of the stigma, the glands and their arms being removed. The cords formed by the pollen tubes have passed along the corresponding sides of the conical base of the stigma, and have reached the tops of the styles.

8. A longitudinal section (more highly magnified) of the conical base of the Stigma with the two styles, to show more distinctly the course of the pollen tubes.

Fig. 9.

Fig. 9. A pollen mass after bursting, with its cord formed of the pollen tubes, entering the apex of the style, which is there lacerated.

10. The two Ovaria with their styles, one being somewhat enlarged in consequence of impregnation, and opened longitudinally; exhibiting pollen tubes extending from the apex of the style to the commencement of the placenta.

11. The same two ovaria and styles, both opened, to show that in one (the left), which is somewhat smaller, no pollen tubes are contained; the other (the right), which is impregnated, shows the tubes reaching the ovula, but not extending further.

12. Two grains of pollen (or rather grains deprived of their outer membranes,) with portions of their tubes and contained spheroidal granules; proving that the tubes are extensions of this (the inner) membrane:—very highly magnified.

Tab. 35. Asclepias phytolaccoides.

Fig. 1. An expanded flower (magnified), from which two of the foliola coronæ and one anthera have been removed.

2. The complete Pistillum, and on one side two of the antheræ, the membrane formed by the united filaments being cut off a little below the stigma; on the other side, a naked pollen mass applied to the stigma, with its gland and arm adhering.

3. A longitudinal section of fig. 2, to show on the left side a pollen mass, with a small portion only of the arm adhering, applied to the base of the stigma, and which, having burst, shows the protrusion of the cord formed by the pollen tubes.

Fig. 4. A longitudinal section of one half of the Stigma and the corresponding style transversely cut near the base, showing more distinctly the position of the pollen mass with the protrusion and course of the tubes.

5. The Style of fig. 4. laid open lengthways, exhibiting within its cavity and beyond it the pollen tubes reaching the apex of the placenta, a reflected portion of which, with three of its ovula, is also shown.

6. An impregnated Pistillum, of which the style is laid open longitudinally, and the placenta, thickly covered with ovula, exposed, to show the descent and course of the pollen tubes.

7. A Pollen mass, to the apex of which the base of the arm adheres, with pollen tubes protruding from the point of dehiscence :—more highly magnified.

8. A transverse section of a Pollen mass, showing an arrangement of the cells somewhat different from that of *A. purpurascens*, there being here a middle irregular series, the cells of which in some cases appear to separate and cover the grains after the production of the tubes.

9. Two grains of pollen with portions of their tubes, very highly magnified, the grain to the left having its outer covering or membrane, which is removed from the grain to the right, and shown separately further to the left.

10. A Pollen mass which has burst and protruded its tubes, exhibited as entering the cavity of the style, which is laid open to show the commencement of their descent.

11. Two Pollen masses (with their arms and gland,) which have burst and protruded their tubes while still inclosed

closed in the cells of the antheræ; this happening in *A. phytolaccoides* in that particular kind of decay mentioned in (p. 729 of) the text.

TAB. 36.

Fig. 1. Two Pollen masses of *Asclepias purpurascens* with protruded tubes; the only instance met with in which both cords are introduced into the same style.

2. A grain of pollen, of the same species, with a portion of its tube; the unusual form probably caused by the pressure of other grains and their tubes.

3. A grain of pollen of *Asclepias purpurascens* containing numerous minute granules and two larger drops or globules of an oily fluid.

4, 5, & 6. Various combinations of pollen masses of *Asclepias purpurascens*. In these it is supposed that the insect having removed and applied to the stigma some of the masses, has extracted, by means of the arms still adhering to it, other masses with their glands and arms.

A combination of the same kind, different from and more remarkable than any of these, but perhaps not very accurately represented, is given, in his *Microscop. Entdeck.*, tab. 36. fig. 8, by Gleichen, who appears (op. cit. p. 81.) to have also met with other combinations, without suspecting in any case the real cause of such apparently anomalous structures.

7. A flower-bud of *Asclepias curassavica* in the earliest stage in which I was able to distinguish its parts; the unopened corolla in its place with one of the sepala, the other four being exhibited separately:—highly magnified.

 Fig. 8.

Fig. 8. The Corolla of fig. 7. opened and in part removed, to show the state of the contained organs: the figure exhibiting two petals hardly cohering at base; within these, two distinct petal-like bodies, alternating with them, and which are the antheræ; and two other smaller bodies, which are the pistilla as yet unconnected.

9. An Anthera taken from fig. 8, and more highly magnified, to show that in this early stage it is entirely petal-like, there being no indication of the two cells, of which the first appearance in a somewhat more advanced stage is given at Fig. 10.

11. A Petal of fig. 8. more highly magnified.

12. The Pistilla of fig. 8, as yet distinct, scarcely at all angular, and with no manifest cavities; so that these two bodies may be regarded as chiefly or entirely the component parts of the stigma.

13. Two Grains of pollen taken from the pollen mass of the expanded flower of *Asclepias curassavica*.

Additional

Additional Observations on the Mode of Fecundation in Orchideæ.

Read June 5, 1832.

The following additions to the Paper, which was communicated to the Society in November last, on the Sexual Organs and Mode of Fecundation in Orchideæ and Asclepiadeæ, relate entirely to the former family.

In the essay itself I had ascertained from the examination of a considerable number of species belonging to different tribes of Orchideæ, that in the expanded flower of this family, however long it had remained in that state, no appearance whatever existed of those tubes which form the mucous cords, either in the tissue of the stigma or in the cavity of the ovarium, anterior to the application of the pollen to the stigma; and that in all cases where pollen had been applied to that organ and enlargement of the ovarium had followed, the mucous cords were to be found.

From these facts I had concluded that the tubes forming the cords were entirely and directly produced from the grains of pollen; and hence I accounted for the cohesion of the pollen into masses, and its frequent application in that state to the stigma.

Some cases, however, in which a few lobules or even grains of pollen only were observed on the stigmata of impregnated flowers, had led me to express myself doubtfully on this point. And since my paper was read, I have had opportunities of making several observations and experiments which prove that the application of a very small portion of a pollen mass to the stigma is sufficient for the production of mucous cords of the ordinary size in the cavity of the ovarium.

My

My observations on this point and on the gradual production and descent of these cords have been made chiefly on *Bonatea speciosa*, perhaps the most favourable subject for such experiments in the whole family.

My first observation on Bonatea related to the probability of a single insect impregnating several or even many flowers with one and the same mass of pollen.

To effect this, it is only necessary that the viscidity of the retinaculum or gland with which the pollen mass becomes inseparably connected, and by means of which the mass is removed from its cell and adheres to the insect, should exceed that of the surface of the stigma, and that the viscidity of the stigma should be sufficient to overcome the mutual cohesion of the lobules composing the mass.

These different degrees of viscidity are very manifest in *Bonatea speciosa*, in which, imitating the supposed action of the insect, I have succeeded in impregnating most of the flowers of the spike with a single pollen mass. I believe they exist also in the greater number of Ophrydeæ, as well as in many Neotteæ and Arethuseæ.

But even in Ophrydeæ they are not universally met with, a very remarkable exception existing I believe in the whole genus Ophrys, in which the resemblance of the flower to an insect is so striking, and in which also the retinacula, whose viscidity hardly equals that of the stigma, are included and protected by concave processes of the upper lip of that organ.

It may also be remarked, that in the genus Ophrys impregnation is frequently accomplished without the aid of insects, and in general the whole pollen mass is found adhering to the impregnated stigma. Hence it may be conjectured, that the remarkable forms of the flowers in this genus are intended to deter not to attract insects, whose assistance seems to be unnecessary,

cessary, and the action of which, from the diminished viscidity of the retinaculum, might be injurious. On this subject I will also hazard another remark, that the insect forms in Orchideous flowers, resemble those of the insects belonging to the native country of the plants.

The next object I had in view was to determine the first appearance and progress of the mucous tubes.

My observations on the *origin* of these tubes are not altogether satisfactory.

It appeared, however, in Bonatea, which was also the plant most particularly examined, that they first become visible soon, but not immediately, after the production of the pollen tubes from the lobules or grains of the mass applied to the stigma; and that their earliest appearance is in the tissue of the stigma, in the immediate vicinity of the pollen tubes, from which they are with difficulty distinguishable, and only by their being less manifestly or not at all granular in their surface or contents, and in general having those interruptions in their cavity, which I have termed coagula, and which I have never yet met with in tubes actually adhering to the grain of pollen.

But even these characters, in themselves so minute, might be supposed to depend on a difference in the state of the contents of the pollen tube, after it has quitted the grain producing it. It is possible therefore that the mucous cords may be entirely derived from the pollen, not however by mere elongation of the original pollen tubes, but by an increase in their number, in a manner which I do not attempt to explain.

The only other mode in which these tubes are likely to be generated, is by the action of the pollen tubes on the coagulable fluid, so copiously produced in the stigma at the only period when impregnation is possible.

The obscurity respecting the origin of these mucous tubes does

does not however extend to their gradual increase and progress, both of which may be absolutely ascertained.

In Bonatea they are, in the first stage of their production, confined to the stigma, with the proper tissue of which they are more or less mixed. Soon after they may be found on the anterior protected surface of the style, at first in small numbers; but gradually increasing, they form a mucous cord of considerable size, in which very few or none of the utriculi of the stigma are observable. This cord, which is originally limited to the style, begins, though sometimes not until several days have elapsed, to appear in the cavity of the ovarium, where it divides and subdivides in the manner I have described in my paper, its descent being gradual until the cords nearly equal the length of the placenta, to which they are parallel and approximated.

That these cords are not in any degree derived from those portions of the walls of the cavity of the ovarium, to which they are closely applied, and which I have termed the conducting surfaces, is manifest from the identity in state of those surfaces before and after the production of the cords.

In Bonatea the first evidence of the action of the pollen consists in the withering of the stigma; a similar decay of the greater part of the style soon follows, and the enlargement of the ovarium generally begins before the withering of the style is completed. When the enlargement of the ovarium is considerable, and the mucous cords are carefully formed in its cavity, a corresponding enlargement of the ovula takes place, and the nucleus becomes first visible.

I have no satisfactory observations in Bonatea respecting any tubes going off from these cords and mixing with the ovula; but in *Orchis Morio* I have repeatedly and very clearly observed them scattered in every part of the surface of the placenta, and in not a few cases have been able to trace them into the aperture

ture of the ovulum, to which they adhere with considerable firmness*.

At what period they reach the foramen of the testa, whether before or immediately after the first faint appearance of the nucleus, I have not yet been able to determine. That the tubes thus traced to the foramen of the ovulum are of the same nature as those which I have called mucous tubes, and not those directly produced by the pollen, is proved by their exact agreement with the former in every respect, except in their being remarkably and irregularly flexuose, apparently from the numerous obstacles they have to overcome after leaving the cords and beginning to mix with the ovula; for in the cords themselves, where the course of the tubes is not at all impeded, they are very nearly or altogether straight.

The two most important facts stated in the present communication are; *first*, the production of tubes not directly emitted from the grains of pollen, but apparently generated by them; and, *secondly*, the introduction of one or sometimes more than one of those tubes into the foramen of the ovulum, the point corresponding with the radicle of the future embryo.

The principal points remaining to be examined, and which we may hope, by careful investigation, to ascertain, are the precise state of the ovulum at the moment of its contact with the tube, and the immediate changes consequent to that contact.

* Since these additional observations were read, I have found in several other Orchideæ, especially *Habenaria viridis* and *Ophrys apifera*, tubes scattered over the surface of the placenta, and not unfrequently inserted, in like manner, into the apertures of ovula.

Supplementary Note.

Since the Paper on Fecundation in Orchideæ and Asclepiadeæ was read before the Society, and a Pamphlet containing all its more important statements was distributed in the beginning of November 1831*, two essays have appeared on the same subject. The first on both families by M. Adolphe Brongniart, in the numbers of the *Annales des Sciences Naturelles* for October and November 1831, but which were not published until January and February 1832: the second, by Dr. Ehrenberg, on Asclepiadeæ alone, in the Transactions of the Royal Academy of Sciences of Berlin, before which it was read in November 1831.

M. Brongniart's statements respecting Orchideæ to a great extent agree with those of my essay. They differ, however, in the following important points:

1st, He does not seem to be aware of the operation of insects in the fecundation of this family.

2ndly, He considers the mucous cords in the cavity of the ovarium (first seen by M. Du Petit Thouars, with whose observations he seems to be entirely unacquainted,) as a continuation of the tissue of the stigma and style, and as existing before the application of the pollen to the female organ.

And 3rdly, He supposes that the male influence reaches the ovula in Orchideæ before the inversion of the nucleus; an opinion founded, as it seems, on his observations on Epipactis, in which, as well as in some other genera of the order, this is the state of the ovulum in the expanded flower.

In Asclepiadeæ M. Brongniart's observations, made chiefly in *Asclepias amœna* and *Gomphocarpus fruticosa*, accord with my statements as far as relates to the application of the more convex

* I may also refer to an excellent abstract of the Paper which appeared on the 1st of December 1831 in the Philos. Mag. and Annals of Philosophy.

edge

edge of the pollen mass to the base of the stigma, its consequent dehiscence, the protrusion of the pollen tubes, and their penetration into the cavity of the style.

The chief differences are,

1st, His not even suspecting the agency of insects in the fecundation of this family, and particularly in the plants examined by him, in which I have regarded their assistance as absolutely necessary.

2ndly, In his assuming that the pollen mass in these two genera of Asclepiadeæ is ruptured, and comes in contact with the base of the stigma without leaving the cell of the anthera.

3rdly, His conjecturing that the secretion visible in the expanded flower on the angles of the stigma after removing the glands, is absorbed by the glands and conveyed through their arms or processes to the pollen mass, which it excites to the production of pollen tubes.

Dr. Ehrenberg on the subject of Asclepiadeæ, repeats, with some slight modifications, his former statements quoted in my paper, and illustrates them by figures. In addition, he suspects that the pollen masses (which with Professor Link he regards as the true anthera, and the cells in which they are lodged as processes of the perigonium,) are not originally distinct from the glands of the stigma, regarded by him as the filaments of his supposed anthera.

The central pentangular body he considers as the stigma, but he has no observations on the mode in which the pollen is applied to it.

And lastly, His original statement respecting the grains of pollen is so far modified, that he now believes them to be in the early stages without tubes or *boyaux*, which, according to him, make their appearance at the period of impregnation.

XXXVI. *Description of a new Species of the Genus Pinus. By Mr. David Douglas, F.L.S. Communicated by the Horticultural Society.*

Read April 3, 1832.

In the autumn of 1826, in the country southward of the river Columbia, in northern California, I had the good fortune to make some valuable additions to the highly ornamental and useful genus *Pinus*. The object of this paper is to put on record one of the most curious and interesting species of that genus, the specimens of which, together with the description made on the spot, I had the misfortune to lose in the course of my travels four years ago. I cannot recall to my recollection, without feelings of deep regret, the loss I then sustained of the greatest and most important part of my collections. So remarkable a tree I could then, perhaps, have described from recollection accurately, but I was fearful lest errors might unavoidably have crept into it; and having found it a second time in the greatest perfection, I now venture to send the present short notice of it for the purpose of insertion in the Transactions of the Linnean Society, should it be considered as deserving a place in their valuable records.

This tree, so far as I have yet observed, attains to but a small size as compared with those species of the genus which inhabit the northern and western parts of this continent. The trees are of a tapering form, straight, and of regular growth, 40 to 120 feet in height, 2 to 12 feet in circumference, clothed with branches

branches to the ground, when standing far apart or solitary. Some few I have measured 140 feet in length, but never any larger in circumference than that just cited.

The largest and most handsome trees inhabit the alluvial deposits on the western flanks of the Cordilleras of New Albion, at a very great elevation above the level of the sea, being 1600 feet below the range of perpetual snow in the parallel of 40° N. On the less elevated mountains near the coast, where the temperature is higher but more uniform, in the parallel of 37° N. in decomposed granite, schist, or gravelly soils, the trees are smaller and fewer, inhabiting the summit of the mountains only.

The wood is white, soft, coarse-grained, and, I think, not very durable. A copious transparent resin issues from the wounds. *Leaves* in threes, very rarely in fours, 11 to 14 inches long, convex and smooth on the underside, channelled above, with an elevated ridge, pointed, and furnished at the margin with minute teeth, which become more distant and conspicuous towards the extremity; erect in summer; flaccid and drooping during winter. *Sheath* 1·5 inch long, light brown, chaffy, and torn at the top. *Stipule* lanceolate, rigid. *Male* and *female catkins* erect. *Cone* (which abounds in pellucid resin) ovate, recurved, pressing on the branch for support, 3 to 9 in number, surrounding the same stem, persistent, and remaining on the tree for a series of years, like *P. Banksiana;* 9 to 11 inches long, 16 to 18 inches round. *Scales* spathulate, 2·25 inches long, having a very strong, sharp, incurved point, which near the base exceeds the length of the scale. *Seed* somewhat oblong, tapering to the base, flattish on the inside, ·875 inch long, nearly ·500 inch broad. *Shell* thick, hard, brown. *Wing* short, stiff, one fourth the length of the seed, which it nearly encompasses. *Kernel* pleasant. *Cotyledons* 7—12 in number.

The

The first year the cone measures from 6 to 8 inches round, and is of a more rounded form than when perfect in November of the following year. The colour of the young cone is bright green. The specific character may be thus framed:

P. Sabiniana. Foliis ternis (raro quaternis quinisve) prælongis, strobilis recurvis ovatis: squamis spathulatis: acumine incurvo.

The active and enlightened zeal which Joseph Sabine, Esq. has ever taken, as Secretary of the Horticultural Society, for the introduction of new, choice and useful plants, more especially of those natives of countries of similar temperatures as England, induces me to affix his name to one of the most beautiful objects in nature, and which I hope will shortly become one of the greatest ornaments in the British Sylva.

Mission of St. John's, Upper California,
February 4, 1831.

XXXVII. *Ex-*

XXXVII. *Extracts from the* Minute-Book *of the* Linnean Society *of* London.

1827.
Nov. 6. Thomas Bell, Esq., was chosen by ballot to fill up the vacancy in the Council, occasioned by the death of Samuel Lord Bishop of Carlisle, the Society having been specially summoned for the purpose of filling up such vacancy.

Nov. 20. Mr. Brookes, F.L.S., exhibited specimens of *Gypaëtos barbatus*, two species of *Larus*, and a gigantic variety of the Rabbit (*Lepus Cuniculus*, Linn.).

Mr. Lambert, V.P., exhibited cones of *Pinus sylvestris*, Linn., found at considerable depths in the peat-bogs of Armagh, Ireland, in perfect preservation.

The Secretary read a letter from John Cresswell, Esq., F.L.S., to Joseph Sabine, Esq., F.R.S. and L.S., informing him that a fish unknown to the oldest fishermen had been taken in the river Exe, weighing one hundred weight, proving identical with that known at Gibraltar by the Spanish name of Umbrina (*Sciæna cirrhosa*, Linn.).

Dec. 4. Mr. Dillwyn, F.L.S., exhibited a series of specimens of the *Ianthina fragilis* of Lamarck, the *Helix Ianthina* of Linnæus, collected from Oxwich Bay, to the west of Swansea, accompanied by a letter stating that the same shell, which is abundant in the Mediterranean, had been found once before there in some abundance. Mr. Dillwyn considered the recording such facts of importance, as being likely to throw some light on the under-currents of the ocean.

Dec. 18. Mr. Bell exhibited three undescribed species of Land Tortoises, two of them very much resembling *Testudo geometrica*. To one of the present species, which Mr. Bell certainly thinks furnished La Cepède with his erroneous description of *T. geometrica*, he has given the name of *T. actinodes*. It differs in the absence of the small *single plate* at the anterior part of the margin. To another specimen, with conical scutæ, he has assigned the specific name of *tentoria;* and to the third specimen (which he has had alive for some time,) he has given the name of *pardalis:* this, although resembling the *Testudo indica*, differs from it not only in colour, but also in the less revolute margin, and in the situation of the *areolæ* of the costal plates, which, instead of being exactly central as in *T. indica*, are in this species placed very near the superior margin.

1828.

Jan. 15. Mr. George Townshend Fox, F.L.S., exhibited from the Newcastle Museum the original specimen of the Green-headed Bunting, *Emberiza Tunstalli* of Latham, the *E. chlorocephala* of Gmelin, which now proves to be identical with *E. hortulana*, Linn.

Mr. Yarrell, F.L.S., exhibited two specimens of *Emberiza*

Emberiza miliaria of Linnæus, one of them entirely white.

March 4. Mr. George Townshend Fox, F.L.S., sent for exhibition, specimens of the following Birds, viz.

1. *Anas rutila* of Pallas, the *Anas Casarka* of Gmelin, or Grey-headed Duck of Brown's Illustrations of Zoology, t. 41. It is on the authority of this specimen that the bird has been received into the British Fauna.

2. *Loxia cantans* of Gmelin, the Brown Grosbeak of Brown's Illustrations, t. 27.

3. *Loxia ferruginea* of Gmelin, the Brown-headed Grosbeak of Latham.

4. *Loxia aurea* of Gmelin, the Gold-backed Grosbeak of Brown's Illustrations, t. 25.

These, together with the specimen of the *Loxia crassirostris*, Gm., exhibited at a former meeting, are the original authorities for the species. They formed part of the late Messrs. Tunstall and Allan's collection, which is now incorporated with the Museum belonging to the Literary and Philosophical Society of Newcastle-upon-Tyne.

The Rev. Leonard Jenyns, F.L.S., exhibited specimens of the British species of *Plecotus*, supposed to have been confounded under the name of Long-eared Bat; and also a specimen of *Vespertilio mystacinus* of Leisler, taken at Bottisham, Cambridgeshire, on the 29th of April 1827, being the second instance of its having been found in Great Britain.

March 18. In consequence of the lamented death of Sir James

 Edward

Edward Smith, (the President of the Society,) the Meeting was adjourned to Tuesday the first of April.

April 15. Read a letter, addressed to the Secretary, from Charles Lucien Bonaparte, Prince of Musignano, F.M.L.S., and dated on board the Delaware, near Gibraltar, March 20th, 1828, containing some curious facts relative to the migratory habits of certain species of *Hirundo* and *Sylvia*. The following are extracts: "In closing my letter I happen to think that the following fact may be thought interesting to some of your ornithological gentlemen. A few days ago, being 500 miles from the coasts of Portugal, 400 from those of Africa, &c., we were agreeably surprised by the appearance of a few Swallows (*Hirundo urbica* and *rustica*). This, however extraordinary, might have been explained by an easterly gale, which might have cut off the swallows migrating from the main to Madeira, only 200 miles distant from us; but what was my surprise, in observing several small warblers hopping about the deck and riggings. These poor little strangers, exhausted as they were, were soon caught and brought to me. The following is a list of the species:—1. *Sylvia Trochilus.* 2. *Sylvia Erithacus*, Lath. (*Tithys*, Temm.). 3. *Sylvia suecica*, or rather a similar species which I have already received from Egypt and Barbary. 4. A species new to Europe, and perhaps even a non-descript, having the plumage of an *Anthus*, and which I think belongs (as *Sylvia Cisticola* and others) to the *hitherto African* genus *Malurus*. This, however, must rest undecided, my specimen

specimen having lost its tail, which had been pulled off by the sailor who caught the bird."

May 6. Mr. Brookes, F.L.S. exhibited a specimen of the cream-coloured Courier (*Cursorius isabellinus*, Temm.), said to have been shot in Great Britain; and Mr. G. B. Sowerby exhibited a specimen of a new species of *Cypræa*, which he has named *C. Leucodon*.

May 24. The Council having had an offer of the late respected President's Collections in Natural History, consisting of the Collections and Library of Linnæus and his Son, and the President's own Collections and Library, submitted the proposal to the consideration of the Society,—when a subscription was entered into by the undermentioned members for the purpose of purchasing the same; viz.

	£.	s.	d.
Edward, Lord Stanley, M.P. *President*	23	2	0
Aylmer Bourke Lambert, Esq. V.P.	23	2	0
William George Maton, M.D. V.P.	23	2	0
Robert Brown, Esq. V.P.	21	0	0
Edward Forster, Esq. *Treasurer*	25	4	0
Francis Boott, M.D.	25	4	0
James E. Bicheno, Esq. *Secretary*	21	0	0
Mr. George Loddiges	20	0	0
Major-General Hardwicke	21	0	0
Lawrence Brock Hollinshead, Esq.	21	0	0
The Lord Bishop of Bath and Wells	10	10	0
Nicholas Aylward Vigors, Esq.	21	0	0
Richard Taylor, Esq.	21	0	0
William Kent, Esq.	20	0	0
	296	4	0

Richard

	£.	s.	d.
Brought forward	296	4	0
Richard Horsman Solly, Esq.	21	0	0
John Curtis, Esq.	5	5	0
William Horton Lloyd, Esq.	10	0	0
John Blackburne, Esq. M.P.	10	0	0
Henry Lee, M.D.	5	5	0
John Carey, Esq.	10	10	0
Samuel T. Carey, Esq.	10	0	0
Richard Waring, M.D.	10	0	0
Thomas Horsfield, M.D.	5	5	0
Mr. William Anderson	4	2	0
Mr. George Charlwood	2	2	0
Mr. Robert Sweet	2	2	0
Mr. George Sinclair	2	2	0
John Eddowes Bowman, Esq.	5	5	0
William Christy, jun. Esq.	5	5	0
Archibald Menzies, Esq.	5	5	0
William Yarrell, Esq.	7	7	0
Mr. Benjamin Leadbeater	5	5	0
Edward Turner Bennett, Esq.	10	10	0
John Joseph Bennett, Esq.	10	10	0
William Peete, Esq.	5	5	0
Joseph Sabine, Esq.	21	0	0
Alexander MacLeay, Esq.	21	0	0
John Morgan, Esq.	10	10	0
Thomas Bell, Esq.	12	12	0
Rev. John Montgomery Traherne . .	5	0	0
Joshua Brookes, Esq.	5	0	0
John Crawfurd, Esq.	5	0	0
John Lindley, Esq.	23	2	0
John Smirnove, Esq.	5	5	0
John Latham, M.D.	5	0	0
Sir Thomas Gery Cullum, Bart. . .	110	0	0
Sir Claude Scott, Bart.	21	0	0
	692	18	0

Mr.

	£.	s.	d.
Brought forward	692	18	0
Mr. Donald Munro	5	5	0
Mr. David Douglas	5	5	0
Michael Bland, Esq.	21	0	0
John Caley, Esq.	10	10	0
Mr. David Don, *Libr. L. S.*	5	5	0
Mr. Abel Ingpen, *Associate*	1	1	0
William Henry Fitton, M.D.	5	5	0
Rev. William Kirby	10	0	0
Samuel Merriman, M.D.	5	5	0
Sir Thomas Mantell	1	1	0
John Obadiah Westwood, Esq.	1	1	0
Charles John Thompson, Esq.	5	5	0
Thomas Castle, Esq.	2	2	0
John Guillemard, Esq.	5	0	0
Henry Beaufoy, Esq.	5	5	0
George Bellas Greenough, Esq.	10	0	0
Charles Stokes, Esq.	10	0	0
John Bostock, M.D.	5	0	0
Rev. James Yates, M.A.	5	0	0
Thomas Lister Parker, Esq.	5	0	0
Robert Barclay, Esq.	46	0	0
A. T. Thomson, M.D.	2	2	0
John Richardson, M.D.	5	5	0
Algernon Peckover, Esq.	5	5	0
J. C. Acherley, Esq.	5	0	0
John Fleming, Esq.	21	0	0
John Hull, M.D.	21	0	0
Rev. R. M. White, M.A.	5	5	0
Rev. W. Stockdale, M.A.	5	0	0
Captain Edmund Sheppard, R.A.	5	0	0
Mr. John Mackay	5	5	0
Rev. James Barlow, M.A.	5	0	0
	947	10	0

His

	£.	s.	d.
Brought forward	947	10	0
His Grace the Duke of Bedford . . .	21	0	0
Nathaniel B. Ward, Esq.	5	5	0
John Edward Gray, Esq.	10	10	0
Rev. Edmund Goodenough, D.D. . .	10	10	0
John Ford Davis, M.D.	5	5	0
George Williams, M.D.	21	0	0
Arthur Aikin, Esq.	5	0	0
John Windsor, Esq.	10	0	0
William Bridgman, Esq.	2	2	0
Rev. Thomas Butt	3	3	0
William Withering, Esq.	5	5	0
His Grace the Duke of Somerset . . .	20	0	0
Sir Abraham Hume, Bart.	10	10	0
Lieutenant-Colonel Durnford	5	0	0
William Beatty, M.D.	2	2	0
Thomas Purton, Esq.	2	2	0
Joseph Whidbey, Esq.	5	5	0
Sir Thomas Frankland, Bart.	21	0	0
J. C. Dale, Esq.	10	0	0
Davies Gilbert, Esq. M.P.	10	0	0
J. G. Children, Esq.	10	0	0
Daniel Sharpe, Esq.	2	2	0
Mr. Edwin Dalton Smith	2	2	0
Messrs. J. D. C. & C. E. Sowerby . .	2	2	0
Rev. Daniel Lysons, M.A.	5	5	0
George Austen, Esq.	5	5	0
William Mathew, Esq.	5	0	0
J. C. Loudon, Esq.	5	5	0
Thomas Salter, Esq.	3	3	0
William Borrer, Esq.	5	5	0
Rev. John Stevens Henslow, M.A. . .	5	5	0
Rev. Leonard Jenyns, M.A.	5	5	0
	1188	8	0

Louis

	£.	s.	d.
Brought forward	1188	8	0
Louis Hayes Petit, Esq. M.P.	10	10	0
Roger Pettiward, Esq.	5	0	0
Rev. Charles Smith Bird, M.A.	5	0	0
Rev. Charles Parr Burney, D.D.	10	10	0
John Shute Duncan, Esq.	2	0	0
Rev. Henry Hasted, M.A.	5	0	0
Charles Lyell, Esq.	10	0	0
William Younge, M.D.	10	0	0
Rev. Joseph Goodall, D.D., Provost of Eton	20	0	0
Rev. William Buckland, D.D.	2	0	0
Rev. Revett Sheppard, M.A.	2	0	0
Rev. Thomas Gisborne, M.A.	10	10	0
John Flint South, Esq.	5	0	0
William Jackson Hooker, LL.D.	5	5	0
George Milne, Esq.	5	0	0
Joseph Janson, Esq.	5	0	0
Rev. Sackville Bale, M.A.	10	0	0
Rev. John Howson, M.A.	1	1	0
Edmund Allen Crouch, Esq.	1	1	0
Thomas Knowlton, Esq.	5	5	0
Jonathan Couch, Esq.	1	0	0
The Most Noble the Marquis of Bath	50	0	0
Right Honourable Earl Brownlow	25	0	0
Rev. James Dalton, M.A.	5	0	0
Rev. Patrick Keith	1	1	0
Richard Cotton, Esq.	3	3	0
Rev. Thomas Newton, M.A.	5	5	0
John Blackwall, Esq.	5	0	0
Robert Cole, Esq.	5	5	0
Rev. Thomas Elton Miller, M.A.	5	0	0
	1424	4	0

 Rev.

	£.	s.	d.
Brought forward	1424	4	0
Rev. Henry John Wollaston, M.A. . .	2	2	0
Rev. Thomas Salwey, M.A.	3	3	0
Larret Langley, Esq.	5	5	0
William Mills, Esq.	5	5	0
Rev. R. B. Francis, M.A.	2	2	0
Alexander Erskine, Esq.	10	10	0
Thomas Andrew Knight, Esq.	26	5	0
Samuel Kershaw, Esq.	2	2	0
Thomas Brightwell, Esq.	2	2	0
Simon Wilkin, Esq.	1	1	0
John Shaw, Esq.	5	5	0
John Hogg, Esq.	3	3	0
Thomas Wilson, Esq.	5	0	0
Rev. William Lloyd Baker, M.A. . . .	10	10	0
Rev. Alexander Power, M.A.	2	2	0
Barron Field, Esq.	5	0	0
Mr. James Main, A.L.S.	2	2	0
A. H. Haworth, Esq.	5	5	0
Edward Holme, M.D.	10	0	0
Rev. Mr. Jenkyns, Fellow of Magdalen College, Oxford	1	1	0
Samuel Peace Pratt, Esq.	5	5	0
Edward Barnard, Esq.	10	0	0
Lewis Weston Dillwyn, Esq.	10	0	0
William John Broderip, Esq.	5	5	0
M. A. Robinson, Esq.	5	0	0
Patrick Neill, Esq.	3	3	0
Marmaduke Ramsay, Esq.	3	3	0
James Lowe Wheeler, Esq.	1	1	0
Robert Younge, Esq.	2	2	0
George Bentham, Esq.	10	0	0
Sir William Jardine, Bart.	5	0	0
	1593	8	0

June

June 17. Read a Letter, addressed to the Secretary, from William Cooke, Esq., on the Preservation of Vegetable Substances in a Solution of Muriate of Soda,—of which the following is an extract. "On the 30th of October 1826, Mr. B. M. Forster brought to me a specimen of *Clavaria muscoides* of Sowerby, with a desire that I would preserve it in the same way that I preserve anatomical preparations.—(*Vide* Med. and Phys. Journ. March 1816.) I put it into brine a little below saturation, suspending it by a delicate thread of silk, and closing the bottle by means of glass. Since that time it has remained in the solution, and, with the exception of having become a little deeper in colour, it is unchanged. As spirits are not only expensive, but usually deprive plants of all colour, the discovery of a cheap and effectual solution for the preservation of plants is a desideratum."

1829.

April 7. Mr. Brookes, F.L.S., exhibited a living specimen of *Lacerta ocellata.*

The President read the following extracts from the Minutes of Council, dated February 24, viz.

"Resolved,—

"That the By-Laws contained in Sections 2, 3, and 4, Chapter II. of the By-Laws of the Society, as also the By-Law made on the 18th day of February 1823, (all of which said By-Laws relate to the admission and annual fees to be paid by Fellows,) be revoked and repealed; and that the following By-Laws be substituted, viz.

"All Fellows elected after the 24th day of May

1802,

1802, and before the 24th day of May 1829, who shall have already paid their admission fees, but have not paid Twenty Guineas in lieu of all annual payments, shall pay to the use of the Society the annual contribution of Two Guineas as heretofore. Provided, however, that every such Fellow may at any time compound for all future annual payments, by paying the said composition of Twenty Guineas, including the annual contribution which may be due at the time such composition shall be paid.

"All Fellows who shall be elected after the 24th day of May 1829, shall, before they be admitted, pay to the use of the Society the sum of Six Pounds for their admission fee; and if any person refuse or fail to pay the said sum, his election shall be void, unless the same be remitted, in whole or in part, by special order of the Council.

"Every Fellow elected after the 24th day of May 1829, shall, besides the admission fee, further contribute towards the funds of the Society, previous to his admission, by paying the sum of Thirty Pounds in lieu of all future payments; or he shall sign an obligation for the regular payment of Three Pounds per annum to the Society so long as he shall continue a Fellow.

"Every such Fellow so elected may at any time compound for his future contributions, by paying the sum of Thirty Pounds in one year, instead of the annual contribution for that year; in which case, his obligation to make annual payments shall be void. Provided, nevertheless, that in case any Fellow be not usually resident within the United Kingdom of Great Britain

Britain and Ireland, such person shall not be permitted to enter into an obligation for the payment of annual contributions, but shall, within two months after his election, or such other time as the Council shall permit, and before he be admitted, pay, or cause to be paid, into the hands of the Treasurer, the sum of Thirty Pounds, in lieu of such contributions.

" Resolved,—

" That it be proposed to the General Meeting of April 7th, for confirmation to revoke and repeal the By-Laws contained in Sections 2, 3, and 4, of the Second Chapter of the Society's By-Laws, and also the By-Law relative to the payment of Fellows, made on the 18th day of February 1823, and to substitute in their stead the By-Laws above specified; and that they be read at the above and following General Meeting, and be balloted for in the manner directed by the By-Laws of the Society."

The President then gave notice that those alterations in the By-Laws will be decided upon by Ballot on Tuesday the 5th of May.

May 5. The alterations of the By-Laws contained in Sections 2, 3, and 4, of Chapter II. of the Society's By-Laws, and also the By-Law relative to the payment of Fellows, made on the 18th day of February, 1823, having been read at the two last General Meetings, as directed by the Charter, were balloted for and confirmed.

Nov. 17. The Vice-President, in the Chair, gave notice that the Library will be open on Mondays, Tuesdays, and Thursdays,

Thursdays, from 12 till 4 o'clock, and that the Museum will be open during the same hours on Wednesdays and Fridays.

1830.

April 20. Mr. N. B. Ward, F.L.S., exhibited a remarkable specimen of exfoliation of the entire hand and foot, which happened five different times in the same person from fever.

June 1. Mr. John Gould, A.L.S., exhibited, by permission, the Skeleton of the *Camelopardalis Giraffa* belonging to His Majesty.

Mr. William Pamplin, jun., A.L S., exhibited a Fruit of the *Carica Papaya*, which ripened in a hot-house belonging to John Barker, Esq., at Aylesbury.

June 15. Read an extract of a Letter from Mrs. Smith, dated Moradabad, July 20th, 1829, to a gentleman in Somersetshire, giving an account of a quantity of Fishes that fell in a shower of rain at that place. Many were observed by Mrs. Smith from the window of her residence, springing about on the grass immediately after the storm. The letter was accompanied by a drawing taken on the spot, which represents a small species of *Cyprinus*, two inches and a quarter in length, green above, silvery white below, with a broad lateral line of bright red.

1831.

Feb. 15. Mr. Westwood, F.L.S., exhibited drawings of two Insects illustrating the connexion between the Coleopterous families *Prionidæ* and *Lucanidæ*, in opposition to the tarsal system.

March

March 1. Read the following Letter from Dr. James Lindsay, addressed to Roderick Impey Murchison, Esq. F.R.S. & L.S. &c., giving an account of the *Helix obvoluta* of Lamarck being found, apparently indigenous, in Hampshire.

"Sir,—Last May, when searching for land shells, I was surprised to meet with the *Helix obvoluta*, hitherto considered a foreign species, and, I believe, *never before noticed in Great Britain.*

"I discovered it, along with other *Helices*, such as the *Helix nitida* and *rufescens*, amongst the moss near the roots of trees in Ditcham Wood, near Buriton, Hants. This shell is found for a considerable distance along the chalk escarpment of the South Downs facing to the north; and, although more rare than the other species above mentioned, I have collected above twenty individuals.

"Lamarck describes the French shell as having the margin of the lip white; but in the Hampshire specimens, when fresh, that part is tinged with red. Lamarck takes no notice of the smooth, tooth-like processes on the inner side of the lip, which in this species are always present. The aperture is triangular; the mouth a little reflected, forming a distinct sinus externally, and in every other respect answering to the Lamarckian description.

"Should you consider these observations worthy the notice of the Linnean Society, I shall feel gratified in your presenting them.

"I am, your most obedient Servant,

"James Lindsay.

"10th November, 1830,
Nursted House, near Petersfield."

May

May 3. Read the following Letter, addressed to the Secretary by John Curtis, Esq., F.L.S., containing remarks on the habits of some Land Shells:

"Grove Place, May 2, 1831.

"Dear Sir,—On my return from France I brought home some Land Shells, which I collected near the celebrated fountain of Petrarch at Vaucluse, on the 8th of last July, at which time they were close packed in a pill-box; and from the high temperature of that part of France, and being kept for several weeks in my trunk, and afterwards in a dry place at home, they appeared, as might be expected, quite dead.

"I was induced however, a few days since, to try if they could be re-animated, although I almost thought it an useless experiment. I put the shells into an earthen vessel, close covered, and containing some wet moss, when, to my astonishment, in less than twenty-four hours these little animals were reanimated and crawling about, after having been shut up without food or moisture for nine months.

"The shells appear to be the *Pupa tridens* and the *Clausilia rugosa*, which renders it more remarkable, since they are species destitute of opercula. I observed that only one of the shells was adhering to another, and the others were quite loose in the box.

"It is not only the extraordinary fact of these little animals being able to remain so long in a torpid state, that has induced me to request that you will do me the favour to lay these observations before the Linnean Society; but I think it may be of service to those who collect shells, to know that the species inhabiting the land may be preserved for so long a period; for it may in in many instances enable those conchologists who wish to describe and draw the inhabitants of shells, to accomplish that desirable object, and probably, by securing them in a well-stopped bottle, they might be kept alive much longer, and be transported from very remote parts of the globe.

"I remain, &c.

"JOHN CURTIS.

"P.S. I have been informed by Mr. Lyell that some shells brought from South America by Lieutenant T. Graves, were seventeen months without food, and are now alive and inhabiting their native plants in the conservatories of Messrs. Loddiges at Hackney.

"But shells closed by an operculum have been known to remain thus hermetically sealed in cabinets for very long periods,—it has been said for forty years,—and afterwards been reanimated by moisture."

Some live specimens of the species referred to in the letter were exhibited at the Meeting.

Dec. 6. Read a Letter addressed to the Secretary by John Blackwall, Esq. F.L.S., correcting his representation, in his Notice of several recent Discoveries in the Structure and Economy of Spiders, and Remarks on the Pulvilli of Insects, respecting the mode by which insects are supported on the sides of highly polished surfaces.

In experimenting upon the House-fly, he observed that individuals frequently remained fixed to the sides of an exhausted glass receiver after they had entirely lost the power of locomotion, and an evident distention of the abdomen had been occasioned by the exhaustion of the aëriform fluids it contained. To detach them from those stations, the employment of a small degree of force was found requisite.

In prosecuting this subject, clean "phials of transparent glass, containing spiders and various insects in the larva and imago states, capable of walking on their upright sides, were breathed into till the aqueous vapour expelled from the lungs was copiously condensed on their inner surface. The result was remarkable. The moisture totally prevented those animals from obtaining any effectual hold on the glass; and the event was equally decisive if a small quantity of oil was substituted for the aqueous vapour. A similar consequence ensued also, when the flour of wheat, or finely pulverised chalk, or gypsum, was thinly strewn on the interior surface of the phials, the minute particles of those substances adhering to the tarsal brushes of the spiders, the pulvilli of the perfect insects, and the under side of the feet of the larvæ. These facts, far from corroborating the mechanical theory, appeared quite inexplicable, except on the supposition that an adhesive secretion is emitted by the instruments employed in climbing. The next point to be determined, therefore, was whether spiders, and insects in the larva and imago states, when moving in a vertical direction on clean glass, leave any visible track behind them. Careful and repeated examinations, made with lenses of moderately high magnifying powers, in a strong light, and at a favourable angle, speedily convinced me that my conjecture was well founded, as I never failed to discover unequivocal evidence of its truth; though

though in the case of the spiders considerable difficulties presented themselves, in consequence of the exceedingly minute quantity of adhesive matter emitted by the brushes of those animals. On submitting this secretion to the direct rays of the sun, in the month of July, and to brisk currents of air, whose drying power was great, I ascertained that it did not suffer any perceptible diminution by evaporation under those circumstances.

"Now it is reasonable to infer, from the foregoing researches, that the hair-like appendages constituting the brushes of spiders, and occurring in such profusion on the inferior surface of the pulvilli of insects, are tubular. The delicate membrane also, on the under side of the prolegs, and the tarsi of the perfect legs of various larvæ capable of traversing polished perpendicular bodies, without the aid of lines produced by a spinning apparatus, must be provided with numerous pores, or minute papillæ, from which an adhesive secretion is emitted. Some larvæ which are not supplied with prolegs, those of the *Coccinellæ* for example, have the inferior part of the tarsi of their perfect legs thickly covered with hair-like appendages resembling in figure, and in the function they perform, those on the pulvilli of insects in the imago state; while others, altogether destitute of legs, emit a viscid mucus from both their extremities, and by advancing and attaching each alternately, are thus enabled to ascend smooth bodies with facility.

"According to my observations, the instrument is composed of several branched membranous papillæ included in a common envelope. They are extremely

 flexible

flexible and extensile, and, either separately or collectively, can be protruded beyond the caudal segment, or retracted within it, at the pleasure of the animal. Their efficiency as a cleaning apparatus, and an organ of adhesion and progression, depends principally upon the mucus they emit, which is secreted in great abundance, and not upon the power of producing a vacuum. When this instrument is applied to the body of the insect, any extraneous matter immediately becomes attached to it, and the impurities thus collected are ultimately expelled by a fresh discharge of mucus and a peculiar motion of the papillæ."

CATALOGUE

OF THE

LIBRARY OF THE LINNEAN SOCIETY,

*Continued from Page 526 of Vol. XV. of the Society's Transactions**.

N.B. To Books which are Continuations of Works included in any of the former Parts of the Catalogue, the original Numbers are here affixed; and the other Books are numbered in regular progression.

1356. Acrel (J. G.) Præside, Dissertatio Medica De Cholelithis, resp. A. M. Wadsberg. Upsaliæ, 1788, 4to.
1357. Afzelii (A.) De Rosis Suecanis Tentamen 3ium. Upsaliæ, 1806, 4to.
1358. Arnott's (G. A. W.) Article "Botany" from the new edition of the Encyclopædia Britannica. Edinburgh, 1832, 4to.
1359. Artis's (E. T.) Antediluvian Phytology. London, 1825, 4to.
1360. Audouin (V.) et Milne-Edwards (H.) Recherches Anatomiques et Physiologiques sur la Circulation dans les Crustacées. Paris, 1827, 4to.
1361. ———————— Recherches Anatomiques sur le Système nerveux. Paris, 1828, 8vo.
1362. Audubon (J. J.) The Birds of America, no. 1—20. London, 1827—31, fol.
1363. ———— Ornithological Biography; or An Account of the Habits of the Birds of the United States of North America. Edinburgh, 1831, 8vo.
1364. Banks's (G.) Plymouth and Devonport Flora, no. 1—7. Devonport, 1830—31, 8vo.
1365. Batūta's (Ibn) Travels; translated from the abridged Arabic Manuscript Copies, preserved in the Public Library of Cambridge; with Notes, by the Rev. Samuel Lee, B.D. London, 1829, 4to.
1366. Baxter (W.) Stirpes Cryptogamæ Oxonienses; or, Dried Specimens of Cryptogamous Plants, collected in the Vicinity of Oxford, fasc. 1—2. Oxford, 1825—28, 4to.

* This Catalogue does not include the extensive additions made to the Library by the purchase of the late President's collections and library, including those of Linnæus and his Son. It only contains such books as have been presented to the Society since the publication of the fifteenth volume.

1367. Benett's

1367. Benett's (Miss E.) Catalogue of Wiltshire Fossils. (*From Sir R. C. Hoare's Modern Wilts.*) fol.

1368. Bennett (E. T.) The Gardens of the Zoological Society delineated. Chiswick, 1830—31, 2 vols. 8vo.

1369. Bennett's (G.) Notices on the Botany of New Zealand. (*From the London Medical Gazette.*) 8vo.

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Page 11. *For* de ces côtes *read* de ses côtés
Page 14. *For* Bullo *read* Buteo
Page 19. *Erase the word* Aquila *from the second column of the lower Table, and insert* Bernicla *at the bottom of the third column.*
Page 41. *For* "but the remarkable relation existing between the larvæ of *Neuroptera*, such as *Myrmeleon*, has not escaped the notice of naturalists," *read* "but the remarkable relation existing between the larvæ of *Neuroptera*, such as *Myrmeleon*, and the *Arachnida*, has not escaped the notice of naturalists."
Page 45. No break should take place between the paragraph ending with the words "Birds of Prey," and that beginning with the words "The backward position," &c.
Page 171, line 15, *for* folia mutata *read* foliis mutatis
Page 532, line 10, *for* Proportionals *read* Proportionates

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DIRECTIONS

FOR

PLACING THE PLATES OF THE SIXTEENTH VOLUME.

Tab.

66
3. P.

The Binder is requested to observe, that as a general Title-page and a Table of Contents for the whole Volume are now given, the Title-pages to the separate Parts, and the Tables of Contents for Parts I. and II. are to be cancelled.

END OF THE SIXTEENTH VOLUME.

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