TRANSACTIONS

OF THE

LINNEAN SOCIETY.

VOLUME IV.

LONDON:
PRINTED BY J. DAVIS.
SOLD AT THE SOCIETY's HOUSE, No. 10, PANTON-SQUARE, COVENTRY-STREET;
AND
BY JOHN WHITE, FLEET-STREET.
M.DCC.XCVIII.

TRANSACTIONS

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LINNEAN SOCIETY.

VOLUME IV.

LONDON:

PRINTED BY J. DIGIS,

SOLD AT THE SOCIETY'S HOUSE, No. 17, PICCADILLY; AND CONSIGNED TO MESSRS.

BY JOHN WHITE, FLEET STREET.

M.DCC.XCVIII.

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XVII. *Am-*

ERRATA.

Page 10, line 3, for "*aretica*" read "*arctica.*"
Page 22, line 11, *add* "See TAB. I."
Page 34, line 1, *for* "Pultney's" *read* "Pulteney's."
——— line 16, *for* "Theirlheld" *read* "Threlkeld."
Page 64, line 7 from the bottom, for "*peristomia*" read "*peristoma.*"
Page 96, line 16, for "*Barraka*" read "*Parraka.*"

TRANSACTIONS

OF THE

LINNEAN SOCIETY.

I. *Aves Suſſexienſes; or, A Catalogue of Birds found in the County of Suſſex, with Remarks, by William Markwick, Eſq. F. L. S.*

Read May 5, 1795.

DIVISION I. LAND BIRDS.

ORDER I. *Rapacious.*

GENUS I. Falcon.

1 *** GOLDEN EAGLE. *Falco Chryſaetos.*

Several years ago I ſaw a bird of this ſpecies, which was killed at Bexhill in this neighbourhood.

2 Common Buzzard. *Falco Buteo.*

3 Moor Buzzard. *Falco æruginoſus.*

4 Kite. *Falco Milvus.*

 5 Peregrine

5 Peregrine Falcon. *Falco peregrinus.*

A bird of this ſpecies was lately living in a gentleman's garden at Lewes: it was taken when young in the neighbourhood.

6 Henharrier. *Falco cyaneus.*
Ringtail. *Falco Pygargus.*

7 Keſtril. *Falco Tinnunculus.*

8 Sparrow Hawk. *Falco Niſus.*

9 Hobby. *Falco Subbuteo.*

10 Merlin. *Falco Æſalon.*

11 *** Minute Falcon. *Falco minutus?*

On the 6th of September 1784 I ſhot a ſmall hawk which I ſuppoſed to be this bird.

12 *** Dark brown Hawk, or Buzzard.

This was alive in the garden at Denn in 1793.

GENUS II. Owl.

* Eared Owls.

13 *** Long-eared Owl. *Strix Otus.*

I never ſaw this bird myſelf, but am informed that it has been found here.

** with ſmooth heads.

14 White Owl. *Strix flammea.*

15 Tawny Owl. *Strix ſtridula.*

16 Brown Owl. *Strix Ulula.*

ORDER II. *Pies.*

GENUS III. Shrike.

17 ** Red-backed Shrike. *Lanius Collurio.*

GENUS

GENUS IV. Crow.

18 Raven. *Corvus Corax.*
19 Carrion Crow. *Corvus Corone.*
20 Rook. *Corvus frugilegus.*
21 ** Hooded or Royston Crow. *Corvus Cornix.*
22 Jack-daw. *Corvus Monedula.*
23 Jay. *Corvus glandarius.*
24 Magpie. *Corvus Pica.*
25 Red-legged Crow. *Corvus Graculus.*

GENUS V. Roller.

26***Garrulous Roller. *Coracias Garrula.*
A bird of this species was killed in this neighbourhood.

GENUS VI. Cuckoo.

27 * Common Cuckoo. *Cuculus canorus.*

GENUS VII. Wryneck.

28 * Wryneck. *Jynx Torquilla.*

GENUS VIII. Woodpecker.

29 Green Woodpecker. *Picus viridis.*
30 Greater spotted Woodpecker. *Picus major.*
31 Lesser spotted Woodpecker. *Picus minor.*
I believe this species is rare. Many years ago I shot one; but have not seen it since.

GENUS IX. Kingsfisher.

32 Common Kingsfisher. *Alcedo Ispida.*

GENUS X. Nuthatch.

33 European Nuthatch. *Sitta europæa.*

GENUS XI. Hoopoe.

34***Common Hoopoe. *Upupa Epops.*

GENUS XII. Creeper.

35 Common Creeper. *Certhia familiaris.*

ORDER III. *Passerine.*

GENUS XIII. Stare.

36 Common Stare. *Sturnus vulgaris.*

GENUS XIV. Thrush.

37 Missel Thrush. *Turdus viscivorus.*
38 Throstle. *Turdus musicus.*
39 ** Redwing. *Turdus iliacus.*
40 ** Fieldfare. *Turdus pilaris.*
41 Blackbird. *Turdus Merula.*
42 *** Ring Ouzel. *Turdus torquatus.*
43 *** Rose-coloured Thrush. *Turdus roseus.*

This bird was killed at East Bourn, and sent to Sir Ashton Lever's Museum, as I was informed.

GENUS XV. Chatterer.

44 *** Waxen Chatterer. *Ampelis Garrulus.*

GENUS XVI. Grosbeak.

45 *** Common Crossbill. *Loxia Curvirostra.*
46 *** Hawfinch. *Loxia Coccothraustes.*
47 Bullfinch. *Loxia Pyrrhula.*
48 Greenfinch. *Loxia Chloris.*

GENUS XVII. Bunting.

49 *** Snow Bunting. *Emberiza nivalis.*

I have seen one specimen of this bird, killed here in a hard winter.

50 Yellowhammer. *Emberiza Citrinella.*
51 Common Bunting. *Emberiza Miliaria.*
52 Reed Sparrow. *Emberiza Schœniclus.*

GENUS

GENUS XVIII. Finch.

53 Houſe Sparrow. *Fringilla domeſtica.*
54 Chaffinch. *Fringilla cælebs.*
55 *** Brambling. *Fringilla Montifringilla.*
56 Goldfinch. *Fringilla Carduelis.*
57 *** Siſkin. *Fringilla Spinus.*
58 Linnet. *Fringilla Linota.*

GENUS XIX. Flycatcher.

59 * Spotted Flycatcher. *Muſcicapa Griſola.*
60 Coldfinch. *Muſcicapa atricapilla.*

I think I once ſaw this bird ſitting on the walls of the old caſtle at Winchelſea.

GENUS XX. Lark.

61 Sky Lark. *Alauda arvenſis.*
62 Wood Lark. *Alauda arborea.*
63 Tit Lark. *Alauda pratenſis.*

Seen here in ſummer only.

64 ** Leſſer Tit Lark. *Alauda trivialis.*

Seen here in winter only, and then in flocks together.

GENUS XXI. Wagtail.

65 White Wagtail. *Motacilla alba.*
66 Grey Wagtail. *Motacilla Boarula.*
67 Yellow Wagtail. *Motacilla flava.*

GENUS XXII. Warbler.

68 * Nightingale. *Sylvia Luſcinia.*
69 * Pettychaps. *Sylvia hortenſis.*
70 * Black-cap. *Sylvia atricapilla.*
71 Hedge-ſparrow. *Sylvia modularis.*
72 * Redſtart. *Sylvia Phœnicurus.*
73 * White-throat. *Sylvia cinerea.*

74 Sedge Warbler. *Sylvia ſalicaria.*
75 Red-breaſt. *Sylvia Rubecula.*
76 Stone-chat. *Sylvia Rubicola.*
77 * Whin-chat. *Sylvia Rubetra.*
78 * Wheat-ear. *Sylvia Oenanthe.*
79 Wren. *Sylvia Troglodytes.*
80 Gold-creſted Wren. *Sylvia Regulus.*
81 * Willow Wren. *Sylvia Trochilus.*

GENUS XXIII. Titmouſe.

82 Great Titmouſe. *Parus major.*
83 Blue Titmouſe. *Parus cæruleus.*
84 Colemouſe. *Parus ater.*
85 Marſh Titmouſe. *Parus paluſtris.*
86 Long-tailed Titmouſe. *Parus caudatus.*

GENUS XXIV. Swallow.

87 * Houſe Swallow. *Hirundo ruſtica.*
88 * Martin. *Hirundo urbica.*
89 * Sand Martin. *Hirundo riparia.*
90 * Swift. *Hirundo Apus.*

GENUS XXV. Goatſucker.

91 * European Goatſucker. *Caprimulgus europæus.*

ORDER IV. *Columbine.*

GENUS XXVI. Pigeon.

92 Common Pigeon. *Columba Oenas.*
Seen here only in the domeſtic ſtate; but I have been informed, that they are found in the wild ſtate in the weſtern part of this county.
93 Ring Dove. *Columba Palumbus.*

94 * Com-

94 * Common Turtle. *Columba Turtur.*
Seen here only in the ſummer, generally two together; but not very common.

ORDER V. *Gallinaceous.*

GENUS XXVII. Peacock.

95 Peacock. *Pavo criſtatus.*
Only in a domeſtic ſtate.

GENUS XXVIII. Turkey.

96 Common Turkey. *Meleagris Gallopavo.*
Only in a domeſtic ſtate.

GENUS XXIX. Pintado.

97 Pintado, or Guinea Hen. *Numida Meleagris.*
Only in a domeſtic ſtate.

GENUS XXX. Pheaſant.

98 Common Barn-door Fowl. *Phaſianus Gallus.*
Only in a domeſtic ſtate.

99 Common Pheaſant. *Phaſianus colchicus.*

GENUS XXXI. Grous.

100 Black Grous. *Tetrao Tetrix.*
I have ſeen this ſpecies on St. Leonard's foreſt near Horſham.

GENUS XXXII. Partridge.

101 Common Partridge. *Perdix cinerea.*

102 * Common Quail. *Perdix Coturnix.*

GENUS XXXIII. Buſtard.

103 Common Buſtard. *Otis Tarda.*
Sometimes ſeen on our South Downs.

104 * Thick-knee'd Buſtard. *Otis oedicnemus.*

DIVISION

DIVISION II. WATER BIRDS.

ORDER VI. *With cloven Feet.*

GENUS XXXIV. Heron.

105 Common Heron. *Ardea cinerea.*
106 Bittern. *Ardea ſtellaris.*

GENUS XXXV. Curlew.

107 Common Curlew. *Numenius Arquata.*
108 Whimbrel. *Numenius Phæopus.*

GENUS XXXVI. Snipe.

109 ** Woodcock. *Scolopax Ruſticola.*
110 *** Great Snipe. *Scolopax major.*
I have ſeen one of this ſpecies which was killed near Horſham.
111 ** Common Snipe. *Scolopax Gallinago.*
112 ** Jack Snipe. *Scolopax Gallinula.*
113 *** Red Godwit. *Scolopax lapponica.*
114 Redſhank. *Scolopax Calidris.*
115 Common Godwit. *Scolopax leucophæa.*

GENUS XXXVII. Sandpiper.

116 Lapwing. *Tringa Vanellus.*
117 *** Grey Plover. *Tringa Squatarola.*
118 Green Sandpiper. *Tringa Ochropus.* } Wood Sandpiper. *Tringa Glareola.* }
119 Common Sandpiper. *Tringa Hypoleucos.*
120 Sea Sandpiper. *Tringa maritima.*
121 ** Purre. *Tringa Cinclus.*
122 Dunlin. *Tringa alpina.*
123 ** Small grey Sandpiper. *Tringa arenaria.*

GENUS

GENUS XXXVIII. Plover.

124 Golden Plover. *Charadrius pluvialis.*
125 * Sea Lark. *Charadrius Hiaticula.*
126 ** Sanderling. *Charadrius Calidris.*

GENUS XXXIX. Oyſter-catcher.

127 Common Oyſter-catcher. *Hæmatopus oſtralegus.*

GENUS XL. Rail.

128 Water Rail. *Rallus aquaticus.*

GENUS XLI. Gallinule.

129 * Land Rail. *Gallinula Crex.*
130 Common Water-hen. *Gallinula chloropus.*
131 *** Spotted Gallinule. *Gallinula Porzana.*
This bird was once ſhot by the ſide of a mill-pond in this neighbourhood.

ORDER VII. *With pinnated Feet.*

GENUS XLII. Coot.

132 Common Coot. *Fulica atra.*

GENUS XLIII. Grebe.

133 *** Tippet Grebe. *Podiceps criſtatus.*
134 *** Eared or leſſer creſted Grebe. *Podiceps auritus.*

ORDER VIII. *Web-footed,*

* with long legs.

GENUS XLIV. Avoſetta.

135 Avoſetta. *Recurviroſtra avoſetta.*

** with ſhort legs.

GENUS XLV. Auk.

136 Puffin. *Alca aretica.*
137 Razor-bill. *Alca Torda.*
138 Black-billed Auk. *Alca Pica.*

GENUS XLVI. Diver.

139 Guillemot. *Colymbus Troille.*
140 Speckled Diver. *Colymbus ſtellatus.*

GENUS XLVII. Tern.

141 * Greater Tern. *Sterna Hirundo.*
142 * Leſſer Tern. *Sterna minuta.*
143 * Black Tern. *Sterna fiſſipes.*

GENUS XLVIII. Gull.

144 Black and white Gull. *Larus marinus.*
145 Wagel. *Larus nævius.*
146 Common Gull. *Larus canus.*
147 Black-headed Gull. *Larus ridibundus.*
148 ** Winter Mew. *Larus hybernus.*
149 Skua. *Larus cataractes.*

I am much miſtaken if I have not ſeen this gull on our coaſt.

150 Parrock Gull. *Larus tridactylus.*

I had one of theſe in my poſſeſſion: it was caught alive in a hard froſt near my houſe, and I have ſince ſeen it on the ſea-ſhore.

GENUS XLIX. Merganſer.

151 *** Dun Diver. *Mergus Caſtor.*
152 *** Red-breaſted Gooſander. *Mergus Serrator.*
153 *** Minute Merganſer. *Mergus minutus.*

154 Smew. *Mergus Albellus.*

I never met with this bird, but have heard it called the Magpie Diver; ſo that I ſuppoſe it is ſometimes ſeen on this coaſt.

GENUS L. Duck.

155 *** Wild Swan. *Anas Cygnus.*

Sometimes killed on our coaſt in hard winters.

156 Tame Swan. *Anas Olor.*

157 Canada Gooſe. *Anas canadenſis.*

Seen in the river at Horſham in a domeſtic ſtate.

158 Wild Gooſe. *Anas Anſer ferus.*
Tame Gooſe. *Anas Anſer domeſtica.*

159 *** Laughing Gooſe. *Anas albifrons.*

Sometimes killed on our coaſt in hard winters.

160 *** Bean Gooſe. *Anas Segetum.*

161 *** Bernacle. *Anas erythropus.*

One of this ſpecies was killed on our coaſt in the hard winter 1789.

162 Brent Gooſe. *Anas Bernicla.*

Seen in a domeſtic ſtate.

163 Muſcovy Duck. *Anas moſchata.*

Seen in a domeſtic ſtate.

164 Chineſe Gooſe. *Anas cygnoides.*

Seen in a domeſtic ſtate.

165 Scoter or Black Duck. *Anas nigra.*

Sometimes ſeen in great flocks at ſea, not far from ſhore.

166 Common Wild Duck. *Anas Boſchas.*
Tame Duck. *Anas Boſchas domeſtica.*

167 ** Scaup Duck. *Anas Marila.*

Killed on our coaſt in 1789.

168 Shieldrake. *Anas Tadorna.*
169 ** Wigeon. *Anas Penelope.*
170 ** Pochard. *Anas ferina.*
171 ** Pintail Duck. *Anas acuta.*
172 ** Golden Eye. *Anas Clangula.*
173 Teal. *Anas Crecca.*

GENUS LI. Pelican.

174 Corvorant. *Pelecanus Carbo.*
175 *** Gannet. *Pelecanus baſſanus.*
Once ſhot in this neighbourhood.

N. B. One aſteriſk (*) immediately after the number affixed to the bird, ſignifies a ſummer bird of paſſage; two aſteriſks (**) a winter bird of paſſage; and three (***) an occaſional viſitor, or bird whoſe migration is irregular and uncertain. The reſt, without any aſteriſk, are ſuppoſed to be reſident here in this iſland, throughout the whole year.

NOTES, *or* REMARKS, *on the foregoing* CATALOGUE.

No. 6.—Henharrier. *Falco cyaneus.*
Ringtail. *Falco Pygargus.*

SEVERAL years ago I ſhot two of the blue grey Hawk, or Henharrier, which differed conſiderably in the colour of their plumage. The firſt was of a light aſh-colour, marked with reddiſh oblong ſpots on the breaſt and hinder part of the head, like the figure in the folio edition of the Britiſh Zoology; the other had none of

theſe

theſe oblong reddiſh ſpots, either on the breaſt or hinder part of the head, but was all over of the ſame pale aſh-colour, becoming gradually lighter on the under ſide to the belly, which was white. This induced me to conclude (perhaps too haſtily) that theſe two birds were male and female of the ſame ſpecies, and that the brown hawk, with a white rump or ring-tail, was a different ſpecies; but a gentleman in this neighbourhood lately informed me, that his game-keeper, ſome time laſt ſummer, killed both the Hen-harrier and the Ringtail from the ſame neſt, and that there is no doubt of their being male and female of the ſame ſpecies. If ſo, the difference in the colour of my two birds muſt ariſe from their different ages; the firſt, with reddiſh ſpots, being, as I ſuppoſe, the youngeſt, and ſtill retaining ſomewhat of the ferruginous colour of the Ringtail; the other, which was all over of a light aſh-colour, I ſuppoſe to have been an old bird, and had attained to its full colour.

No. 12.—Dark brown Hawk or Buzzard.

In the winter 1792, two of theſe birds were obſerved to frequent the high trees in Denn Park, in purſuit of the rooks. One of them was taken, and kept alive in the garden, where I found it, and made a drawing and deſcription of it. If it is not a variety of the Moor Buzzard, *Falco æruginoſus*, it probably is a new Britiſh ſpecies; for I cannot find, either in Mr. Pennant's or Mr. Latham's works, any deſcription that perfectly agrees with it. It ſeems to me to be of leſs dimenſions, of a more ſlender make, and more active than the Moor Buzzard: but, as I never had this latter bird in my poſſeſſion, I cannot form a proper judgment upon it.

No. 21.—Hooded or Royſton Crow. *Corvus Cornix.*

This bird is, with reſpect to us, a bird of paſſage, being ſeen only in the winter, and then only near the ſea-ſide. On the 30th of

of March 1790, as I was walking in my land, which is about four miles diſtant from the ſea-ſhore, I ſaw, what I thought had the appearance of migration in theſe birds, a ſmall flock of them (leſs than twenty in number), having paſſed ſteadily by me from the ſea towards the north.

No. 25.—Red-legged Crow. *Corvus Graculus.*

This bird frequents the South Downs about Beachy Head and Eaſt Bourn, where it is called the Red-billed Jack-daw.

No. 26.—The Roller. *Coracias Garrula.*

This uncommon bird was killed in our neighbourhood: I made a drawing from its ſkin, which differed, in ſome reſpects, from Mr. Edward's figure; whence I had reaſon to think that mine was a young bird of the preceding year, driven acroſs the ſea into this iſland by the ſtormy weather which prevailed about that time.

No. 27.—The Cuckoo. *Cuculus canorus.*

The old birds of this ſpecies leave us when they ceaſe to ſing, which is about the latter end of June; but the young ones are ſometimes ſeen very late in the autumn,—as late as the 28th of September.

No. 34.—The Hoopoe. *Upupa Epops.*

I once had this beautiful bird alive in my poſſeſſion; and, at another time, one of theſe birds flew before my horſe, near Eaſt Bourn in this county, and ſuffered me to approach near enough to diſtinguiſh its colour, and even its creſt, though it carried the latter folded up as it flew. From what I could obſerve in both theſe birds, it ſeems to reſemble the Jay in its habits, particularly in its note or ſcreech, and in its manner of flying.

No. 44.

No. 44.—The Chatterer. *Ampelis Garrulus.*

This rare bird ſometimes makes its appearance here in hard winters: I have met with two inſtances of it.

No. 45.—The Croſs-bill. *Loxia Curviroſtra.*

I have known two or three inſtances of this bird being killed in the neighbourhood. A male bird of this ſpecies was ſent me by a friend on the 15th of January 1795.

No. 46.—The Hawfinch. *Loxia Coccothrauſtes.*

Two inſtances of this bird's being met with here, in hard winters, have fallen within my obſervation.

No. 54.—The Chaffinch. *Fringilla cœlebs.*

Mr. White, in his Natural Hiſtory of Selborne, aſſerts, that only the hen Chaffinches are to be ſeen in winter at that place; or, at moſt, but very few cocks among them. Such a circumſtance (which confirms Linnæus's account of the migration of the female Chaffinches only) happening ſo near to this place as the very next county, has induced me to take particular notice of theſe birds, eſpecially in the winter. Not long ſince, as I was riding, I obſerved a number of Chaffinches in the hedges on each ſide of the road, and, as far as I could diſtinguiſh, moſt of them appeared to be cocks. I now began to think that I had diſcovered ſome traces of this partial migration, and that the hens were gone, and had left their mates behind them: but my ſubſequent obſervations have not tended to confirm this idea; for, ſince that time, I have ſeen at leaſt as many hens as cocks; particularly on the 22d of this month, January 1795, nineteen of theſe birds were killed and brought to me. On examination, there proved to be ten females and nine males; ſo that I muſt revert back to my original opinion, that no ſuch partial migration of one ſex only takes place here.

No. 55.

No. 55.—The Brambling. *Fringilla Montifringilla.*

This bird is ſometimes driven hither (as I ſuppoſe) by the ſeverity of the winter in more northern countries. I have met with a few inſtances of it in very hard winters.

No. 57.—The Siſkin. *Fringilla Spinus.*

The viſits of this bird to us in this neighbourhood ſeem to be very irregular and uncertain. Some years ago, I ſaw it ſeveral times, in the month of April only, frequenting ſome fir-trees near my houſe, as may be ſeen in my Table publiſhed in the Firſt Volume of the Linnean Tranſactions; but for theſe laſt fourteen years I have never ſeen it once.

No. 59.—The ſpotted Flycatcher. *Muſcicapa Griſola.*

The chief food of this bird being flies, it does not make its appearance here till late in the ſpring,—never before May. A pair of theſe birds have conſtantly built their neſt, every year, in the ſame hole of the wall of my houſe, for a great number of years; which leaves but little room to doubt, that the ſame individual birds return every year to the ſame place to build their neſt. From whence do they come? Do they come from a far diſtant country (lying perhaps on the other ſide the equator), and repair annually to the ſame identical ſpot for the purpoſe of incubation? or, Do they, at the proper ſeaſon of the year, come out from their hiding-place near at hand, where they have paſſed the winter in a torpid ſtate, ſecure from the ſeverity of that ſeaſon?

No. 69.—The greater Pettychaps. *Sylvia hortenſis.*

I have had two birds in my poſſeſſion, which, from their ſize, I am perſuaded were of this ſpecies: there was ſome difference in their colour, one being of a more olivaceous green than the other; and

and alſo in their ſize, but both of them, were larger than the common Pettychaps, *Sylvia Hippolais.*

No. 74.—The Sedge Warbler. *Sylvia ſalicaria.*

This bird is ſeen here only in the ſummer, and is then not very common; it is a very lively active bird, which frequents the reeds near ponds, and ſings very prettily.

No. 78.—The Wheat-ear. *Sylvia Oenanthe.*

This little bird, which is found in great plenty on our South Downs, is juſtly eſteemed a great delicacy for the table, and vaſt numbers of them are annually caught in traps by the ſhepherds as they tend their flocks. Theſe Wheat-ear traps conſiſt of horſe-hair nooſes, placed under a ſod of turf dug out of the ground for that purpoſe. They are firſt ſet up every year on St. James's day, the 25th of July, ſoon after which time they are caught in numbers truly aſtoniſhing, when we reflect that it is a ſolitary bird, more than two or three being ſcarcely ever ſeen together. Obſerving that all the birds which were caught in the proper ſeaſon had the ſame coloured plumage as the hen bird, I made ſome enquiries reſpecting them of a ſhepherd at Eaſt Bourn, who informed me, that the flights conſiſted chiefly of young birds, which arrived in the greateſt numbers when a weſterly wind prevailed, and that they always came againſt the wind. He told me that on the 15th and 16th of Auguſt 1792 he caught twenty-ſeven dozen with only a few old birds amongſt them; but this is a ſmall number when compared with the almoſt incredible quantity ſometimes taken. A Gentleman informed me, that his father's ſhepherd once caught eighty-four dozen in one day. Early in the ſpring only a few old birds are to be ſeen, and none (that I could ever obſerve) in the winter. I enquired of the ſhepherd whether theſe birds breed on the South Downs: the anſwer was, A few only.

No. 80.—The Gold-crested Wren. *Sylvia Regulus.*

This, I believe, is the smallest bird in Europe; yet, notwithstanding its diminutive size, it is able to brave our severest winters, as I have before observed. Being very small, fond of solitude, and living chiefly in the woods, it is not often observed; but I am inclined to think that these birds abound in greater numbers than is generally supposed, because, on the 4th of January 1792, I counted eight or nine of them playing about in a short cut copse within my sight at the same time. In summer it sings very prettily; its note is weak, as may be supposed from its size, but melodious. Where and how it breeds, I know not, having never seen its nest.

No. 81.—The common Willow Wren. *Sylvia Trochilus.*

I have not yet been able to ascertain the three different varieties of this bird mentioned by Mr. White in his Natural History of Selborne. I have more than once shot it in the very act of uttering its sibilous shivering note, spoken of by that Gentleman; but when I got it into my possession, instead of being his largest Willow Wren, it proved to be the common kind, or *Motacilla Trochilus* of Linnæus. It is an elegant, lively, active little bird, which is very common here in the summer; and I once found its nest at the bottom of a furze bush.

No. 86.—The long-tailed Titmouse. *Parus caudatus.*

These birds are seen in small flocks or companies together in the winter time, flying from bough to bough in the woods and hedges.

No. 89.—The Sand Martin. *Hirundo riparia.*

Not far from my house is a sand-pit, where these birds have made many holes, and build their nests every year. By frequently visiting

viſiting this pit in the ſpring, I have pretty accurately aſcertained the time of their arrival, or firſt appearance, to be early in the month of May. In the year 1789 none were to be ſeen on the 28th of April, but on the 6th of May ſeveral were flying about the holes. In 1790, on the 8th of May none were to be ſeen, but on the 12th of the ſame month ſeveral made their appearance. In 1791 I viſited the pit on the 5th and 7th of May, but could diſcover no birds; yet on the 10th, when I viſited it again, ſeveral were flying about. Since that time my further obſervations have been prevented by ſome Houſe Sparrows having taken poſſeſſion of the holes, and driven away the Sand Martins.

No. 90.—The Swift. *Hirundo Apus.*

During my reſidence at Eaſt Bourn in the year 1792 I had an opportunity of marking the time of the departure or diſappearance of theſe birds with ſome accuracy. I lodged near the church, round which building I uſed conſtantly to ſee them playing on the wing till the 10th of Auguſt, after which day not one was to be ſeen.

No. 102.—The Quail. *Perdix Coturnix.*

Theſe birds undoubtedly breed on our South Downs, and in the autumn are found by the ſportſmen in the ſtubbles in bevies or broods ſeveral together. It is probable that moſt of them migrate; but that they do not all leave this country I can aver, for I well remember, that, in company with a friend, we found three or four brace of quails in one morning in the middle of winter (about Chriſtmas) in a field of turneps at Eaſt Bourn.

No. 104.—The thick-kneed Buſtard. *Otis oedicnemus.*

It is called here the Stone Curlew, and breeds on the South Downs, where its whiſtling note is frequently heard in a ſummer's

evening. That moſt of theſe birds leave us in the autumn is moſt probable; but I have known one inſtance of its having been killed here in the winter.

No. 105.—The common Heron. *Ardea cinerea.*

Herons frequent our marſhes and ſides of ponds in ſearch of their food. They probably come hither from Penſhurſt Park in Kent, where there is a large Heronry; and vaſt numbers of their neſts are to be ſeen in ſome very large tall beech-trees,—often many neſts in one tree.

No. 106.—The Bittern. *Ardea ſtellaris.*

This bird is ſometimes met with here, and in the ſpring is frequently heard to blow or make a loud hollow ſound. This ſound has been ſuppoſed from the bird's putting its bill into the hollow of a reed: this I ſuſpect to be a vulgar error, and rather think that it is the call of love uttered, in the ſpring, by the male, to invite the female to him. I once ſhot one of theſe birds in froſty weather: it fell on the ice, which was only ſtrong enough to ſupport my dogs, and they immediately ruſhed forwards to attack, but, being only wounded, it defended itſelf ſo vigorouſly with its ſharp-pointed bill, that not a dog would touch it, till I fired again and killed it.

No. 107.—The common Curlew. *Numenius Arquata.*

This bird is to be met with on our ſea-coaſt, both in ſummer and winter.

No. 108.—The Whimbrel. *Numenius Phæopus.*

This bird is not ſo common as the foregoing ſpecies; I have met with only one inſtance of its being found here.

No. 110.

No. 110.—The Great Snipe. *Scolopax major.*

On the 1st of October 1793 I received this bird from a friend. I have no doubt of its being the *Scolopax major* of Mr. Latham, although it was inferior in size and weight, and differed somewhat in colour from that Gentleman's description; perhaps mine was a young bird.

No. 113.—The Red Godwit. *Scolopax lapponica.*

These birds are sometimes found on our sea-coast in great numbers. Many years ago, two persons fired amongst a flock of them, and killed ten: these were brought to me, and I made drawings from them; but have not seen one of the species since.

No. 115.—The common Godwit.—*Scolopax leucophæa.*

I believe this bird is not often met with here. The only one I ever saw, was one that I shot on the sea-coast at Bexhill on the 22d of September 1792; and I suspect that to have been a young bird, because it was of a very light colour, and its measurements were far short of Mr. Latham's. It was boring into the mud with its bill in search of food when I shot it.

No. 117.—The Grey Plover. *Tringa Squatarola.*

This bird is seen on our sea-coasts only in the winter, and then but seldom. I have seen only one, which was killed on the 13th of January 1776 by the sea-side at Bexhill.

No. 118.—The Green Sandpiper. *Tringa Ochropus.*
The Wood Sandpiper. *Tringa Glareola.*

These birds agree so nearly in size, mode of living, and other respects, that they are with the greatest probability supposed to be only varieties of the same species, perhaps male and female. A

few of theſe birds frequent the banks of the river at Horſham, and in 1793 I was in hopes that I ſhould be able to aſcertain whether it were ſo or not; but I could procure only one of them, which proved to be the *Tringa Ochropus.* The *Tringa Glareola* is deſcribed in the Firſt Volume of the Linnean Tranſactions.

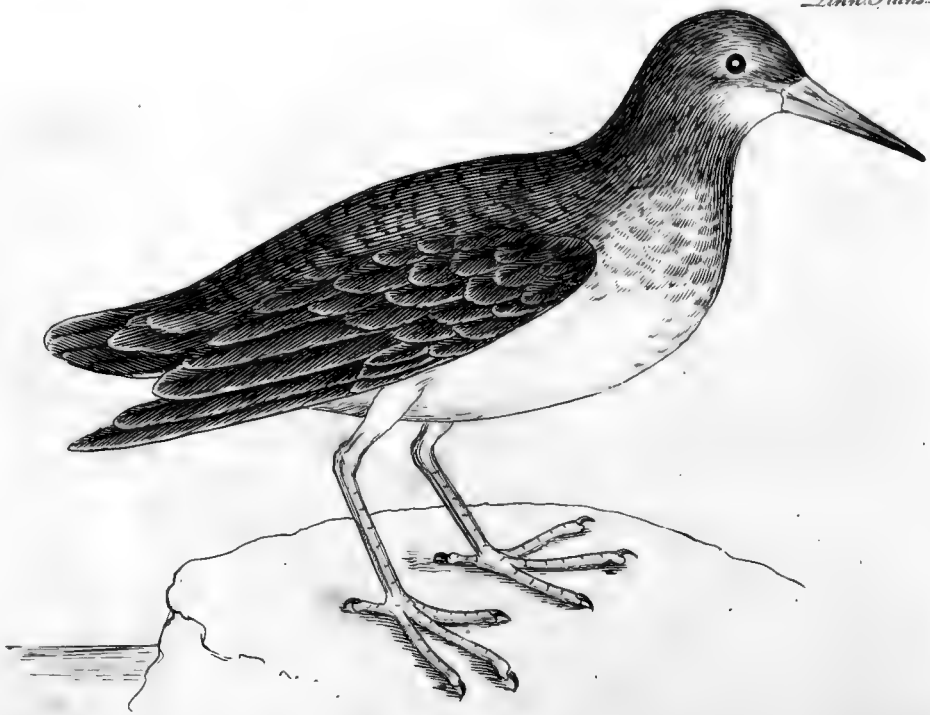
No. 119.—The common Sandpiper. *Tringa Hypoleucos.*

This is a ſolitary bird, frequenting the ſides of ponds and rivulets. I never had but one in my poſſeſſion, and that I ſhot by the ſide of a large mill-pond in the year 1773.

No. 120.—The Sea Sandpiper. *Tringa maritima. Lath. Orn.* 11. *p.* 731. *n.* 18.

On the 8th of December 1796 a ſmall flock, conſiſting of ten or twelve of theſe birds, were ſeen on the ſea-coaſt near Bexhill: two of them were ſhot and brought to me.

Its length from the tip of the bill to the end of the tail is eight inches and an half; its breadth from tip to tip of the wings when extended, fifteen inches and an half. Its bill is an inch and a quarter long, yellow from the baſe half way, and the tip black. Its weight is two ounces and an half. The head, neck, ſhoulders and back are of a dark duſky aſh-colour, with the edges of each feather on the back ſomewhat lighter: the prime quill feathers of the wings are duſky, with their ſhafts white, particularly the firſt: the ſecondary quills are lighter, with white tips; and the hindermoſt are almoſt white, having only one duſky ſpot. The tail is ſhort, and conſiſts of twelve feathers, of which the four middlemoſt are of a dark duſky colour, and the four on each ſide *gradually* ſhorter, and of a pale aſh-colour edged with white. The under-ſide of the neck and breaſt duſky, with the feathers on the breaſt fringed with white. The chin, lower part of the breaſt,


Linn. Trans. XV. tab. 1. p. 22.

breaſt, belly, thighs and vent white, except a few duſky ſpots on the ſides, thighs and vent. The legs and feet are yellow, naked above the knees; and the toes entirely divided, without the leaſt connecting membrane between any of them. The claws are blackiſh.

No. 121.—The Purre. *Tringa Cinclus.*

Theſe birds are found in great flocks on our ſea-coaſt in the winter. I have had ſeveral of them in my poſſeſſion. There are three remarkable varieties of this ſpecies.

On the 1ſt of February 1776, a bird of the firſt variety, in its winter dreſs, from which I made this deſcription and a figure, was ſhot on the ſea-ſhore near Bexhill.

Its length from the tip of the bill to the end of the tail is ſeven inches; its breadth from tip to tip of the wings when extended, thirteen inches and an half. Its bill is an inch and a quarter long, black, and rather bent or curved downwards near the tip. The top of the head, hinder part of the neck, and the back, are of a duſky browniſh aſh-colour, ſpotted with darker brown: the upper covert feathers of the wings are brown, with the edges of a lighter colour: the quill feathers of the wings of a blackiſh brown, having their baſes and ſhafts white: the middle feathers of the tail of a duſky brown, and the reſt lighter or whitiſh. The under ſide of the neck, and upper part of the breaſt, are of a pale duſky brown, ſpotted with darker brown: the reſt of the breaſt, belly, and covert feathers under the tail, are of a pure white. The legs and feet are black, and have not any membrane or web between the joints of any of the toes.

I have ſince ſeen ſeveral of theſe birds in the winter, which all agreed exactly with the above deſcription, except a ſmall variation in reſpect to ſize.

The

The ſecond variety is in a mixed ſtate, between its winter and ſummer dreſs. On the 18th of September 1792 I ſhot one of theſe birds, amongſt ten or a dozen more, on the ſea-ſhore at Bexhill.

Its length from the tip of the bill to the end of the tail was ſeven inches; the breadth from tip to tip of the wings when extended, fourteen inches; and the bill, which was black and a little bent near the tip, one inch and a quarter long. The head and hinder part of the neck were variegated with reddiſh brown and black, the middle of the feathers being of a dark brown or black, with the edges of a pale reddiſh brown. The feathers on the ſhoulders were of an aſh-coloured brown, and thoſe on the back of a dark brown or black in the middle, having their edges of a pale yellowiſh or reddiſh brown, not very unlike thoſe of the Jack Snipe. The covert feathers of the wings were duſky, edged with pale brown, and thoſe next the quills tipped with white. The quills were of a duſky black with white ſhafts and baſes. The tail was rather pointed; the two middlemoſt feathers were of a dark brown edged with light yellowiſh brown, and the reſt were of a light aſh-colour with white ſhafts. The chin, belly and vent were white, but the breaſt was of a light brown, ſtreaked with darker brown; and the ſides of the belly were alſo marked with duſky ſpots. The legs were naked above the knees, of a black colour; and the toes were entirely divided, without any web between them.

Some time about the middle of the ſummer 1795 I had an opportunity of ſeeing a bird of the third variety in its ſummer dreſs, whoſe whole upper ſide and breaſt were variegated with duſky and yellowiſh brown, the middle of the feathers being of a blackiſh, and the edges of a yellowiſh brown. Its chin, lower part of the breaſt, belly, thighs and vent were white; and its bill, legs and feet black.

All

All theſe birds agreeing exactly in ſize, ſhape, length and colour of the bill and legs, particularly in having the toes entirely divided, without any web between any of the joints; and, laſtly, in the ſhafts of the quill feathers being white in all of them, induces me to look upon them as different varieties of the ſame ſpecies: if ſo, this bird not only changes its place of reſidence, but its dreſs alſo, according to the different ſeaſons of the year.

No. 122.—The Dunlin. *Tringa alpina.*

On the 31ſt of May 1780 I ſaw this bird on the ſea-ſhore at Bexhill: it ſuffered me to approach near enough to diſtinguiſh its colours, eſpecially the black mark on its breaſt, as figured in the folio edition of the Britiſh Zoology.

No. 123.—The ſmall grey Sandpiper. *Tringa arenaria.*

On the 31ſt of December 1793 a bird was brought to me which, I have no doubt, is the *Tringa arenaria* of Linnæus: its ſhape was ſhort and thick, very different from that of the Sanderling or Curwillet; and it had alſo a perfect back toe with a claw, which that bird is entirely deſtitute of. I was informed that it was killed on the ſea-coaſt near Rye, and that they were ſeen there in flocks in the winter.

No. 124.—The Golden Plover. *Charadrius pluvialis.*

This ſpecies is frequently killed on our ſea-coaſt in the winter; and, if my memory does not fail me, I have alſo ſhot it in the ſummer. But the moſt ſingular circumſtance relating to this bird is, that it varies in one of its characteriſtic marks. Two birds of this ſpecies, from which I drew a figure and deſcription, had no back toe, as appears both from my figure and deſcription: and indeed, to the beſt of my recollection, none that I ever ſaw had any back

toe, except one I ſhot on the 22d of September 1792, which, to my great ſurpriſe, had a ſmall back toe.

No. 125.—The Sea Lark. *Charadrius Hiaticula.*

Theſe birds are very common on our ſea-coaſt in the ſummer; but I have reaſon to think that they, or at leaſt the generality of them, leave us in the winter; for, during my reſidence at Haſtings, from the 19th of November 1792 to the 11th of February 1793, I never once ſaw this bird, although I was conſtantly on the look-out to take particular notice of this and other ſea-birds: but I remember one inſtance of this bird's being killed during a hard froſt in the winter by the ſea-ſide, near Pevenſey; and I have more than once obſerved it ſo early as February and March, particularly on the 19th of February 1787.

No. 126.—The Sanderling, or Curwillet. *Charadrius Calidris.*

Theſe birds frequent our ſea-coaſt in the winter, and are ſeen in large flocks. I received two of them in about a fortnight after I had drawn and deſcribed the ſmall grey Sandpiper: they were ſo different from that bird in ſhape, colour, and particularly in the total want of a back toe, that I have no doubt of their being a diſtinct ſpecies, and even that they belong to a different genus, as Linnæus has placed them.

No. 127.—The Sea-Pie, or Oyſter-catcher. *Hæmatopus oſtralegus.*

It is called here the Olive. I have frequently ſeen them in pairs on our ſea-coaſt in the ſummer, but do not recollect having ever ſeen them in the winter.

No. 133.—The Creſted or Tippet Grebe. *Podiceps criſtatus.*

This bird is ſometimes found here in hard winters. In the year 1789 I had a dead bird of this ſpecies in my poſſeſſion: its head appeared

appeared to be quite ſmooth, without any creſt, and I ſuppoſe it was either a female or a young bird; for, on the 27th of January in this preſent year 1795, a bird of this ſpecies was diſcovered ſitting under a hedge in the pariſh of Battle, at the diſtance of ſix or ſeven miles from the ſea: it was ſo much weakened by the ſeverity of the froſt, that it ſuffered itſelf to be taken, and was brought to me alive. I kept it alive till I had made drawings and a deſcription of it, during which time it erected the feathers on the top of the head into two tufts or creſts, and ſwelled out the white feathers beneath its cheeks into a kind of ruff, ſo as to make the head appear as if encircled by a ſort of hood. It was very pugnacious, ſtriking fiercely with its ſharp bill whenever I put my hand near it, and at the ſame time uttered a harſh ſcream. According to authors this bird ſpends its life almoſt wholly in the water:—is it not ſingular then that it ſhould be found on dry ground, not near any water, and at ſo great a diſtance from the ſea, eſpecially as its wings are ſo ſhort and unfit for long flight?

No. 134.—The Eared or Leſſer-creſted Grebe. *Podiceps auritus.*

This bird is very rare in our neighbourhood: I have had one in my poſſeſſion, which was killed in a freſh water pond on the 2d of May 1789.

No. 135.—The Avoſetta. *Recurviroſtra Avoſetta.*

This bird is not uncommon on our ſea-coaſt in ſummer; but whether it is to be found here in winter I cannot tell, as I do not recollect to have ever ſeen it at that ſeaſon. That it breeds here I have been an eye-witneſs, for I remember that, ſeveral years ago, I found in the marſhes near Rye, a young one of this ſpecies, which appeared to have been juſt hatched, and I took it up in my

 hands,

hands, whilſt the old birds kept flying round me. I have alſo ſeen it in the ſummer on the ſea-coaſt at Bexhill.

No. 136.—The Puffin. *Alca arctica.*

It is found on this coaſt, and known about Eaſt Bourn by the name of the Parrot-billed Wille.

No. 137.—The Razor-bill. *Alca Torda.*

I think this bird is known here by the name of the common Wille; if ſo, it breeds in vaſt numbers in the cliffs at Beachy Head.

No. 138.—The black-billed Auk. *Alca Pica.*

I believe it is ſometimes found on our ſea-coaſt. In the hard winter of 1789 a bird of the Auk kind was brought to me, which I took to be this ſpecies.

No. 139.—The Guillemot. *Colymbus Troille.*

I have ſeen one ſtuffed and preſerved, which I underſtood was taken on this coaſt.

No. 140.—The ſpeckled Diver. *Colymbus ſtellatus.*

It is found on this coaſt: I have ſeen one or two ſpecimens of it.

No. 141.—The greater Tern. *Sterna Hirundo.*
No. 142.—The leſſer Tern. *Sterna minuta.*
No. 143.—The black Tern. *Sterna fiſſipes.*

The two firſt ſpecies are very common on our coaſt in the ſummer; but the black Tern is, I believe, very rare, for I never ſaw it but once.

No. 151.

No. 151.—Dun Diver. *Mergus Caſtor.*
No. 152.—Red-breaſted Gooſander. *Mergus ſerrator.*
No. 153.—Minute Merganſer. *Mergus minutus.*

I have ſeen all theſe birds; they were killed on our ſea-coaſt in the winter.

No. 160.—The Bean Gooſe. *Anas Segetum. Lath. Orn.* 11. *p.* 843. *n.* 28.

On the 8th of December 1796 three of theſe birds were ſeen near the ſea-ſhore at Bexhill, two of which were ſhot, and one of them, having only its wing broken, was alive when I received it. When I attempted to touch it, it pecked at my hand, and hiſſed exactly like the common tame Gooſe.

The largeſt of the two meaſured from the tip of the bill to the end of the tail two feet three inches; and from tip to tip of the wings when extended, four feet ſix inches. Its weight was three pounds and fifteen ounces; but the other, which was ſmaller, weighed only three pounds. Its bill was of a pale red, tinged with duſky on the tip and ſides: its head, neck, back, wings and tail were of a light aſh-coloured brown, mottled with darker brown, the center of each feather being darkeſt: the rump and tips of the wing-coverts and tail were white; and the leſſer wing-coverts, and baſtard wing, of a light aſh or ſlate colour, tipped with black; and the great quills duſky black: the whole under-ſide was of a dull white, clouded with light aſh-brown, paleſt towards the belly and vent, which were of a dull white. Its legs and feet were webbed, and of a dirty yellow, with black claws.

Notwithſtanding there was a conſiderable difference in the weight and dimenſions of theſe two birds, yet I ſuſpect that they were both young birds of the laſt ſummer, becauſe even the largeſt was inferior in

in weight and ſize to Mr. Latham's deſcription; their bill and legs were of a paler colour than he deſcribes them to be, and when dreſſed, their fleſh was tender and well-flavoured.

No. 167.—The Scaup Duck. *Anas Marila.*

Theſe birds frequent our ſea-coaſt in hard winters. On the 27th of January 1795 my ſervant, in company with another perſon, fired amongſt a flock of theſe birds conſiſting of near an hundred: he brought me a male and female; the latter proved to be the *Anas frænata* of Dr. Sparman's Muſeum Carlſonianum.

No. 168.—The Shieldrake. *Anas Tadorna.*

This bird is found on our coaſt both in winter and ſummer: that it breeds here I am confident, having frequently ſeen a pair of old ones, and alſo a brood of young ones taken at Bexhill.

I beg leave to lay before the Society a Continuation of my Tables of the Appearance and Diſappearance of certain Birds.

A TABLE

To front Page 30.]

A T

Swallow—*Hirundo rustica.*
First seen
Not seen afte

Martin—*Hirundo urbica.*
First seen
Not seen afte

To front Page 30.]

A TABLE of the Appearance and Disappearance of the following BIRDS.

	1784	1785	1786	1787	1788	1789	1790	1791	1792	1793	1794
Swallow—*Hirundo rustica.*											
First seen	Ap. 13	Ap. 11	Ap. 27	Ap. 18	Ap. 15	Ap. 21	Ap. 18	Ap. 13	Ap. 9	Ap. 25	Ap. 19
Not seen after	Oct. 14	Nov. 13	Nov. 14	Nov. 5	Nov. 14*	Nov. 16*	Oct. 21*	Nov. 1*	Oct. 24*	Oct. 19	Oct. 24*
Martin—*Hirundo urbica.*											
First seen	Ap. 26	May 3	May 3	May 16	May 9	May 8	May 4	May 4	Ap. 21	May 3	May 12
Not seen after	Oct. 14*	Oct 28*	Sep. 30*	Dec. 8*	—	Nov. 2*	Oct 21*	Nov. 1*	Oct 9*	Oct. 19	Oct. 24*
Sand Martin—*Hirundo riparia.*											
First seen	July 15	—	Ap. 27	Sep. 8	July 19	May 6	May 12	May 10	Ap. 16	—	—
Not seen after	Sep. 4*	Sep. 2	Sep. 6	Nov. 5	Sep. 25	Sep. 29*	Aug. 21*	Sep. 23	Sep. 1*	—	—
Swift—*Hirundo Apus.*											
First seen	May 17	May 4	May 14	May 15	May 5	May 5	May 19	Ap. 28	May 3	May 6	May 13
Not seen after	Oct. 14	Sep. 2	Sep. 6	Nov. 5	Sep. 10	Aug. 5*	Aug. 19	Aug 12	Aug. 10*	Aug. 2	July 19*
Goat-sucker—*Caprimulgus Europæus.*											
First seen	Aug. 23	Sep. 9	—	—	—	—	July 11	Aug. 30	May 16	Sept. 2	July 6
Not seen after	—	—	—	—	—	—	—	Sep 4*	Sep. 14*	—	Sep. 28*
Turtle-dove—*Columba Turtur.*											
First seen	May 29	—	July 28	—	—	June 1	June 21	—	July 5	May 14	June 14
Not seen after	—	—	—	—	—	Aug. 2*	—	—	—	Aug. 16	—
Wryneck—*Jynx Torquilla.*											
First seen or heard	Ap. 16	—	June 30	Ap. 12	Ap. 17	May 5	Ap. 26	May 12	Ap. 3	Ap. 25	Ap. 14
Not seen after	—	Aug. 18*	Sep 22	July 6†	—	—	—	—	Sep. 7*	Oct. 18	Sep. 8*
Cuckoo—*Cuculus canorus.*											
First seen or heard	Ap. 26	May 3	May 13	May 7	Ap. 16	Ap. 27	May 10	May 9	Ap. 15	Ap. 27	Ap. 19
						June 19†			June 19†	June 27†	June 22†
Not seen after	June 19†	Sep. 28*	Sep. 6	June 22†	June 17†	Sep. 9*	June 19†	—	Aug. 19*	July 27*	Sep. 19
Nightingale—*Motacilla Luscinia.* *Sylvia Luscinia.*											
First seen or heard	Ap. 25	May 11	Ap. 25	Ap. 26	Ap. 16	Ap. 29	Ap. 26	Ap. 13	Ap. 11	Ap. 30	Ap. 21
Not seen after	—	—	—	—	—	—	Sep. 17	—	Sep. 24	—	—
Black-cap—*M. atricapilla.* *S. atricapilla.*											
First seen	May 18	—	—	May 31	Ap. 17	—	Ap. 24	—	May 1	—	—
Not seen after	—	Sep. 8*	Sep. 18	—	Sep. 25	—	Sep. 17	—	Sep. 24	—	—
White-throat—*M. Sylvia.* *S. cinerea.*											
First seen	Ap. 28	May 3	Ap. 27	Ap. 19	May 1	Ap. 29	Ap. 27	Ap. 21	Ap. 14	Ap. 26	Ap. 23
Not seen after	Nov. 11	—	Sep. 23*	—	Sep. 25	Sep. 10*	Sep. 17	Aug. 30*	Sep. 23*	Aug. 26*	Aug. 14*
Wheat-ear—*M. Oenanthe.* *S. Oenanthe.*											
First seen	Ap. 25	Ap. 26	May 28	Mar. 20	Ap. 12	Ap. 10	May 3	June 1	Ap. 11	May 3	—
Not seen after	Nov 11	—	Sep. 22	Oct. 18*	Sep. 25	Sep. 23*	Sep. 17	Sep. 22	Sep. 20*	Sep. 25*	Sep. 29*
Whin-chat—*M. rubetra.* *S. rubetra.*											
First seen	Aug. 4	Aug 30	June 23	May 29	—	June 16	Aug 11	Ap. 21	Ap. 21	May 23	Aug. 9
Not seen after	—	—	Sep. 19*	—	—	—	—	Sep. 23*	Sep. 23*	—	—
Redstart—*M. phœnicurus.* *S. phœnicurus.*											
First seen	Ap. 28	Ap. 28	May 19	May 9	Ap. 23	Ap. 28	Ap. 22	Ap. 12	Ap. 13	Ap. 25	Ap. 19
Not seen after	Aug. 30*	Aug. 30*	Sep. 18	Sep. 26*	Sep. 25	—	Aug. 18*	Sep. 15*	Sep. 20*	Aug 23*	Sep. 21*
Willow Wren—*M. Trochilus.* *S. Trochilus.*											
First seen	Ap. 30	—	Ap. 15	Ap. 13	Mar. 27	Ap. 28	Ap. 28	May 16	Ap. 6	Ap. 25	Ap. 14
Not seen after	Nov. 11	Sep. 8	Sep. 23*	Sep. 20*	Sep. 24*	Sep. 13*	Sep. 17*	Sep. 20*	Oct. 6*	Sep. 26*	—
Fly-catcher—*Muscicapa grisola.*											
First seen	May 6	June 12	May 15	May 16	Ap. 29	May 13	May 16	May 8	May 23	May 27	May 14
Not seen after	Nov. 11	—	Sep. 11*	Aug. 20*	Sep. 25	Sep. 22*	Sep. 17	Aug. 22*	Sep. 30*	Sep. 4*	Sep. 22*
Red-backed Shrike—*Lanius Collurio.*											
First seen	Aug. 16	May 18	—	—	Aug. 4	May 8	May 19	May 30	July 11	July 5	July 6
Not seen after	—	—	—	—	—	—	—	—	Aug. 1*	July 24*	Aug. 30
Land-Rail—*Rallus Crex.*											
First seen	Sep. 4	Sep. 3	Aug. 29	Aug. 27	Sep. 1	Sep. 4	Sep. 1	—	Sep. 4	Oct. 15	Sep. 1
Not seen after	Nov. 6	—	—	—	—	Nov. 8	—	—	Oct. 8*	—	Sep. 26*
Quail—*Tetrao Coturnix.* *Perdix Coturnix.*											
First seen	Sep. 9	Sep. 16	Aug. 29	—	—	Sep. 1	—	—	July 23†	—	—
Not seen after	—	—	—	—	—	—	—	—	—	—	—
Thrush—*Turdus pilaris.*											
First seen	—	Nov. 6	—	Dec. 26	Oct. 13	Dec. 3	Nov. 3	Oct. 24	—	—	Jan. 6
											Ap. 16
Not seen after	—	Mar. 6*	—	May 1*	—	Mar. 23*	Mar. 19*	Mar. 12*	Mar. 9*	Feb 15	Dec. 6
Redwing—*Turdus iliacus*											
First seen	—	Nov. 9	Nov. 4	Dec. 31	Dec. 16	—	Nov. 2	Oct. 1	Oct. 8	—	Jan. 11
											Mar. 8*
Not seen after	—	Ap. 6*	—	Feb. 24*	Mar. 21*	Feb. 10*	Mar. 2*	—	—	Mar. 30	Dec. 16
Woodcock—*Scolopax Rusticola.*											
First seen	Oct. 6	Oct. 24	Oct. 19	Oct. 27	Oct. 21	Oct. 26	Oct. 13	Oct. 1	Oct. 3	Nov. 9	Oct. 22
Not seen after	—	Ap. 5*	Mar. 21*	Mar. 21*	Mar 26*	Ap. 6*	Ap. 5*	Mar. 14*	Mar. 24*	Ap. 4	Ap. 16
Snipe—*Scolopax Gallinago.*											
First seen	—	Nov. 30	Nov. 13	Nov. 26	—	Dec. 12	—	Nov. 30	Oct. 4	Nov. 22	Nov. 26
Not seen after	—	—	—	Mar. 21*	Mar. 26*	—	Mar. 28*	Mar. 11*	—	—	Mar. 18*
Jack Snipe—*Scolopax Gallinula.*											
First seen	—	—	Jan. 5	Dec. 29	—	Dec. 29	Nov. 12	—	Dec. 5	—	Jan. 29
Not seen after	—	—	Mar. 20*	Ap. 4	Mar. 26*	—	—	Mar 11*	Feb. 25*	Mar. 29	Ap. 16
Sea Lark—*Charadrius Hiaticula.*											
First seen	May 12	—	—	Feb. 19	Feb. 28	May 1	Mar. 11	June 1	Ap. 11	—	June 11
Not seen after	—	—	—	—	—	June 16*	—	—	Sep 22*	—	—
Greater Tern—*Sterna Hirundo.*											
First seen	May 12	—	—	July 18	July 21	May 8	May 4	June 1	May 16	July 24	June 11
Not seen after	—	Sep. 20	—	Sep. 15*	Oct. 25	Nov. 8	—	—	Sep. 18	Oct. 30	Sep. 29
Lesser Tern—*Sterna minuta.*											
First seen	May 19	—	—	—	—	May 1	May 4	June 1	Ap. 26	July 24	—
Not seen after	—	Sep. 20	—	—	Oct. 25	Nov. 8	—	—	Sep. 18	Oct. 20	—
Royston Crow—*Corvus Cornix.*											
First seen	Oct. 13	Nov. 9	Oct. 7	Oct. 20	Oct. 25	Oct. 19	—	—	Oct. 16	Oct. 30	Nov. 13
Not seen after	—	—	—	Mar. 21*	Mar. 26*	Mar. 5*	Ap. 15*	—	—	—	Ap. 16

Those marked with an asterisk (*) were seen on that day, and not afterwards, till their return next season.

Those marked thus (†) were heard on that day, and not afterwards, till their return next season.

II. *Anecdotes of the late Dr. Patrick Browne, Author of the Natural History of Jamaica. By Aylmer Bourke Lambert, Esq. V. P. L. S.*

Read Dec. 1, 1795.

HAVING in a visit to Ireland in the year 1790 accidentally met with Dr. *Patrick Browne*, well known to this Society by his Natural History of Jamaica, I judged it might not be an unacceptable anecdote to give some account of my interview with this veteran in those pursuits which form the intentions of our meetings.

I first heard of him by the country people in the neighbourhood of Ballinrobe in the county of Mayo, at which place he lived. I sent him a message that I would wait on him. He was then so infirm that I found him confined to his room and his bed, but he received me with much cordiality when I told him my errand was to visit him merely from respect as a lover of the Science of Botany; and I gave him the first information of our institution, and the success that had hitherto attended our researches.

He conversed much on the subject of botany, and informed me that he had corresponded for twenty years with Linnæus himself, and had communicated many plants to him. Those Gentlemen who are at all conversant with the *Amœnitates Academicæ* will recollect, in the fifth volume of that collection, a paper under the title of *Pugillus Plantarum Jamaicensium*, in which the descriptions of 130 species are more correctly given than they stand in Dr. *Browne*'s book. This was in consequence of Dr. Solander's having purchased *Browne*'s whole collection, and sent it to Sweden for Linnæus.

And hence, in the Species Plantarum of 1764, Linnæus was enabled to correct both Sloane and *Browne* himself in many instances.

After Dr. *Browne*'s return from Jamaica, and the publication of his History, he took another voyage to the West Indies, where he resided, principally in Montserrat and Antigua, occupied in the practice of physic, for four years. He returned home for the last time in 1781.

Having much leisure during this stay in the islands, he collected a large Herbarium, and many seeds, which on his return he presented to Dr. Edward Hill, Professor of Botany in the University of Dublin.

He also began a *Flora Indiæ Occidentalis*, which formed a thin quarto volume; this he presented to me, and it is now in the possession of our President. I recollect, in speaking of this manuscript, that he told me he had taken uncommon pains to describe and discriminate the generic characters of the *Ipomæa* and *Convolvulus*; and that Linnæus had signified, in a letter to him, his approbation of the distinctions given of those genera.

I could not help remarking the small number of books that he seemed to possess on the subject of Natural History, his supellex being confined to the *Genera* and *Species Plantarum* of Linnæus, and a copy of Hill's edition of *Ray*'s *Synopsis*, especially when I recollected the considerable number of authors he had quoted in his History of Jamaica; but he soon gave me to understand that in his last voyage he had the misfortune to lose his library, consisting of 200 volumes on Natural History subjects.

During my abode in his neighbourhood I paid him several visits, in one of which he made me a present of a MS. *Flora Hibernica*, and of a small Herbarium collected in the counties of Mayo and Galway, with a separate Collection of Mosses, which are now in the possession of this Society.

In

In my way to the Doctor I one morning found the *Cynosurus cæruleus* of Linnæus, which had escaped his notice, and of which he immediately gave a short description. This I have the pleasure of presenting to the Society, as a specimen of his hand-writing, and as the last description of a plant that he ever wrote.

When at Dublin, some time after I left him, I procured from Mr. Wilson the bookseller the letter I now produce, which was written a little time before his death. I produce it, not because it contains any very interesting information, but as a proof that to the last he preserved a wish to improve and propagate botanical knowledge. By this it appears too, that he had meditated to give all the assistance in his power towards the publication of the *Flora Hibernica.*

He received from me the first intelligence of the new edition of his History of Jamaica, and expressed a great desire to have seen it; but he died soon after, aged 70, and was buried at Crosboyne near Castle Macgarret in the county of Mayo.

Letter from Dr. Browne to Mr. Wilson Bookseller of Dublin, written a little while before his Death.

"MY design was only to give a simple and as cheap a Catalogue of the plants I met with here as I could devise. I mentioned it to Sir J. Banks, and he assured me he spoke to the Provost, and he promised to put a *Flora Hibernica* on foot. Such a Catalogue as mine might be of great service to such a work, and such a work alone deserves the embellishment and attention you mention. But it would require a visit to the south and north of the kingdom; undertakings by no means fit for infirmity at 70. However, by publishing small Catalogues, it might be brought about by individuals, and mine you are welcome to towards any thing of that sort.

Pultney's View of Linnæus I have not ſeen, and wiſh you would ſend it to me: I will get one of our carriers to call for it ſoon, and will be obliged to you to alter ſuch Engliſh names as you ſee proper. As to the Iriſh, if ever you print it, put the Iriſh in Italicks only. I wrote them as much to the pronunciation of the Iriſh as I could, but not according to the Iriſh orthography, which I could not find in any book. *Paddowpipe* is undoubtedly the proper name of the *Hippuris*. I do not think the addition of *ruſh* proper to any name, and the method of adding a ſhort character to the different *genera* (as in Linnæus's *Syſtema*) beſt, as in Martyn's of Cambridge. You mention the title-page: I think you ought not to publiſh more than a deſign of printing a *Flora Hibernica*, if ſuch a thing could be completed, and of giving a Catalogue, in the cheapeſt manner poſſible, of ſuch plants as have been collected for ſuch an undertaking, with the Engliſh and Iriſh names, keeping the deſcriptions and remarks for a capital work. As to Theirlheld and K. Eogh's, I have had them, and think nothing of them. I loſt all my books a few years ago: I had about 200 botanical books, and now I have only the *Genera* & *Species Plantarum* of Linnæus, with a copy of Ray's *Synopſis* in a Linnæan dreſs, which was the amuſement of ſome time to me ſome years paſt. Lord Lucan promiſed to ſend me another copy of Dill. and Ray's *Synopſis*. If you could ſucceed in getting any other additions, ſo as to undertake a general *Flora Hibernica*, if I live and am able to ſtir I ſhall give you what aſſiſtance I can in the manuſcript you have, which you may keep. *Liguſticum Scoticum* of that MS. is the *Smyrnium Oluſatrum*.

"I have made out a Catalogue of our Agarics, for which this laſt ſeaſon was very favourable, and it amounts to eighteen or more; but I have not this by me."

III. *Deſcriptions*

III. *Descriptions of three rare Species of British Birds.* By G. Montagu, *Esq.* F. L. S.

Read March 1, 1796.

1. SYLVIA SYLVICOLA.—WOOD WREN.

S. virescens subtus flavescens, superciliis luteis, abdomine crissoque niveis.

Asilus major, *Briss. orn.* 3. *p.* 482. A.

Regulus non cristatus major, *Will. orn. p.* 228.—*White, Hist. Selb. p.* 55.

Laubvögelchen, *Naturf.* 27. *p.* 47. 4.

Wood Wren, *Linn. Trans.* 2. *p.* 245. *pl.* 24.

IN the latter end of April in the year 1790, as I was walking with my gun, I was attracted by the note of a bird I had never before noticed, and presently discovered it on an oak-tree, at the verge of a wood in the parish of Easton Grey in the county of Wilts. The first appearance of the bird much resembled that of the Yellow Wren, *Motacilla Trochilus*; but its note and manners at once decided it to be a very different species. It is an active restless bird, and, at the time I shot it, was excessively busy in pursuing some species of winged insect, which seems to be its principal food. Upon near inspection it might readily have been mistaken for the

Trochilus, had I not been attentive to its note and actions. Having recollected that Mr. White, in his Nat. Hist. of Selborne, page 55, speaks of three distinct species of Yellow Wrens, I concluded this to be one, as doubtless the *Motacilla Trochilus* and *Motacilla Hippolais* are the other two. In order therefore to compare those with this species, I shot fresh specimens, with which that country abounds, and by which I was thoroughly convinced they were distinct; and in all probability this is the identical bird Mr. White calls the Largest Yellow Wren, and describes as inhabiting the high woods of beech at Selborne.

As this elegant little species of warbler seems to have escaped the notice, or at least the historic attention, of ornithologists, probably from confounding it with the Yellow Wren, it was my intention to present it to the Linnean Society as soon as opportunity offered the discovery of its nest and eggs, in order that it might be added to the list of British birds. In a tour through South Wales the following spring, I found this species not unfrequent in the oak woods of Carmarthenshire. The first I saw that season was on the 29th of April, the thermometer at 51 at 9 o'clock A. M. and, in a week after, a great many more arrived, which, from their incessant chirping and actions, I took to be all males. About the middle of May I plainly discovered some females were arrived, and on the 30th of that month I had the good fortune to find two nests, by watching the birds with some of the materials in their bills, and soon after took them with six eggs each; and in order to clear the matter beyond doubt, I caught one of the females on the nest, and shot the male, who approached very near, at the same time. It may not be improper to remark, that I found these birds in greatest plenty in coppice woods of oak of about eighteen or twenty years growth: their flight is short, slow and vibrating, as they move from spray to spray, seldom varying their situation above twenty yards

yards from the firſt choſen ſpot till the young take wing, when they quit the lower branches, and take to the higheſt trees, ſearching for inſects amongſt the upper foliage. At this time they are not ſo vociferous, and have entirely left off that conſtant vibration of their wings, which ſeems peculiar to the courting and incubating ſeaſon.

It is not to be ſuppoſed that this ſpecies is a new or accidental viſitant to theſe parts, but that its near reſemblance in ſize and colour to the Yellow Wren has probably occaſioned it to be miſtaken for that bird. But whoever will bring them together will at once obſerve, that the plumage of this is much more vivid; the ſtroke above the eye of a much brighter yellow; and, as a ſpecial characteriſtic mark, the belly and under tail-coverts are invariably of a pure white, which in the Yellow Wren are tinged, and the latter part daſhed with yellow. There is no diſtinction in the plumage of the ſexes of either ſpecies: this ſhould not therefore be miſtaken for the male of the other, which doubtleſs has often been the caſe; neither ſhould it be confounded with the *Hippolais*, that bird being much inferior in ſize, and none of the under parts of a pure white: its legs are alſo duſky, in which it differs from both the *Sylvicola* and the *Trochilus*. Beſides, were every other mark of diſtinction wanting, the note, manners and habits of this widely differ: this only inhabits woods in the breeding ſeaſon: its cry, for it cannot be called a ſong, bears not the leaſt reſemblance to any other ſpecies: the firſt part ſeems to expreſs the word *twee* drawn out to ſome length, and repeated five or ſix times ſucceſſively, terminating in notes ſomething of the ſame tone, but delivered in a hurried manner, ſhaking its wings at the ſame time. This ſpecies weighs about two drams forty grains; the length five inches and a quarter: the bill is duſky; irides hazel: the upper part of the head, back, ſcapulars, and upper coverts of the tail, are of a lively yellow green:

over

over the eye is a bright brimstone-coloured stroke; the cheeks and throat yellow; the upper part of the breast, white tinged with yellow; the lower part, belly, and under tail-coverts, pure white; the quill feathers are dusky, edged on their exterior webs with yellow green; the tail very little forked, coloured like the wing feathers, except the two outmost, which want the yellow margin: the legs are of a yellowish brown.

The female caught on the nest weighed three drams.

This bird is a migratory species, and like most, if not all our summer migrants, the males precede the other sex in their vernal flight a week or ten days. It leaves us about the middle of September.

The nest is formed on the ground, beneath the shade of trees or bushes, constructed of dry grass, with a few dead leaves and a very little moss externally, and lined with finer grass and a few long hairs. Its shape is oval, with the entrance near the top, like those of the Yellow Wren and Lesser Pettichaps; but materially differs from them in the internal part of its structure, as those birds invariably line their nests with feathers. The eggs weigh from eighteen to twenty-two grains; their colour white, sprinkled all over with rust-colour spots: in some those markings are confluent.

These observations were intended to be presented to the Linnean Society immediately after the discovery of the nest and eggs; but, by some unaccountable means, my notes were mislaid: this delay gives me the opportunity of seeing the same bird described by Mr. Lamb in the second volume of the Linnean Transactions, p. 246; but as neither the female, nest, eggs, or place of nidification is mentioned, I have thought proper to retain the original form of my notes, especially as Mr. Lamb makes mention of my name as having noticed the bird first to him under the denomination of Wood Wren, which name he has retained. I cannot, however,

take upon myſelf the merit of its firſt diſcovery as a Britiſh ſpecies: that properly belongs to Mr. White. I have, however, fortunately been enabled to inveſtigate its hiſtory more minutely; the only inducement at this period to lay it before the Society. This bird is alſo found in Germany, where it is likewiſe a migratory ſpecies, as we are informed by Dr. Beckſtein in the 27th volume of Naturforſcher, p. 38, where he gives a deſcription of ſuch of the *Motacilla* ſpecies inhabiting that country as have a yellow ſtreak over the eye.

To my friend Mr. Latham I am indebted for the tranſlation of that part of the work for my inſpection, where I find under the denomination *Der Laubvögelchen* *, p. 47, No. 4, an excellent deſcription of this bird and its manners; though the author does not ſeem acquainted with the neſt and eggs. He adds *(Motacilla Sibilatrix)* ſuperciliis luteis, ſupra vireſcens, ſubtus flaveſcens. This author particularly remarks the whiteneſs of the under tail-coverts, the ſtrong characteriſtic mark of diſtinction.

After what has been ſaid of this hitherto little known beautiful ſpecies of warbler, little can be added to elucidate its hiſtory: to my former remarks I can only ſay, that ſince my intimate acquaintance with the bird, I have met with it in plenty in all the ſouthern counties and wooded parts I have been in, eſpecially where oak or beech abound. To this I have taken the liberty of adding a coloured drawing of the egg, taken from thoſe in my own collection †. See *Tab.* 2. *fig.* 1.

* Little leaf-bird.

† I met with this bird in Parkinſon's Muſeum under the title of Green Wren, caſe No. 271.

2. TRINGA

2. TRINGA NIGRICANS.—PHAYRELARN SANDPIPER.

Tr. cinereo-nigricans, gula abdomineque medio albis, rostro basi pedibusque rubris.

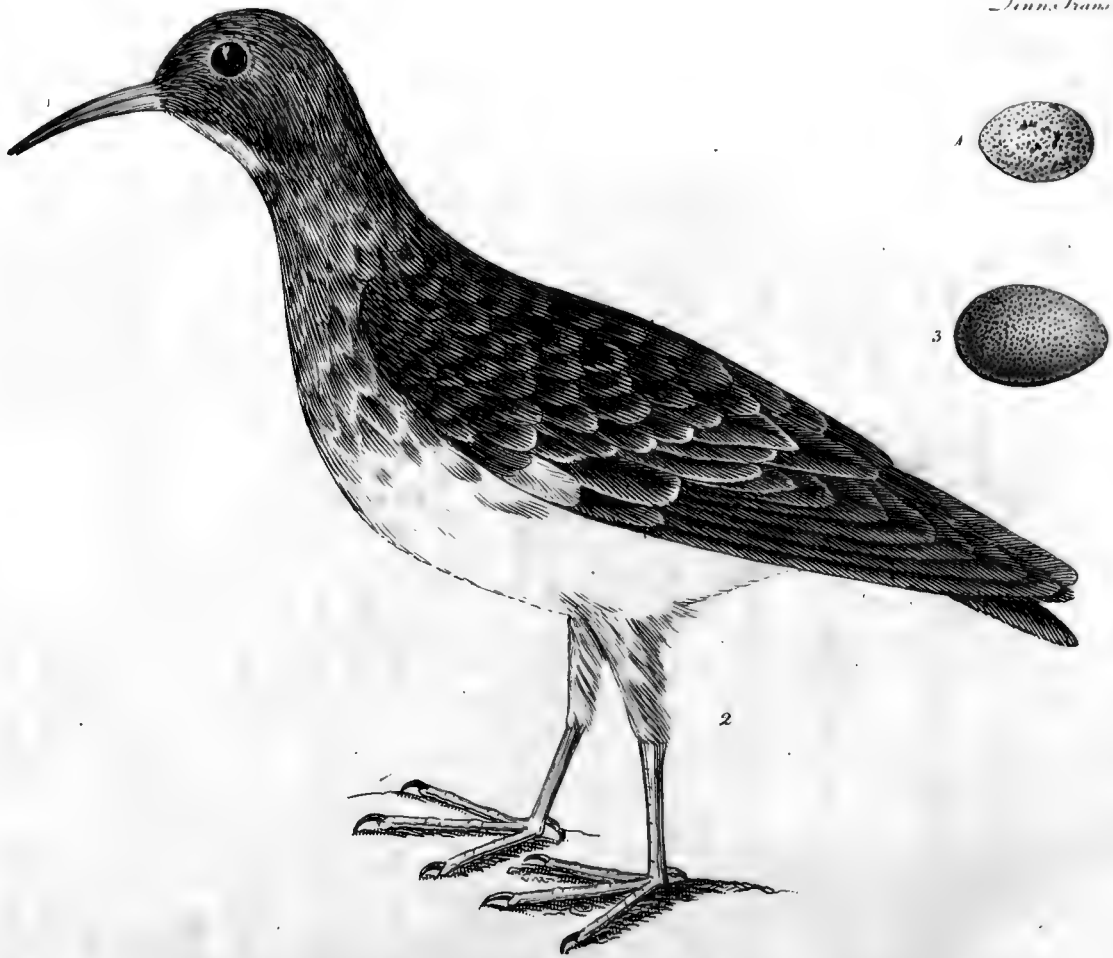
THIS non-descript species of *Tringa* was killed at Larn, or Lougharne, on the coast of Carmarthenshire in Wales, January 20, 1792, and presented to me by my friend Robert Phayre, Esq. which induced me to give it the above trivial name. It was shot in company with its congenera the Purre *(Tringa Cinctus)*, &c. All I could learn was, that, at the time it was killed, the weather was very severe, and that two others had been shot there the same season, and were called by the fishermen *Red-legs*.

In size it rather exceeds the Purre: the length was eight inches and a half; the bill slender, an inch and a quarter long, tapering towards the point, a little curved, and of a dull red colour, except at the apex and sides; the irides hazel; the head and neck dusky black; eye-lids whitish; the throat white; back and scapulars black, edged with ash-colour; the wing-coverts black tipt with white; quill feathers black, slightly edged with white on the exterior webs; shafts white; breast and all beneath white, prettily spotted with black, except the middle of the belly and vent; the rump black; the two middle feathers of the tail black, the outer one cinereous, and the rest dusky; the legs and toes dull red; claws black and blunt; toes nearly divided to their origin; middle toe an inch long.

This bird is now in my collection, from which I have taken the figure annexed, *Tab.* 2. *fig.* 2.*

* Mr. Latham suspects this may possibly be the Purple Sandpiper figured by Mr. Walcot in his second volume of British Birds.

3. ALAUDA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3. ALAUDA PETROSA.—ROCK LARK.

A. olivaceo-fusca subtus flavicans, lateribus colli pectoreque fusco maculatis, rectrice extima albo dimidiata.

Alauda obscura, *La. Ind. orn.* 2. *p.* 494. 7.

Dusky Lark, *Lewin's Br. birds, vol.* 3. *pl.* 94.

HAVING been favoured with a species of *Alauda* a few years since, from that excellent ornithologist Mr. Latham, amongst others of the same genus, in which he honoured me by a request of my opinion as to their distinction, I did not hesitate in acknowledging my being wholly unacquainted with this bird; but I took the liberty of pointing out such specific differences from all other British larks, as might obviate the idea of its being only a variety of some other species. It was the only one that gentleman had ever seen, and was sent to him by Mr. Lewin. As no description of it could be found in any author, I gave it the name of the Dusky Lark, for distinction; which name Mr. Lewin afterwards adopted in his publication on British birds, vol. iii. No. 94, as well as Mr. Latham in his *Ind. orn.* vol. ii. p. 494—7. In the year 1791 I discovered this bird to be a native of the coast of South Wales, from Monmouthshire to St. David's, the extreme part of Carnarvonshire, in all the rocky situations. Upon enquiry of the natives, I found some of the fishermen knew it by the name of the Rock Lark, and that it was indigenous to those parts: this name therefore I continue it by, instead of Dusky Lark, being expressive of its habits. As I had an opportunity of seeing these birds daily, I thought myself fortunate not only in proving, beyond all doubt, that it was a British species, but also in being able to investigate its natural history, and with certainty to add another bird to the catalogue of this country; and my wishes were fully accomplished by finding several nests with eggs. There is some reason to believe Mr. Pennant had met with

 this

this bird many years before it was given to the world as a diſtinct ſpecies by Mr. Lewin; for, in his folio edition of Britiſh Zoology, pl. P i, he has given what he calls a variety of the Tit-lark (*Alauda pratenſis*) with duſky legs, ſhot on the rocks on the coaſt of Carnarvonſhire. Should this prove to be the ſame bird, of which I believe there is no doubt, it does not detract from the merit of Mr. Lewin, who firſt gave it as a diſtinct ſpecies, but only ſerves to ſhew the ſlow progreſs of light upon Natural Hiſtory. That gentleman, however, did not ſeem acquainted with the particulars of its hiſtory. This circumſtance has induced me to lay before the Society the fruits of my further diſcovery reſpecting it.

The Rock Lark only affects the rocky parts of the coaſt: where the ſandy flats intervene it is not to be met with, except in winter, when it is occaſionally found in the marſhes, but ſeldom, if ever, out of the influx of the ſpring tides; from which we may conclude its food is principally marine inſects. Early in the ſpring it begins its ſong, which much reſembles that of the *Alauda pratenſis*, mounting in the air like that bird, and returning again to the ground, or ſome neighbouring rock, with motionleſs wing. It begins breeding early in the ſpring: on the 16th of April I found a neſt with five eggs: it was placed upon the ſhelf of a rock, about fourteen feet from the ground, behind a tuft of coarſe graſs, beneath a ſmall buſh. The neſt is formed of dry graſs, marine plants, and very little moſs externally, and lined with finer graſs, and a few long hairs. The eggs are of a dirty white, ſprinkled with numerous ſpecks of brown, darker and confluent at the larger end, ſo as to appear on that part wholly brown: their weight is about 36 grains.

The bird weighs about ſeven drams; the length ſix inches three quarters. The bill is duſky, near ſeven eighths of an inch long from the apex to the corner of the mouth; irides hazel; the upper part of the head, back of the neck, and tail-coverts, are of a dark brown;

brown; the back and ſcapulars of the ſame colour, obſcurely marked with duſky ſtrokes; above the eye, and beneath the ear, is a lightiſh-coloured ſtroke; the throat whitiſh; the breaſt and belly yellowiſh white, the former blotched with large duſky ſpots; the ſides marked with ſtrokes of the ſame; under tail-coverts light brown; the two middle feathers of the tail dark brown, the others duſky,—the outer one of a dirty yellowiſh white on the interior web and the point of the exterior,—in the ſecond feather the light colour is juſt viſible at the end; the quill feathers and wing-coverts are duſky, ſlightly edged with light brown; legs and toes duſky; claws black; hind claw four tenths of an inch long, and ſomewhat crooked. The female reſembles the male.

The young birds are not maturely feathered till after the winter of their firſt year; till then their upper parts have a tinge of olivaceous aſh-colour; beneath, the lighter parts are yellowiſh, and the coverts of the wings more deeply margined with light brown: the baſe of the under mandible and legs leſs duſky.

I have lately obſerved this bird on the coaſt of Kent and Suſſex.

Mr. Lewin having publiſhed a figure of this bird already, its egg only is here delineated, *Tab.* 2. *fig.* 3.

IV. *Account of ſome Species of Foſſil Anomiæ found in Derbyſhire.* By *Mr. William Martin, F. L. S.*

Read April 5, 1796.

AMONG the petrifactions of Derbyſhire, which I have been drawing and deſcribing for ſome time paſt, there appear to me none more worthy of a careful examination than thoſe foſſil ſhells, generally referred by authors to the family of *Anomia:* the variety of form the different ſpecies exhibit, and the prodigious quantity of ſome of thoſe ſpecies our limeſtone *ſtrata* afford, muſt ſtrike even a caſual obſerver as curious circumſtances, and certainly well deſerve the attention of the Naturaliſt. Though my own reſearches, in regard to this genus of foſſil *exuviæ*, have been indirect and imperfect, it has chanced that a great variety of ſpecimens, within this year or two, has paſſed through my hands: among theſe I reckon near thirty diſtinct ſpecies, ſeveral of which ſeem to have eſcaped the notice of authors. The *Anomia* delineated in the annexed tables, is one I ſuppoſe to be as yet undeſcribed. It appears to have been a curious ſhell; its form is very ſingular; and the *perforation*, which is placed in what is commonly called the *upper valve*, differs from that of every other foſſil ſpecies I have yet ſeen, in reſpect to its ſuperior ſize, as well as its ſituation.

DESCRIP-

DESCRIPTION.

ANOMIA (cuſpidata), teſta conica ſulcata: valvula altera convexa, nate incurvata: altera pyramidata, magno foramine trigonali. *Tab.* 3.

Sharp-pointed conical Anomia.

The *general figure* of this ſhell is conical.

The *beaked* or *under valve*, as it is uſually called, is convex, broad (its greateſt extent being from ſide to ſide), and wrought with longitudinal ribs, which are cloſely ſet, thick, prominent, and croſſed by a few ſlight concentric wrinkles, marking, apparently, the growth of the ſhell. The middle rib is much larger than the reſt, forming a high convex ridge down the centre of the valve, increaſing in breadth from the beak to the margins, which in that part are undulated or waved. The number of ribs, including the middle one, about twenty-nine. The *beak* is ſmall pointed, and curved over the hinge.

The *hinge* lies on a perfect ſtraight line, extending the whole breadth of the ſhell.

The *upper valve* is pyramidal, gradually tapering from a broad baſe, formed by the other valve, to a fine point or *apex*, which is the centre or middle part of the valve produced and acuminated. The *back*, or that portion of the *pyramid* proceeding from the margins, is rounded, longitudinally ribbed, and indented with a deep concave groove or *ſulcus*, correſpondent to the ridge in the under valve. The groove and ribs are croſſed by a few ſtrong but diſtant wrinkles. The *front*, or that part which extends from the hinge to the *apex*, is flat, ſmooth, and perforated; in figure it nearly approaches to an equilateral triangle. The *perforation* is very large; it runs through the middle of this ſide of the valve, and reſembles

a long perpendicular ſlit or fent. Its greateſt breadth is at the hinge, from which it gradually diminiſhes to a point.

This ſpecies is very rare: I have only met with one perfect ſpecimen, which was found at Caſtleton, in the common, hard, grey limeſtone. It is a complete change, evidently retaining the external ſhape and markings of the original, which has been diſplaced by limeſtone, ſimilar to that in which the foſſil was lodged. The ſame kind of ſtone, alſo, and ſpar blended together, conſtitute the interior part of the ſpecimen, and fill up the aperture in the front of the conical valve.

EXPLANATION OF THE FIGURES.

TAB. III

Contains different views of the Anomia deſcribed above: the figures the exact ſize of the ſpecimen from which they were taken.

Fig. 1. A full view of the *under* or *beaked* valve.

Fig. 2. Repreſents the ſpecimen placed in a proper poſition for ſhewing the *hinge*, with the *beak* of the *under* valve*, and the flat perforated ſide of the *upper* or *conical* valve.

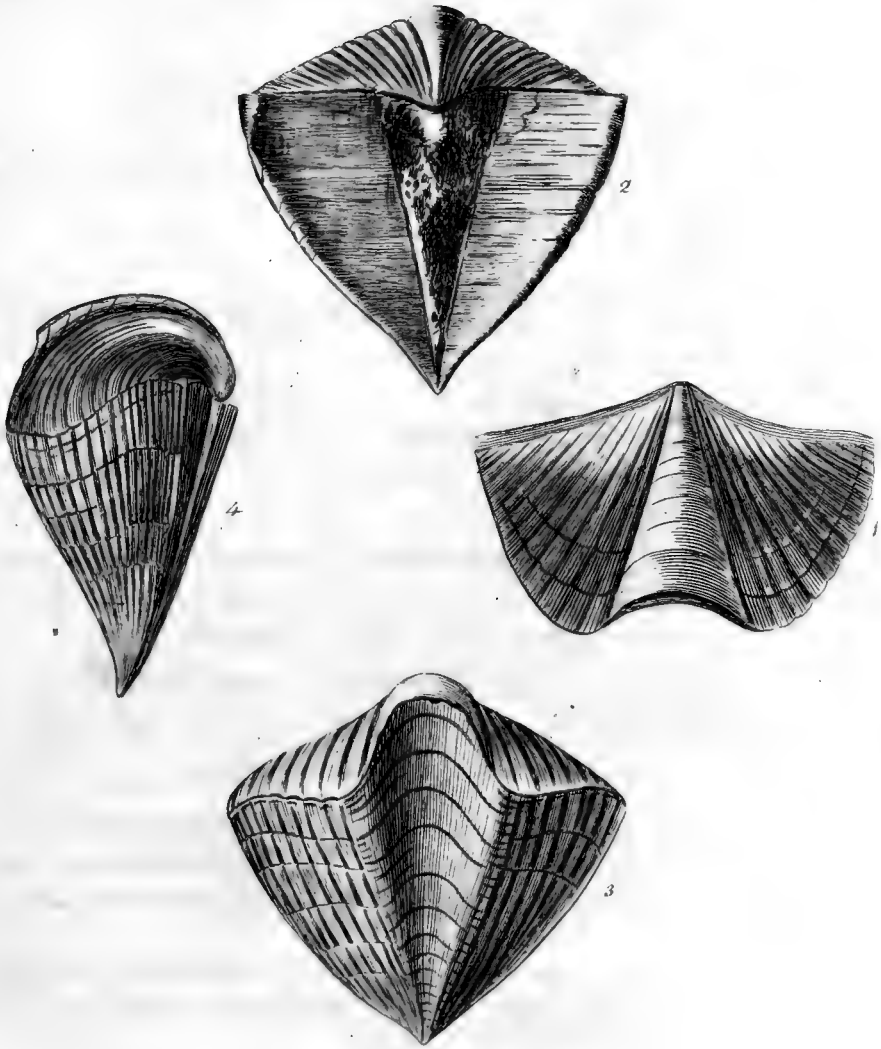
Fig. 3. An oppoſite view, ſhewing the back of the conical valve, with its deep groove or furrow, and the undulation of the margins.

Fig. 4. A ſide view of the ſame ſpecimen.

Obſervation. It ſeems probable that this ſhell, in a recent ſtate, adhered by the flat perforated part of the larger valve to ſome other body. I believe the few living Anomiæ which are known, are al-

* It is proper to remark, that what is called the under valve forms the upper part of fig. 2, 3, 4. the poſition in which they are given appearing moſt agreeable to the general make of the ſhell.

ways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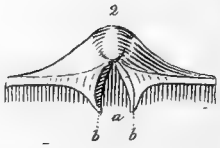
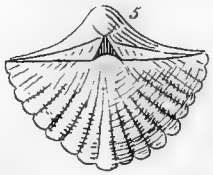
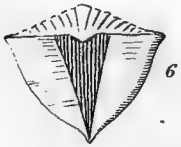






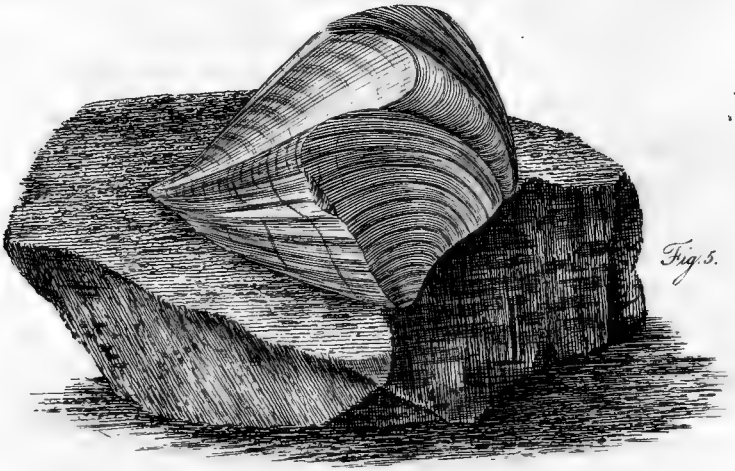


Fig. 5.

ways found fixed to ſtones, corals, &c. by a ſtrong tendinous ligature, that paſſes through their perforated beaks. In this ſpecies it is evident, from the apparent ſize of the aperture, that a large portion of the included animal was left bare, which, inſtead of a ligament, might have been furniſhed with a ſtrong adheſive power, ſimilar to that enabling limpets, and ſome other univalves, to ſtick to rocks, &c. In Tab. 4. I have given a ſketch of the ſhell thus fixed: it will help to elucidate the idea I have formed relative to its recent ſtate; and, as the poſition of the figure differs, may aſſiſt the explanation of the other figures.

Tab. IV.

The large figure in this table (5*) has been already noticed: the ſmall figures are explanatory of a few remarks I beg leave to offer on the *hinge* and *perforation* of the *Foſſil Anomiæ*, together with a ſketch of an arrangement which will include all the different ſpecies yet collected in Derbyſhire.

Of the Hinge.

It has been ſuppoſed that the *Anomiæ* whoſe hinge is on a ſtraight line, like that of ſome of the *Arcæ*, were in a ſimilar manner multarticulate, or furniſhed with many teeth: but perhaps this is not the caſe:—in all of them I am ſure it is not. The moſt perfect extraneous foſſil I ever ſaw, was a *ſingle* valve of a ſquare-hinged Anomia: it retained its ſhelly nature, with little or no change, and the hinge was quite entire and diſtinct. In this, however, as well as in many leſs perfect petrifactions of ſingle valves of the ſame kind I have occaſionally met with, I could never diſcover the leaſt appearance of a multarticulate connexion. Indeed from what I have been able to obſerve it ſhould ſeem, that the *cardo* in the ſtraight-hinged foſſil *Anomia* is the ſame, in many reſpects, as that of the recent ſpecies, namely,

namely, a cavity or notch under the beak of the larger valve furniſhed with two ſmall lateral prominencies; and in the ſmaller valve a projection that correſponds with the notch and hollows that receive the prominencies juſt mentioned. But of this a better judgment may be formed by comparing Tab. 4. fig. 1, the top of the under valve of an *Anomia*, known in the recent ſtate, and alſo found in great quantities foſſil, with fig. 2, a correct drawing of the ſame part of a petrified ſingle valve of the ſtraight-hinged kind. In this laſt the cavity *a* (forming when the valves are united a triangular aperture between the beak and hinge), and the pointed proceſſes *b*, *b*, may perhaps anſwer the purpoſe of the notch *a*, and lateral prominencies *b*, *b*, fig. 1, though greatly differing in ſhape. That this is at leaſt probable will appear, if we examine fig. 5, which repreſents the petrifaction, fig. 2, as commonly found, of ſolid limeſtone, with the valves joined. Here it is evident a part of the cavity, with the proceſſes * *b*, *b*, of fig. 2, are covered by the upper valve, the hinge of which, as in the recent *Anomiæ*, I ſuppoſe to be indented into the bottom of the notch, and furniſhed on the inſide with hollows anſwerable to the prominencies in the other valve. Before however the whole internal ſtructure of the foſſil ſtraight-hinged *Anomiæ* can be properly determined, it will be neceſſary to examine a perfect, detached *upper* valve, which I have never yet been fortunate enough to meet with.

Of the Perforation.

Some authors, in their definition of an *Anomia*, have conſtituted the perforation as the leading or eſſential character of the *genus*, and have even confined it to a particular part of the ſhell—the

* In a ſpecimen of a ſingle valve which I have lately met with, theſe proceſſes are not ſtraight, as in fig. 2. their points being curved inward, towards the hollow of the valve, ſo as to reſemble hooks.

beak

beak of the larger valve. It is not however constantly placed in that situation, as one of the recent subjects, the *Anomia Ephippium, Lin. Syst. p.* 1150, and the fossil described in the preceding pages, evince. Nor does it appear that it should be considered as a principal or determinate characteristic of this family; for in examining some hundred specimens, similar to those represented by fig. 7, 8, 10, as well as all the different species which come under the divisions those figures elucidate, I have not been able to detect the smallest aperture in either of the valves, though many of the specimens were far more perfect than some of those in which the perforation is always sufficiently visible. I am well aware that some of these imperforate *Anomiæ* would be ranked by Conchologists, who esteem the aperture as the leading character, under another *genus*; for instance, the *Anomia Gryphus*, and other species of a like form, with the *Ostreæ*. But though there may be some doubt respecting the family to which the fossils in question properly belong, certainly there is no *genus* yet established, except *Anomia*, that will receive those imperforate bivalves represented by fig. 7, 8, 10. Must we therefore form a new *genus* for the subjects under consideration, or adhere to the definition of an *Anomia* Linnæus has left us, in which the perforation is not, I think, considered as a constant generic character? Perhaps till more accurate investigations prove the hinge (from which without doubt the leading character in every family of bivalves should be taken) in the perforated *Anomiæ*, to differ from that of the imperforate, it will be advisable for those who are engaged in the pursuit of extraneous fossils to consider *all bivalves with unequal valves, the beak of one being produced or more prominent than that of the other (generally the smaller valve), and for the most part curved over the hinge*, as belonging to the *genus* of *Anomia*.

An Attempt towards an Arrangement of ſuch Anomiæ *as have been collected in Derbyſhire.*

	Number of Species collected in each Diviſion.
I. Imperforate;	
Or thoſe which have no viſible hole or perforation in either valve.	
——— with one valve gibbous, the other flat or concave.	
—— —— hinge rounded, or not on a ſtraight line. Fig. 9	1
—— —— hinge on a ſtraight line. Fig. 10 -	7
——— with both valves convex.	
—— —— hinge rounded, or not on a ſtraight line.	
margins even. Fig. 8 - -	3
margins waved. Fig. 7 - -	3
Perforate;	
Or thoſe in which one of the valves is pierced with a hole.	
——— with both valves convex.	
—— —— hinge not on a ſtraight line.	
the beak of the larger or under valve pierced through like a tube. Fig. 3. 1	4
a triangular aperture between the beak of the larger valve and hinge. Fig. 4	6
—— —— hinge on a ſtraight line.	
with a triangular aperture under the beak of the larger valve. Fig. 2. 5	4
with the upper valve perforated. Fig. 6	1

I have at preſent no more to offer on theſe ſubjects. At ſome future period I ſhall be happy in having permiſſion to lay before the Society ſketches of the other *Anomiæ* remaining in my hands, which are judged to be non-deſcript.

V. *Eſſay*

V. *Essay on the Eye-like Spot in the Wings of the Locustæ of Fabricius, as indicating the Male Sex. By Professor Anthony Augustus Henry Lichtenstein, F. M. L. S.*

Read May 3, 1796.

INTER insecta, præ ceteris curatiore digna sunt consideratione *Locustæ* sensu latiore; sive illæ species *hemipterorum*, quas immortalis Linnæus communi nomine generico, *gryllos* appellat. Fabricius vero, quem, pro solidissimo entomologiæ systematicæ conditore, venerari fas est, tamquam ad diversa genera: *acridium*, *truxalis*, *acheta*, *locusta* et *gryllus*, pertinentes, a se invicem segregavit, et subtiliore methodo descripsit. Plurimum enim nostra omnium interest, ut præsertim discamus naturam atque indolem eorum animalium, quotquot humano generi proxime, vel ad usum fructuosa sunt, vel rursus perniciosa et ad noxam damnifica reperiuntur. Jam vero haud facile alius ordo naturalis insectorum, arctiori nexu cum œconomia copulatus cohæret, dum vitæ humanæ commodis in omni terrarum orbe obest, passim vero etiam, utpote quem inter cibos recipere, multæ gentes dignantur, idem simul prodest, quam *Ulonata* Fabricii, et quidem præcipue, quotquot eorum pedibus saltatoriis instructa sunt. Non sine adflatu divino præclarus ille Israëlitarum legislator, Moses, quum suo populo præcepta circa cibos traderet, atque omnium reliquorum insectorum volatilium usu, cives Hebræos interdiceret, blanda duntaxat alimenta a *gryllis* desumenda illis concessit, ac solis *ulonatis saltatoriis* vescendi veniam dedit. "Omne insectum alatum," inquit *Levit.* xi. 20. seqq. "quaternis pedibus in-

 "grediens,

" grediens, abominandum vobis esto. Solummodo ista comeditote
" ex insectis alatis, quæ quaternis pedibus ingrediuntur, quotquot
" habent duo crura præter suos pedes, quibus saltent super terram.
" Sequentia ex illis comeditote: *gryllum* ejusque species, *locustam* se-
" cundum ejus species, *truxalidem* secundum ejus species, et *achetam*
" secundum ejus species."

Neutiquam est, cur miremur, antiquissimum illum auctorem jam in quatuor genera dispescere istius modi insecta, et singulorum horumce generum plures agnoscere species. Quem ad modum enim ignoti nulla cupido; ita rursus noscitare, domique perspicere amant homines naturam illarum rerum, quas pro victu cupediisque usurpare consueverunt. Hinc factum est, ut historia naturalis ulonatorum adsultim ingredientium in oriente percrebresceret multis seculis ante, quam Europæi spreta isthæc sibi fastidiataque monstra, propius considerare et notis peculiaribus a se invicem distinguere sustinerent vel dignarentur. Tametsi vero nunquam in omni Europa, quantum equidem sciam, usquam ille Asiatis Afrisque solemnis mos, locustis vescendi obtinuerit, aut olim facile unquam in consuetudinem abiturus esse videatur: nihilo secius tamen illud insectorum genus, vel eo nomine solertem attentionem meretur, quod identidem agros pessimis exemplis devastans, magnam calamitatem infert rei rusticæ. Quam ob rem tot tantique exstant singulares de locustis libri, totiesque obiter, et quasi aliud agendo, de iisdem exposuere docti homines, modo agricolis, nunc naturæ curiosis consulturi, ut noctuam Athenas inferre putetur, si quis novi aliquid et inauditi de hoc insectorum genere docere præsumat. Verum tamen manet inexhausta dives illa naturæ vena; et immane quantum adhuc restat indagandum, circa bestiolas, falso pro jam satis superque cognitis habitas. Sed qui recens patefactis naturæ mysteriis, locupletare cupit litterarum studia, næ ille vehementer errat, ubi ultro sibi manifestatum iri sperat ea, quæ celavit ad hunc usque diem solers opifex,

ſex, nuſquam niſi in minimis tota natura, curioſos, ſed parum oculatos cordatoſve obſervatores, perfunctorie ſupinaque oſcitantia tractantes intricata ſtructuræ animalis miracula. Dici, quin animo fingi vix poteſt, quantum per omnem ſubſidiorum litterariorum apparatum, adhuc lateat in adumbrationibus generum et formarum, quæ ad ulonata pertinent, rite conſtituendis. Contigit mihi, *gryllos* et *locuſtas* in ditiſſimo muſeo Holthuſiano improbo labore examinanti, errores quoſdam inveſtigare, qui viros in entomologia verſatiſſimos induxerunt, ut notas et characteres genericos cum ſpecificis confunderent, et meras diverſitates e ſexus diſcrimine ortas, pro ſpecificis proprietatibus adhiberent. Sic tribuit Linnæus numquam niſi honorifice nominandus, *Gryllo ſuccincto* gulam cornutam, quaſi characterem ſpeciei, id quod recentiores entomologi, ejus auctoritatem temere ſecuti, uno ore confirmant. At cuncti *grylli* Fabricii habent cornu, longius vel brevius in gula; eoque tamquam charactere naturali generico liquidiſſime a *locuſtis*, *achetis*, *truxalidibus* et *acridiis* diſtinguuntur. Ex hoc abuſu characteris generici, pro nota ſpecifica, non poteſt fieri, quin oriantur errores, excuſandi quidem, ſed nihilo minus emendandi. Plurimum reverendus Herbſt (*Archiv. inſ. tab.* 54. *fig.* 2.) exhibet iconem *Grylli Lineolæ* Fabric. n. 29. ſub nomine *Grylli ſuccincti*, propter gulam cornutam. Quis hoc illi vitio vertere poteſt, quum nemo uſquam annotaverit, omnes omnino ſpecies *grylli* Fabriciani communiter gaudere hacce tali protuberantia corniculata, nunc recta, nunc incurvata, modo longiore, modo breviore, nunc ſerrata, nunc integerrima? Nondum conjectura adſequi valui, cui bono natura tribuerit hanc partem peculiarem *gryllis*, et quidem hiſce ſolis. Nihil profecto fruſtra vel temere creavit, nil molitur inepte Numen ſapientiſſimum. Docebit olim experientia, quo valeat iſthæc ſingularis gulæ in *gryllis* Fabric. conformatio. Sed de hoc nunc quidem hactenus.

Tranſeo

Transeo ad aliud argumentum circa *locustas* Fabricii, quod, tamquam propriam et primariam hujus schediasmatis materiam, ita pertractare conabor, ut quantum inde, non modo ad hujus generis species rite definiendas, verum in universam adeo entomologiam utilitatis redundet, manifesto appareat. Pertinet vero hæc recens observatio ad ocellum dorsalem in basi hemelytrorum, quem clarius, vel item occultius conspicuum, gerunt mares omnium formarum, quæ merito sunt referendæ ad genus naturale, quod Fabricius sub nomine *locustæ* constituit, sive ex disciplina Linnæi ad illam tribum *gryllorum*, quam *Tettigonia* inscripsit. Quum in supra laudato museo, ea, qua par erat sedulitate, *locustas* examinarem, ut unam quamque vindicarem suæ propriæ et genuinæ speciei, nomineque debito insignirem: incidi quoque in exemplaria, quorum hemelytra juxta basin ocello fenestrato perquam distincte notata reperirentur. Simul atque hoc animadverti, ultro nimirum delatus sum ad illas locustarum species, quibus sagax naturæ interpres Fabricius nomen ex hoc charactere imposuerat, videlicet ad locustam perspicillatam, specularem et perforatam. Sed mox edoctus sum, hanc species hujus generis determinandi viam, in errorem citius, quam ad veritatem perducere. Primum enim incidi in specimina, tali ocello speculari prædita, sed alioquin a characteribus reliquis apud Fabricium enumeratis, toto cœlo diversa. Deinde manifesto deprehendi alia exemplaria, penitus illis, ocello dorsali vitreo notatis conformia, præter solum hunc ipsum ocellum; aut caudam ensiferam, pro certo charactere sexus feminini gerentia. Ilicet animus tulit, librorum abjicere suppellicem, viamque proprio studio pandere, atque ex labyrintho fugam quærere, ope logices artificialis, quæ instar fili Ariadnei, fida superat, errores proprios alienosque relecturo, dux atque magistra, ubi magna pars litteratorum hominum, et præsertim naturæ curiosorum, Pythagorico more, cum haud sordidis naturæ verique auctoribus in alia omnia descendere, quam sibi sapere, suaque sponte, abditam per-

plexis

plexis latibulis veritatem investigare, mavult. Postquam ex inductione, incompleta illa quidem nimirum, attamen multorum exemplorum, mihi constitit, ocellos illos dorsales juxta basin hemelytrorum, in solis maribus *locustis* exsistere; contra vero feminas, ense partumeio in hoc genere facile adgnoscendas, semper exhibere basin illam planam ac simplicem: oppido intellexi, sæpe jam commemoratos ocellos, utpote constantem et peculiarem masculæ sortis notam, nulla ratione pro charactere specifico in hoc genere posse adhiberi. Alios igitur profecto characteres anquirendos esse, in sexum sequiorem pariter quadraturos. Mox unde oriantur ocelli, quove ex mente optimi maximi creatoris spectent investigare sustinui. Hoc agens ingressus sum speculationem, quam a tot sagacissimis entomologis huc usque neglectam fuisse miror. Omnia nempe insecta, quæ *hemiptera* nuncupare Linnæo placuit, dummodo non omnino carent elytris, gerunt hemelytrum dextrum, qua marginem baseos internum, sub interno margine baseos hemelytri sinistri reconditum. Hæc ratio latius valet, ultra *gryllos* et *locustas*, non modo *Ulonata* cuncta, verum etiam *Rhynchota* Fabricii pleraque, sub communi formula complectens. Donec nempe hemelytra illa, sive hemipterorum elytra, in situ naturali jacent, neque externa quadam violentia loco suo mota sunt, neque ad volandum expansa: semper basis elytri dextri, qua partem internam, sub margine interiore baseos elytri sinistri latet. Hinc emendandus est character artificialis ordinis hemipterorum, sub quo duo ordines naturales *ulonatorum* et *rhynchotorum*, ex disciplina Linnæi militant. Vera enim et unica omnium illuc relatorum congruentia, in eo consistit, quod basis elytri sinistri tegit marginem interiorem baseos elytri dextri. Si fatendum, quod res est, paucissima modo insecta hemiptera sunt prædita veris hemelytris, sive alis superioribus elytris dimidiatis, vel uno certoque sensu semicoriaceis. Longe enim diversa ratio est, utrum elytra sint versus basin coriacea, sed versus apicem pellucida, veluti in cimicibus; an vero tota quoad

sub-

substantiam membranacea, vel quasi mediæ cujusdam inter crustaceam coleopterorum et scariosam neuropterorum naturæ, quem ad modum in *blattis*, *gryllis*, *fulgoris*, *cicadis*, &c. reperimus. Non est mei instituti, hic de omnibus ulonatorum et rhynchotorum generibus, ne dicam formis singulatim exponere, aut varia discrimina, quæ circa eorundem alas, pro generis, speciei, varietatis et sexus diversitate, obtinent, curate persequi. Alioquin operæ pretium foret, utrumque systema Linnæanum et Fabricianum ad ipsius naturæ obrussam exigere; atque ex universo habitu demonstrare, an et quatenus illi duo naturales ulonatorum et rhynchotorum ordines, ad unum artificialem hemipterorum combinari mereantur. Sed ne longius a proposito nostro divagemur; ulteriorem hanc disceptationem omittentes, nunc exempli causa solummodo monebimus, ex neglectu modo laudatæ observationis, ortam esse falsam descriptionem *Blattæ Petiverianæ*. Fabricius (*Entomol. system. tom.* 2. *pag.* 9. *n.* 16.) hanc ita definit: "Blatta nigra, elytris maculis quatuor flavescentibus." Genus quidem suo jure emendavit, est enim utique insectum hoc *blatta*, sicuti jam Pallas recte docuerat; sed differentiam specificam perperam repetit a *Cassida Petiveriana* Linn. syst. nat. 2. pag. 578. n. 28. quum debuisset desumere a *cassida septemguttata* Linn. pag. 577. n. 19. quam merito huc eodem refert. Est enim profecto: blatta nigra, coleoptris maculis septem albis. Errat quidem ibi Linnæus, dum scribit: "elytra singula maculis tribus albis, longitudinaliter "digestis rotundis; et in medio unica utrisque elytris communi." Potius ita res habet: elytrum sinistrum, præter tres maculas rotundas longitudinales albas aut si mavis flavescentes habet insuper quartam in margine interiore sinistri elytri, qui alterius dextri marginem interiorem ultra basin obtegit, quemadmodum in reliquis etiam blattis plerisque esse fierique solet.

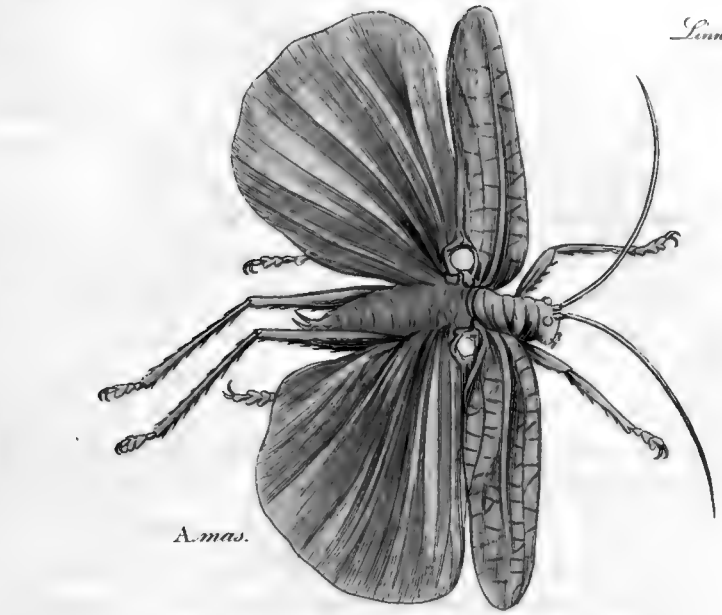
Jac. Petiverius *Gazophylac. tab.* lxxi. *fig.* 1. primam dedit hujus insecti figuram, in qua falso utrumque elytrum gaudet quatuor maculis.

culis. Præter maculam ad marginem interiorem elytri dextri, et alarum defectum, icon et descriptio bene cum natura conveniunt. Illustrissimus Pallas in *Spicil. Zool. fasc.* 9. *tab.* 1. *fig.* 5. dedit figuram apprime bonam, in qua, sicuti natura postulat, elytrum sinistrum est superius et quadriguttatum, dextrum vero inferius gaudet modo guttis tribus. Sulzer, *Hist. Insect. tab.* 11. *fig.* A. B. omnia invertit, ut in iconibus chalcographicis fieri solet, quando imagines temere ita æri inciduntur, quemadmodum in ipsa natura vel in adumbratione prototypa exstant. Hinc fit, ut elytrum dextrum loco sinistri superius et quadrimaculatum evadat. Herbst, *Archiv. Ins. tab.* 49. *fig.* 7. dedit figuram coloribus illustratam, exacte cum ipsa natura convenientem; in textu vero, *pag.* 185. solummodo de alarum inferiorum præsentia locutus, reliqua pristinarum figurarum vitia, circa numerum macularum in elytro dextro et sinistro, plane silentio prætermisit.

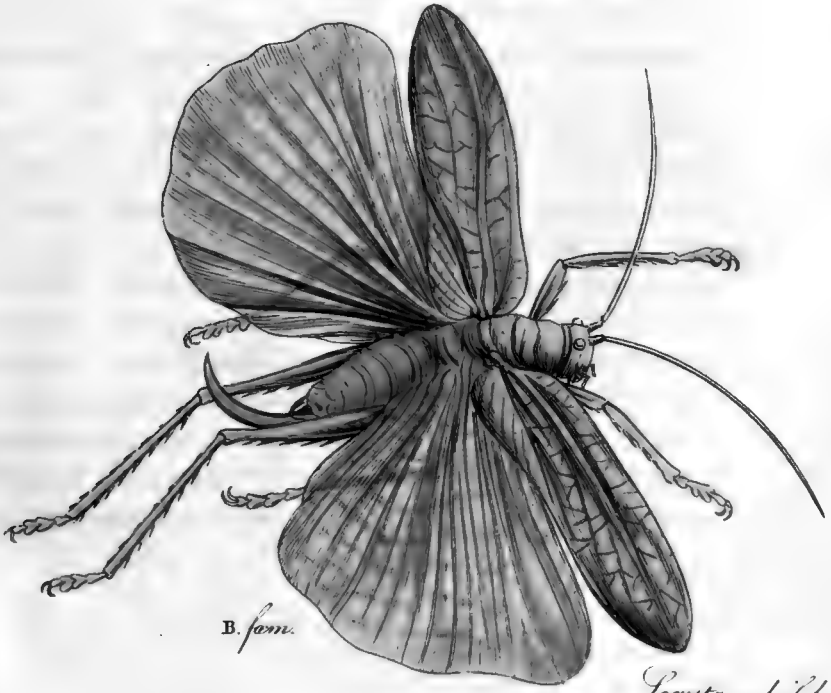
Verum relinquamus *Blattas*, de *Locustis* ex professo disputaturi. In hoc genere nempe non solum, ut in omnibus hemipteris, basis elytri sinistri obtegit marginem internum dextri, verum etiam in maribus, hic ob defectum ensis partumcii facillime agnoscendis, eadem isthæc basis elytri sinistri, ope alicujus scrobiculi rotundi, satis firmiter compaginatur cum scrobiculo simili, at paulo ampliore et profundiore, juxta marginem interiorem elytri dextri exsistente. Recipit enim inferius illud acetabulum dextrum parte sua concava alterius desuper ingruentis elytri convexam apophysin, ut inde oriatur quasi quædam temporaria synarthrosis, ferme in eundem modum sicuti clausuræ fibularum, vel potius instar contignationis, qua florum papilionaceorum alæ, carinæ eorundem, citra symphysin, satis firmiter inhæresount. Prouti vero capitulum illud, basi elytri scævi adnatum, amplum vel exiguum est, ita dextrum acetabulum huic recipiendo inserviens, plus minusve in conspectum venit. Neque hoc semper proportione totius corporis, ut major *Locusta* etiam ma-

jorem gerat ocellum fibularem. At acetabulum dextrum in omnibus masculis cujusvis speciei sine discrimine clarius patescit, atque oculi fenestrati similitudinem manifestiorem præ se fert, quam capitulum fibulare sinistrum in eadem specie, imo in eodem exemplari. Utrumque illud instrumentum vix in visum cadit contemplanti *Locustam viridissimam* Fabric. n. 32. Contra vero liquido apparet in *Locusta varia* Fabric. n. 35. quamvis illa major, quamvis hæc minor exsistat. Negari quidem nullo modo potest, longe certissime elucescere has partes, in illis *Locustarum* formis, quarum mares Fabricius, sub nominibus *Locustæ perspicillatæ*, *specularis* et *perforatæ* descripsit. Nihilo tamen secius in omnibus quoque reliquis *Locustis* Fabricii, videlicet præter omnino apteras, vestigia ejusdem fabricæ, etiamsi haud ubique pariter manifesta, deprehendet cordatus et sagax arbiter, quotiescunque specimina sexus masculini curate ac subtiliter examinabit. Depingi curavi *Locustam*, elytris lanceolatis concavis viridibus, alis rubris, quam sub nomine *locustæ salvifoliæ* descripsi in Catalogo Musei Holthusiani, *sect.* 3. *pag.* 82. *n.* 72. Mas hujus novæ speciei (vid. *tab.* 5. *fig.* A.) gerit juxta basin elytrorum ocellum dorsalem fenestratum; fœmina vero (*fig.* B.) ense partumeio insignis, habet marginem internum ibidem pariter incumbentem sinistrum dextro, at prorsus simplicem et planum. Utcunque magna intercedit inter hanc nostram *salvifoliam* et *Locustam perspicillatam* Fabric. n. 10. similitudo, non tamen pro eadem specie habere licet, quoniam laudatus auctor de rubro colore alarum plane tacet, quem neutiquam prætermisisset tam oculatus arbiter. Quando idem ocellum dorsalem fenestratum cum ense adscendente extrorsum crassiore conjungit, certissime aliquis error, qualiscunque demum est, latet, sola curata contemplatione exemplaris Hunteriani extricandus. Ex comparatione omnium *Locustarum* quas unquam oculis usurpavi, pro certo mihi constat, illos ocellos fenestratos esse perpetuum et constantem characterem sexus masculini, numquam cum ense, fœminis

Linn. Trans. IV. tab. 5. p. 58.



A. mas.



B. fem.

Locusta salvifolia.

in hoc genere proprio, co-exsistentem. Cæterum ipsum illud splendidorum colorum jubar extra omnem dubitationis aleam ponit, quod utrumque illud insectum *fig.* A. et B. depictum solummodo ratione genitalium et baseos elytrorum qua marginem interiorem differat, ideoque manifesto sit pro duplici sexu unius ejusdemque speciei reputandum. Fac igitur, id quod, donec probetur contrarium, pro vero certoque defendere valeo, cunctas *Locustas* mares gaudere acetabulis dorsalibus, plus minusve ocellaribus sive fenestratis; contra vero fœminas margine interiore juxta basin elytrorum plano; atque hunc characterem sexualem in hoc genere naturali a Fabricio rite constituto, non minus esse constantem, quam præsentiam vel defectum ensis partumeii: cui bono hanc singularem structuram optimum maximum naturæ opificem machinatum esse dicemus? Utinam universa teleologia tam prona foret adeoque expedita: tunc ilicet, me ultro auctorem systematis teleologici exstiturum esse, profiterer. Nihil profecto aliud egit aut agere potuit summus rerum naturæ arbiter Deus, quum masculæ sorti daret alas superiores ita diversas ab elytris fœmineis, nisi ut *Locustas* femellas, utpote ovorum sequestras, prolisque futuræ cara pignora, pro conservandis speciebus, ita tutissime ab ingruentium hostium injuria defenderet; mares contra, post impregnata fecundo coitu ova, nulli alteri amplius in œconomia naturæ, usui futuros, proscriberet, atque volucribus et insectis zoophagis in prædam traderet. Quando nimirum avis vel alius qualiscunque hostis appropinquat *Locustarum* gregi; fœminæ extemplo expedita elytra explicare, in alas se conjicere, volatuque fugam capescere valet. At rursus mares, præsertim veneris usu debilitati, sinistrum elytrum (ut ipsum ex acetabulo dextro, cui per apophysin illam baseos qua marginem internum inhærescit, tollant) magno conatu lentoque successu levaturi, occupantur interim ab adversariis, qui, saginati mascula præda, fugaces matres studiose persequi negligunt, commodiore esca contenti. Quid? quod eadem hac

 structura

structura consultum voluit sapientissimi numinis providentia gravidis, ne salaces mares invitas illas vana et præpostera libidine vexarent. Coitus *Locustarum* non potest aliter peragi, nisi elytris complicatis. Hinc mares ægre se allevantes, nullo modo violenter comprimere queunt altius succinctas multoque expeditiores fœminas. Nec tamen sese exhibuit iniquum contra mares *Locustas* creator sanctissimus idemque indulgentissimus. Nam cantum illis dedit, fatalium sibimet ipsis alioqui partium attritu prurientes fœminas virgines allecturis, ne cælibes repulsæ tædio fatigati animum desponderent, aut contra naturam inter semetipsos veneris diverticula quærerent. Quamvis ergo *Locustæ* mares, præ aliis aliorum generum insectis masculini sexus, pro salute fœmineæ sortis devoti et pessundati esse videantur: attamen blanda mercede redimuntur, magnoque gaudent privilegio, quod cum paucis modo, præsertim cum *Cicadis*, commune habent, scilicet ut fœminæ, arguti ac sonori stridoris dulcedine captæ, ultro petant amplexus, dum citra molestæ verecundiæ delicias ipsæ conscendunt miseros inopesque amasios, ab ambitiosæ persecutionis labore immunes. Idem alia quadam ratione in pulicibus fieri constat, etiamsi in tam parvis causa cur ita rem habeant investigatu difficilis lateat.

Neque vero in solis *Locustis* vel adeo hemipteris obtinere videtur talis alarum pro variante sexu diversitas, quam solers natura ob similem scopum videtur esse machinata. *Lepidoptera* Linnæi, sive *Glossata* Fabricii, magna ex parte produnt istiusmodi providæ naturæ molimina. Multi *Papiliones*, præsertim *Heliconii*, peculiares gerunt elateres, alarum remigio, vel potius velificanti aërio cursui, pro sexus varietate diversimode inservientes. *Sphinges* mares reperiuntur præditi fibulis pro ala superiore cum inferiore constringenda relaxandave, quibus carent fœminæ, alio mechanismo pandentes et rursus contrahentes Dædalea vela. Qua de re exstat singularis lectu dignissima commentatio in Transactionum Societatis Linnæanæ Londinensis vo-

lumine primo, cujus uberior discussio non est mei præsentis instituti. Cæterum ipsa insecta *aptera* Linnæi, ac præsertim *agonata* Fabricii, magna ex parte illam habent indolem, ut mares, ad analogiam quasi quamdam multarum plantarum dioicarum, citius ad maturitatis ac robusti vigoris florem pertingant, et rursus, peractis nuptiis, multo celerius e rerum natura quotannis evanescant, quam fœminæ, quas pro sobole ad maturitatem perferenda diutius superstites manere fas est. Sic, verbi causa, *Gammarus stagnalis* (Fabric. *Entomol. System. tom. II, p.* 518. *n.* 11.) cujus descriptionem novissimam atque curatissimam debemus viro experientissimo doctissimoque Georgio Shaw Med. Doct. *(Transact. of the Linn. Soc. vol. I.)* insectum in fossis quibusdam prope Hamburgum satis frequens, quotannis, apparet circa initium veris, et quidem eo ordine, ut primum statim post glaciei nivisque regelationem parva nec dum adulta soboles utriusque sexus reperiatur, inter quam masculi celerius ad justam perfectamque magnitudinem excrescere solent. Hi quidem cum femellis paulo post ipsos adultis co-exsistunt et nuptias celebrant, quibus peractis mox evanescunt mares, relictis solis viduis pregnantibus, quæ brevi tempore ante fervorem æstatis fossas exsiccantem moriuntur, postquam ova in limo deposuerunt. Limus ille per æstatem durescit atque in pulverem abit, auctumno demum imbribus madescit, nec tamen in nostro climate umquam excluduntur ova ante hiemem. In agro Brunsvicensi per auctumnum quoque hunc *Gammarum stagnalem* me in perfectæ ætatis robore vigentem videre memini, sed nunquam circa Hamburgum. Obiter hæc monuisse sufficiat. Universa quidem per omnia omnium classium genera disquisitio, quænam animalia et præsertim insecta fœmineæ sortis, ope singularis providentiæ, præ masculis diutius ab interitu defendi et conservari soleant, forsan neque jucunditate careret, neque usu œconomico. Sed profiteor, me nondum sufficientes observationes circa generalem illam fœminei sexus prærogativam instituisse, vel institutas satis rite digessisse.

digessisse. Hoc saltim jam nunc pro certo affirmare ausim, multo latius patere hanc rationem, quam ut de insectorum quibusdam generibus solummodo valeat. Pisces certe multi, præcipue *branchiostegi* et *chondropterygii*, per certas anni tempestates nulli nisi fœminei sexus capiuntur. Sed, ut unde sum digressus denique redeam, *Locustas* Fabricii, præsertim exoticas, fœminas multo plures quam sexus masculini in omnibus vel maximis museis deprehendi, constans et perpetua experientia docet. Neque hoc mirum videbitur amplius cordato entomologo, consideranti quanto diutius insectorum plurimorum fœminæ superstites manere soleant, quam mares ejusdem speciei. Idem in primis manifestum est in genere *Mantis*, cujus curatissimam elaboravi monographiam, quam entomologorum facile princeps Fabricius vehementer approbavit, et quam elegantibus figuris illustratam publici juris facere haud gravabor.

VI. *A New*

VI. *A New Arrangement of the Genus Polytrichum, with ſome Emendations. By Mr. Archibald Menzies, F. L. S.*

Read February 7, and March 7, 1797.

IT is not my intention to preſent you with a long and tedious hiſtory of the genus *Polytrichum*; my objects are merely to eſtabliſh, by your ſanction, what I conceive to be its true and obvious characteriſtics, and to diſcriminate the different ſpecies, by laying before you, with due diffidence, the following arrangement, in which you will readily perceive that I have added ſeveral new ones, and ſeparated ſome of the moſt conſpicuous varieties of authors into diſtinct ſpecies. This led me on to form new deſcriptions, and to new-model the whole genus.

At the time this genus was firſt deſcribed, there were but few ſpecies of it known; conſequently its character could not be made ſo general, nor its arrangement ſo complete, as when a much greater number of ſpecies are at once before us. Indeed it is pretty evident that Linnæus took its character chiefly from the *Polytrichum commune*, and what were conſidered as its varieties, as we find ſo much ſtreſs laid upon the *apophyſis* at the baſe of the capſule, that, for want of that ſingle diſtinction, three ſpecies were then excluded, and forced with diſcordant characteriſtics into another genus, under the name of *Mnium Polytrichoides*, and varieties: and although ſome of theſe have been ſince reſtored to their proper place, on account of their natural affinity, yet we find but few ſatisfactory attempts

tempts made to amend the general character of the genus; though it is very clear that the character taken from the *apophysis* ought to have been long ago excluded, or rather ought never to have been admitted, as it was only to be found in a few species, and therefore could not with propriety be considered as a generic distinction.

The laborious works of the celebrated and persevering Hedwig have, of late years, thrown much light upon the subjects of this natural order; but the general complaints against his new arrangement of it are, that his genera are too artificial, and that their characters are taken from parts so minute and difficult to examine, that they rather tend to perplex and discourage a young beginner in his investigations, than aid his pursuits in acquiring a scientific knowledge of this intricate tribe. While it can therefore be avoided, no generic or specific characters ought ever to be adopted, that cannot easily and distinctly be seen by the assistance of a single lens magnifier, such as Botanists commonly carry in their pockets.

Hedwig's generic characters have indeed this recommendation, that they are short and extremely beautiful upon paper, on which account his character of this genus has been lately adopted by authors whose erudition and general accuracy none can admire with more profound respect than I do; yet I cannot join them in this instance without offering violence to a beautiful and natural family, merely because its individuals differ only in the number of small dents in the *peristomia*, or rim of the capsule; some having thirty-two dents, others about double that number.

For these reasons I have not ventured to place much dependence on Hedwig's new character of this genus, more especially as it brings together plants which have so little natural affinity: of this we have an example, in his making the *Bryum undulatum* a *Polytrichum*, though it agrees in no other respects with this genus than merely

merely in the number of minute dents, and general ſtructure at the orifice of the capſule.

This author's ſtrict adherence to theſe very minute characters has made him regardleſs of others more conſpicuous, and induced him to place another plant under this genus, viz. the *Polytrichum hircinicum*, which, from its ſingle calyptra with upright hairs, more obviouſly, and perhaps more naturally, belongs to one of his new genera. I ſhall therefore in the following arrangement be obliged to exclude theſe two ſpecies of Hedwig: nay, I muſt go further; many authors, and thoſe too of great reſpectability, have placed the *Bryum ſtriatum* of the *Species Plantarum*, and its varieties, under this genus, although they have not the moſt diſtant affinity, and, according to the generic character I have adopted, cannot poſſibly be arranged under it. Hedwig has, I think, very properly deſcribed theſe varieties as diſtinct ſpecies, and placed them under a new genus, which he calls *Orthotrichum;* and though I am not at preſent much inclined to adopt his minute diſtinctions, or follow him in his revolutionary career through this natural order, yet I cannot help conſidering this genus as a real improvement, and ſhall endeavour at a future opportunity to lay ſome account of it before the Linnean Society, as my late peregrinations have enabled me to enrich it with a conſiderable number of new ſpecies.

Having thus excluded theſe ſeveral ſpecies, and ſeemingly mutilated the genus, it now remains for me to eſtabliſh its characteriſtic; and this I am happily enabled to accompliſh by means of that ingenious diſcovery of the double calyptra, made upwards of twenty years ago, and nearly about the ſame time, by two celebrated Naturaliſts, who were then unacquainted with each other's labours, and conſequently may both be conſidered as equally entitled to the merits of this improvement. It was firſt publiſhed in the year 1775, in Leers's *Flora Herbornenſis*, where, after deſcribing the *Poly-*

trichum commune, page 229, the author makes the following obſervation:

"*Polytrichum hoc calyptrâ gaudet duplici: exteriore piloſâ, interiore multo minore, membranaceâ, albidâ, lævi; exteriore obtectâ.*"

I do not find that Leers made any practical application of this diſcovery, or traced it in any other ſpecies: but Mr. Curtis, a valuable member of this Society, who made the ſame diſcovery the year following, purſued it further, and finding the double calyptra conſtant in other ſpecies as well as the *Polytrichum commune*, he applied it, with his uſual perſpicuity and diſcernment, as a diſtinguiſhing character of the genus, in one of the numbers of his *Flora Londinenſis*, publiſhed in the year 1778; and I am confident that a more beautiful or a more obvious one could not be ſelected, having found it conſtant and invariable in every ſpecies here deſcribed, except the *Polytrichum magellanicum*, which has only a ſingle ſmooth calyptra; but then it ſo ſtrongly poſſeſſes the peculiar habits, and every other characteriſtic of the genus, that I think it cannot poſſibly be ſeparated. I have therefore drawn up the following general character, which, with the above exception, will be found applicable to every individual of this natural family.

POLYTRICHUM.

Natural Character.

THE plants of this genus, whether ſingle or branched, grow moſtly erect from the ground, and have an unpliant ſtiffneſs or rigidity of appearance that peculiarly diſtinguiſhes them from moſt others of this natural order.


Fig. 5.
Fig. 1.
Fig. 2.
Fig. 4.
Fig. 3.

The *leaves* are generally thick, tough, and rigid, growing round the ſtems and branches without order, and preſſing cloſe or half-embracing them by broad, ſheathy, membranaceous baſes.

The *peduncles* are ſmooth, ſtiff, ſhining, erect, and for the moſt part ariſe from the ſummits of the ſtalks and branches, out of a cylindrical membranaceous tube or *perichætium*, that cloſely ſurround the baſe of each.

The *capſules* are of various forms, as roundiſh, quadrangular, and oblong; and each has a pointed lid or *operculum*, with a thin tranſverſe central membrane underneath; and when theſe are removed or fallen off, the rim of the orifice appears elegantly fringed with a regular row of incurved minute dents (either thirty-two dents, or about double that number), which before maturity are connected by their tips to the central membrane.

The *calypira* is double, one within the other; the exterior one is compoſed of ſhining woolly hairs, cloſely matted together, and is generally of a conical figure, lacerated in a looſe manner at the baſe, but compact at the top, where it is cloſely united to the inner one, and is, for the moſt part, about double its length: the interior one is ſmall, ſubulate, ſmooth, tough, and membranaceous; but, as the capſule ſwells, it burſts open on one ſide from the baſe upwards for half its length or more.

Character eſſentialis.

Capſ. operculata, ſubrotunda, oblonga ſeu quadrangula.
Periſt. dentatum: dentibus incurvis (32—64) apicibus membranâ tranſverſâ adglutinatis.
Calypt. duplex: interior lævis, membranacea, minuta: exterior floccoſa, apicibus unitis.
Mas diſciformis, in diſtincta planta.

SPECIES.

* *Acaulia.*

1. POLYTRICHUM *tenue*, fol. lanceolatis accuminatis adpressis integerrimis, capsula cylindrica erecta.

MNIUM *polytrichoides var.* γ. *Linn. Sp. Pl.* 1577. *Dill. Musc.* 434. *t.* 55. *f.* 12.
Hab. in Nova Scotia, locis sterilibus prope Halifax.

The *leaves* of this are but few in number, and press close round the base of the peduncle; the inner ones are longer and more acutely pointed than those on the outside; they are thin, lanceolate, sharp-pointed, and entire on the edges, with a strong middle nerve; and in a dried state they are of a reddish brown colour.—The *peduncle* is nearly an inch long, of a deep straw-colour, and closely surrounded at the base by a tubular *perichætium*.—The *capsule* is cylindrical and erect; the *operculum* reddish, almost flat, and slightly pointed in the centre.—The exterior *calyptra* is of a light straw-colour, and somewhat more than double the length of the inner one, which is smooth and of the same colour, but somewhat paler.

2. POLYTRICHUM *subrotundum*, fol. lanceolatis obtusis integerrimis rigidis, capsula turbinata erectiuscula.

MNIUM *polytrichoides Linn. Sp. Pl.* 1576. *Dill. Musc.* 428. *t.* 55. *f.* 6. A. B. C. D. E. F.
P. *subrotundum Hudf. Fl. Angl. ed.* 1. 400. *Scop. Fl. Carn.* 134. *n.* 2. *Vaill. Par.* 131. *tab.* 26. *f.* 15.
P. *pumilum Swartz. in Act. Stockholm.* 1795. *p.* 271.
Hab. in ericetis, et locis sterilibus Angliæ, &c.

This

This has no *ſtalk.*—The *leaves* are lanceolate, obtuſe, thick, ſhort, and rigid, without any apparent middle nerve, and entire on the edges: they are crowded round the baſe of the peduncle; of a dark green colour when recent, but blackiſh when dried.—The *peduncle* is from a quarter to about three quarters of an inch long, of a dark reddiſh colour, and ſurrounded at the baſe by a vaginal *perichætium.*—The *capſule* is ſhort, turbinated and ſomewhat erect: the *operculum* is flat, but pointed in the centre, and the rim is conſpicuouſly fringed with minute dents.—The exterior *calyptra* is conical, of a dark ferruginous colour, and about twice the length of the inner one.

Dr. Swartz having lately ſent me a ſpecimen of his P. *pumilum*, I carefully compared it with the above, and found it to be the ſame ſpecies.

3. Polytrichum *nanum*, fol. lanceolatis obtuſiuſculis, apice obſcurè ſerrulatis, capſula hemiſphærica cernua.

Mnium *polytrichoides Linn. Sp. Pl.* 1576. *Dill. Muſc. tab.* 55. *f.* 6. G. H. I. K. L.?
P. *nanum Hedw. Stirp. Crypt. vol.* 1. 35. *tab.* 13.
Hab. in ericetis, et locis aridis Angliæ, &c.

This ſpecies has ſcarcely any *ſtalk.*—The *leaves* are lanceolate, ſomewhat obtuſe, and entire on the edges towards their baſe, but ſlightly ſerrulated towards their tips: they are not ſo thick and ſtiff as in the preceding ſpecies, but are ſomewhat longer.—The *peduncle* is from half an inch to upwards of an inch long, of a deep orange colour, and ariſes out of a vaginal *perichætium* about one tenth of an inch long.—The *capſule* is ſhort, hemiſpherical, a little inclined or ſomewhat nodding, and the rim is beautifully fringed with

with minute dents: the *operculum* is flat, but in the centre very slightly pointed.—The exterior *calyptra* is short and conical, ending in a small *mucro*; it is of a light ferruginous colour, and double the length of the inner one.

This and the preceding species have been confounded together by most authors, although they appear very distinct; and I am doubtful whether Dillenius himself has not fallen into this mistake, as he seems to have given both under the same figure: but having delineated them on two separate papers in his original drawings, which are in Sir Joseph Banks's library, there is reason to suppose that he originally intended them to be distinct species.

** *Caule simplici.*

4. POLYTRICHUM *aloides*, fol. lanceolatis conniventibus obtusiusculis rigidis apice serratis, capsula cylindrica obliquata.

MNIUM *polytrichoides var.* β. *Linn. Sp. Pl.* 1577. *Dill. Musc.* 429. *t.* 55. *f.* 7. *Vaill. Par.* 131. *t.* 29. *f.* 11. *Weiss Crypt.* 173.
P. *nanum Lightf. Fl. Scot.* 701. *Hudf. Fl. Angl. ed.* 2. 470.
P. *aloides Hedw. Stirp. Crypt. vol.* 1. 37. *tab.* 14.
Hab. in ericetis, et locis sterilibus Angliæ, &c.

The *stalk* of this is about a quarter of an inch high.—The *leaves* are of a dark green colour, and press close together round the stalk, especially in a dried state: they are thick, lanceolate, somewhat obtuse, and finely serrated towards their tips.—The *peduncle* is from half an inch to an inch long, of a deep straw-colour tinged with red, and issuing from the top of the stalk out of a tubular *perichætium* about a tenth of an inch long.—The *capsule* is cylindrical and a little

little oblique, with a flat *operculum* pointed in the centre.—The exterior *calyptra* is of a light ferruginous colour, eſpecially towards the tip, and is double the length of the inner one.

5. Polytrichum *convolutum*, fol. linearibus involutis apice ſerratis; ſiccitate contortis, capſula cylindrica erectiuſcula.

P. *convolutum Linn. ſil. Method. Muſc.* 33. *t.* 1. *f.* 3. *Swartz Prod.* 139.
Hab. in India occidentali, &c.

The *ſtalk* is erect, and varies from an inch to about three inches in height.—The *leaves* are longer and more crowded towards the top of the ſtalk: they are ſlender, linear, with their edges finely ſerrated towards their tips; and in a dried ſtate they are of a dark brown colour, with their edges turned in, ſo as to appear channelled. —The *peduncle* is from an inch to an inch and half long, iſſuing from the ſummit of the ſtalk out of a looſe tubular *perichætium* about a quarter of an inch long.—The *capſule* is ſomewhat erect, ſhort and cylindrical, with a ſtrong rim finely dentated.—The exterior *calyptra* is of a light ferruginous colour, and about two-thirds longer than the inner one.—The male roſaceous cups are produced upon the ſummits of ſeparate ſtalks, and are ſometimes proliferous.

6. Polytrichum *magellanicum*, fol. lineari-lanceolatis acutis denticulato-ſerratis, capſula oblonga ſub-cylindrica erectiuſcula, calyptra ſimplici. Tab. 6. Fig. 1.

P. *magellanicum Linn. Suppl. Plant.* 449.
Hab. in freto magellanico, et in Nova Zeelandia.

This grows ſtiff, erect, and from two to even ſix inches high: the lower part of the *ſtalk* is naked, but the upper part is ſurrounded

rounded with ſpreading leaves, which are longer and more copious at the termination of each year's growth and round the baſe of the peduncles.—The *leaves* are long, ſpreading, linear-lanceolate, and ſerrated with deep dents on their edges: in a dried ſtate they are of a reddiſh-brown colour, and their edges turn in, ſo as to give them a round or ſubulate appearance.—The *peduncles* are ſhining, of a light ſtraw-colour, and from two to three inches long, iſſuing out of a tubular *perichætium* from the ſummit of the ſtalk; but as a young ſhoot frequently iſſues from near their baſe, the peduncle thereby becomes lateral, and thus there are often two on the ſame ſtalk, one terminal and the other lateral.—The *capſule* is oblong, nearly cylindrical, and ſomewhat erect: the *operculum* is conical, with a long ſlender point turning ſideways.—The exterior woolly *calyptra* is wanting: the inner one, which is ſmooth, ſubulate, and of a dark brown colour, is about three tenths of an inch long, with a little roughneſs appearing about the point: as the capſule ſwells it ſplits ſideways from the bottom upwards.—The male roſaceous cups are proliferous, and upon ſeparate ſtalks, which in general produce ſtronger and more crowded leaves.

I was enabled to aſcertain this plant by carefully comparing it with the original ſpecimen of P. *magellanicum* in the Linnean Herbarium.

7. POLYTRICHUM *attenuatum*, fol. lineari-lanceolatis carinatis cartilagineo-ſerratis patulis, capſula quadrangulari cernua, baſi conſtricta. TAB. 6. FIG. 2.

Hab. in ora occidentali Americæ Septentrionalis.

The *ſtalk* of this ſpecies is ſimple, erect, and from an inch and half to upwards of three inches high.—The *leaves* are ſpreading, linear-lanceolate, with rough hiſpid points, and whitiſh cartilagineous edges deeply ſerrated; the middle nerve is ſtrong, whitiſh, and on the

the back slightly dentated towards the tip. When recent the leaves are of a dark glaucous colour, but in a dried state they become rigid, and of a dark brown colour, with their edges curled in so as to make them appear round and channelled.—The *peduncle* is from two to four inches long, of a reddish straw-colour at the bottom, but much lighter towards the top: it arises from the top of the stalk, out of a close cylindrical sheath about one-eighth of an inch long.—The *capsule* is quadrangular, nodding, and a little contracted at the base, but not so much as to form an *apophysis*: the *operculum* is conical: the rim has about sixty-four minute dents.—The exterior *calyptra* is straw-coloured, of a pointed conical figure, and about a third longer than the inner one, which is smooth and of the same colour.

8. Polytrichum *gracile*, fol. lanceolatis acutis carinatis denticulato-serratis erectiusculis, capsula obovata subangulata obliquata, apophysi destituta. Tab. 6. Fig. 3.

Hab. in alpibus Scoticis, Dickson.—*et in Suecia*, Swartz.

This is simple-stalked, and of a slender appearance; from an inch to upwards of two inches in height.—The *leaves* are small, and remotely placed on the lower part of the stalk; but are larger, erect, and more crowded towards the top: they are of a light green colour, short, lanceolate, with acute hispid points, and serrated with deep dents on their edges: the middle nerve is strong, whitish and dentated on the back, especially toward the tip.—The *peduncle* is about three inches long, shining, and of a deep orange colour, and arises from the summit of the stalk out of a cylindrical sheath about two tenths of an inch in length.—The *capsule* is nearly ovate, and obscurely angulated, without any apparent *apophysis*; the *operculum* is small and conical, ending in a straw-coloured point.—The exterior

calyptra is of a deep ferruginous colour, and about a third part longer than the inner one.

I was favoured with this ſpecies by Mr. Dickſon, who collected it on Ben Nevis in Scotland, about half way up the mountain. I alſo received the ſame from Dr. Swartz of Stockholm, who lately diſcovered it in Sweden. His ſpecimen has the lower leaves and calyptra black, which I conſider only as accidental diſtinctions. I was at firſt inclined to conſider it as a variety of P. *attenuatum*; but its ſlender appearance, its leaves being ſhorter, erect, and thinner ſet, and the difference in the form of its capſule, induced me to make it a diſtinct ſpecies; and I have ſome doubts whether it may not be the ſame which Dillenius has figured in *Tab.* 54. *fig.* 2. I have not however ventured to quote that figure till I am enabled to remove my doubts by a ſight of Dillenius's ſpecimen. Both this and the foregoing are to be diſtinguiſhed from P. *commune* by their carinated leaves, with ſtrong whitiſh middle nerves, by having no membranaceous leaves round the baſe of their peduncles, and no apparent apophyſis at the baſe of their capſules.

9. POLYTRICHUM *commune*, fol. lineari-lanceolatis acutis ferrulatis, capſula quadrangulari, apophyſi ſubjecta.

P. *commune Linn. Sp. Pl.* 1573. *Dill. Muſc.* 424. *t.* 54. *f.* 1.
P. *ſerratum Schranck Fl. Bav.* 2. 446. *n.* 1371.
Hab. in ſylvis, et ericetis humidis.

The *ſtalk* is erect, from two to five inches and upwards in height.—The *leaves* are ſtiff, linear-lanceolate, ending in acute hiſpid points, and finely ſerrulated on their edges: they are of a bright green colour when freſh, but of a reddiſh brown when dried or in decay: thoſe on the top of the ſtalk, ſurrounding the baſe of the peduncle, differ from the others in being more erect, whitiſh, membranaceous, and

and entire on their edges, with greeniſh middle nerves, ending in long filaceous tips.—The *peduncle* is from two to four inches long, of a ſhining deep orange colour, and iſſuing from the top of the ſtalk out of a tubular ſheath about a quarter of an inch in length.—The *capſule* is quadrangular, with an *apophyſis* at the baſe, and is of a greeniſh colour when young, but reddiſh when ripe: the *operculum* is flat or rather concave, with a ſmall point projecting from the centre.—The exterior *calyptra* is ferruginous, and about double the length of the inner one.

10. POLYTRICHUM *piliferum*, fol. lanceolatis confertis integerrimis rigidis apice piliferis, capſula quadrangulari, apophyſi ſubjecta.

P. *commune var.* γ. *Linn. Sp. Pl.* 1573. *Dill. Muſc.* 426. *t.* 54. *f.* 3.
P. *piliferum Schreb. Spicil.* 74. *n.* 1031.
Habitat in ericetis, et paſcuis montoſis Angliæ, &c.

This grows ſingle, from half an inch to an inch and half in height, and is naked at the bottom, but at the top it is furniſhed with a crowded cluſter of leaves.—The *leaves* are ſhort, lanceolate, thick, ſtiff, and crowded, entire on the edges, and each tipt with a white hair.—The *peduncle* is ſtiff, reddiſh, and from half an inch to upwards of an inch in length, ariſing from the top of the ſtalk out of a tubular *perichætium*.—The *capſule* is ſmall, nodding, and quadrangular, with a diſtinct *apophyſis* at its baſe: the *operculum*, like the preceding, is concave, with a ſmall mucro iſſuing from the centre.—The exterior *calyptra* is ſometimes reddiſh, but generally of a dark ferruginous colour, and about as long again as the inner one.

11. POLYTRICHUM *juniperinum*, fol. lineari-lanceolatis mucronatis patulis, marginibus inflexis integerrimis, capſula quadrangulari, apophyſi ſubjecta. TAB. 6. FIG. 4.

P. *juniperinum Willd. Fl. Berol.* 305 (excluſo Synon. Dillen.)
Hab. in ora occidentali Americæ Septentrionalis.

The *ſtalk* is erect, from two to three inches high, and rather naked at the bottom.—The *leaves* are ſpreading, linear-lanceolate, and ending with ſharp points, ſlightly hiſpid: their edges are entire, and fold in flat upon the ſurface of the leaf from both ſides.—The *peduncle* varies from an inch and half to about three inches in length, and is cloſely ſurrounded at the baſe by a cylindrical tube or *perichætium*, which is about a quarter of an inch long, iſſuing from the top of the ſtalk.—The *capſule* is quadrangular, with an *apophyſis* at the baſe; the *operculum* is flat but pointed in the centre, and the rim is fringed with a regular row of about ſixty-four whitiſh dents.—The exterior *calyptra* is long and ſubulate, whitiſh at the bottom, but ferruginous at the tip, and about double the length of the inner one.

All authors I know of, who have taken up P. *juniperinum*, deſcribe it with entire leaves, yet make no ſcruple in quoting for it *Dill. Muſc.* 424. *t.* 54. *f.* 2. which that accurate author deſcribes and figures with ſerrated leaves: it is therefore very evident the quotation muſt be erroneous.

Note. The *Polytrichum pulverulentum* in *Gmel. Syſt. Nat.* belongs, I believe, to this ſection; but as I have not been able to procure a ſight of the plant itſelf, or even of the figure of it, quoted from *Reynar. Act. Lauſann.* I could not take it up in this Arrangement.

*** *Caule*

**** Caule ramoſo.*

12. POLYTRICHUM *ſtrictum*, fol. lanceolatis acuminatis erectiuſculis, marginibus inflexis integerrimis, capſulis quadrangularibus, apophyſi inſidentibus. TAB. 7. FIG. 1.

Vaill. Par. 131. *t.* 23. *f.* 6.
Hab. in America Septentrionali, in locis ſterilibus Angliæ, et in Scotia.

This ſpecies was gathered in the year 1766 on Newfoundland by Sir Joſeph Banks, Bart. who deſcribed it under the foregoing name in a manuſcript preſerved in his library, which I was ſuffered to peruſe in the moſt liberal manner. I found it about twelve years ago near Halifax in Nova Scotia, and ſince that time in ſeveral places on the north-weſt coaſt of America; and I lately found it alſo in different places in Scotland, particularly on the top of the park walls, on both ſides of the road, about a mile to the eaſtward of Taymouth in Breadalbane, where it grows in common with P. *commune* and P. *piliferum.*

It is branched, and about two inches in height. The roots, together with the lower parts of the ſtem and branches, are covered with a whitiſh downy ſubſtance, of a ſpongy texture: the lower parts of the branches appear ſlender, from the leaves being ſmaller and more thinly ſet there than towards the tops, where the leaves are larger and more crowded.—The *leaves* are thick, ſtiff, erect, lanceolate and ſharp-pointed, with entire edges, which, like the preceding, are folded flat back to the ſurface of the leaf from both ſides: in a dried ſtate the leaves preſs cloſe to the ſtalk, and their points are ſlightly hiſpid: thoſe which ſurround the baſe of the peduncles are moſtly membranaceous and pellucid, with greeniſh middle nerves ending in ſlender filaceous tips.—The *peduncles* are from an inch to two inches in length, ariſing from the ſummits of the branches out of cylindrical tubes nearly

nearly a quarter of an inch long, which closely surround their base. —The *capsule* is small and quadrangular, with an *apophysis* at the base: the *operculum* is reddish and flat, with a small point issuing from its centre; and the rim of the orifice is fringed with about sixty-four minute dents.—The exterior *calyptra* is conical, of a light ferruginous colour, and about double the length of the inner one.

As this species generally divides very low down, single branches of it may be carelessly pulled up or separated, in which state it may sometimes be confounded with the P. *juniperinum*; but its being rather smaller in all its parts, its leaves being shorter, stiffer, more erect and crowded towards the top of the branches, and its lower parts being generally matted together and enveloped in a whitish downy substance, will easily distinguish it.

As neither the woolly calyptra nor the downy substance about the lower parts of the plant are expressed in Vaillant's plate, I have been induced to give a new figure of it, from a specimen collected in Nova Scotia.

13. POLYTRICHUM *contortum*, fol. lineari-lanceolatis serratis involutis siccitate contortis, pedunculis lateralibus, capsulis cylindricis erectiusculis. TAB. 7. FIG. 2.

Hab. in ora occidentali Americæ Septentrionalis.

This is from two to four inches high, and generally naked towards the bottom, but covered with leaves, and often divided into two or three branches towards the top.—The *leaves* are linear-lanceolate, with their edges turned in and finely serrated, without any apparent middle nerve: when fresh they are of a dark green colour; but in a dried state they are contorted, and of a dull dark brown colour: they are rather thinly scattered on the stalk, excepting here and there where they form tufts by being more thickly set and somewhat

what longer at the termination of each year's growth.—The *peduncles* are from an inch to an inch and half long, and ariſe out of a vaginal tube about a quarter of an inch in length, at the extremity of each year's growth; but as the young ſhoots iſſue from their baſe, they afterward become lateral.—The *capſule* is cylindrical and ſomewhat erect, having a ſtrong annulated rim fringed with about thirty-two minute dents: the *operculum* is conical and pointed.—The exterior *calyptra* is ſmall, of an oval form, and of a light ſtraw colour, and is about twice the length of the inner one.

This ſpecies very much reſembles P. *convolutum*, but that has always a ſimple ſtalk with a ſingle terminating peduncle, and its leaves are only ſlightly ſerrated towards their tips; whereas this, even in its ſimple ſtate, has generally two or three lateral peduncles, and the leaves are finely ſerrated their whole length, which will afford ſufficient marks of diſtinction.

14. POLYTRICHUM *rubellum*, fol. lanceolatis carinatis obtuſiuſculis ſerratis dorſo denticulatis, capſulis ſubcylindricis erectiuſculis. TAB. 7. FIG. 3.

Hab. in ericetis Scotiæ, et locis ſterilibus Angliæ.

The *ſtalk* of this ſpecies appears reddiſh, and is generally ſlightly branched, though not unfrequently met with ſingle, and grows from an inch to two inches in height —The *leaves* are obtuſely lanceolate, and finely ſerrated on the edges, with the middle nerve dentated on the back of each: thoſe on the upper parts of the ſtalk and branches are of a dark glaucous colour, changing in the dried ſtate to a dull blackiſh hue; but the lower leaves, and the baſes of the upper ones, are reddiſh, and become whitiſh when dried; they are generally larger and more crowded at the top and at the diviſions of the branches.—The *peduncles* very ſeldom exceed three in number, and are

are from an inch to an inch and half in length: they are reddiſh, ſlightly twiſted, and generally terminate the lower branches, each ariſing out of a cylindrical tube, about two tenths of an inch long.—The *capſule* is ſomewhat erect, and nearly cylindrical, having a ſtrong annulated rim, fringed with a regular row of reddiſh dents: the *operculum* is long and ſubulate.—The exterior woolly *calyptra* is ferruginous, and about double the length of the inner one.

The only plant which this reſembles is P. *aloides*, and I ſtrongly ſuſpect that they have been hitherto confounded together, both by Hudſon and Lightfoot, under the name of P. *nanum*. It is undoubtedly a very diſtinct ſpecies from P. *aloides* of Hedwig, not only by its being larger in all its parts, and generally branched, but alſo by its leaves being ſerrated their whole length, and dentated on their back along the courſe of the middle nerve.

15. POLYTRICHUM *dentatum*, fol. lanceolatis acutis aculeato-dentatis, capſulis ſubcylindricis erectis. TAB. 7. FIG. 4.

Hab. in ora occidentali Americæ Septentrionalis.

It is from an inch to two inches high, and generally divided into three or four ſlender branches.—The *leaves* are ſtiff, lanceolate, acute, and ſtrongly dentated on the edges with ſharp whitiſh dents; their colour is a dark green when recent, but a reddiſh brown when dried; the middle nerve is elevated on the back of the leaf, and marked with a few dents near the tip.—The *peduncles* are generally two or three in number, of a dark reddiſh colour, and grow to an inch or an inch and half long: they ariſe from the ſummits of the branches out of cylindrical tubes which ſurround about two tenths of an inch of the baſe of each.—The *capſule* is ſomewhat cylindrical and erect; the rim is ſtrong and fringed with minute dents: the *operculum* is flat, with a ſmall point in the centre.—The exterior

calyptra

calyptra is of a ferruginous colour, and about twice the length of the inner one.

This is in Sir Joseph Banks's Herbarium, and was first brought from the north-west coast of America by Mr. Nelson, who accompanied Captain Cook in his last voyage. I have since frequently met with it myself in the pine-forests on the same coast; but it has not been found, to my knowledge, any where else.

16. POLYTRICHUM *urnigerum*, fol. lanceolatis acuminatis denticulato-serratis rigidis, capsulis cylindricis erectis.

P. *urnigerum Linn. Sp. Pl.* 1573. *Dill. Musc.* 427. *t.* 55. *f.* 5.
Habitat in ericetis montosis Angliæ, &c.

This grows from an inch to three inches in height; the lower part of the *stalk* is naked, but the upper part is crowded with leaves, and generally divided into numerous branches.—The *leaves* are lanceolate, sharp-pointed, rigid, and irregularly serrated with acute dents.—The *peduncles* are about an inch or an inch and half long, and arise pretty copiously from the summits of the lower branches, and not from the *axillæ* of the leaves, as they have been generally described: the vaginal *perichætium*, which closely surrounds the base of each, is about an eighth of an inch in length.—The *capsule* is cylindrical and erect, having the rim wide, and fringed with minute dents. The *operculum* is flat, with a small point in the centre, and covers the rim with a thick obtuse edge.—The exterior *calyptra* is small and subulate, of a light ferruginous colour at the top, but whitish towards the bottom, and is rather more than twice the length of the inner one.

17. POLYTRICHUM *ſeptentrionale*, fol. lanceolatis acutis apice obſcurè ſerrulatis, capſulis ovatis erectiuſculis, operculo mucronato recurvato. TAB. 7. FIG. 5.

P. *ramoſum Gunner. Fl. Norveg.* 814. *Fl. Dan. tab.* 297.
P. *ſeptentrionale Swartz in Act. Stockh.* 1795. *p.* 270.
Hab. in alpibus Norvegicis.

This plant is about an inch and half in height, and from a ſmall naked *ſtem* ſuddenly divides into ſhort ſtiff crowded branches.—The *leaves* are ſhort, narrow, lanceolate, acute, and entire on the edges, except towards their tips, where, with the aſſiſtance of a magnifier, they may be perceived ſlightly ſerrulated: they are all nearly of the ſame ſize, and equally diſperſed round the branches.—The *peduncles* are ſtiff, yellowiſh, about half an inch long, ariſing from the ſummits of the branches out of ſmall ſheathy tubes, which cloſely embrace their baſes.—The *capſule* is ovate and nearly erect: the *operculum* is conical, ending in a long recurved mucro.—The exterior *calyptra* is of a light ferruginous colour, and about twice the length of the inner one.

This is to be diſtinguiſhed from P. *alpinum* by being much ſmaller in all its parts,—by its leaves being ſhorter, more erect, and nearly entire on their edges,—by its capſules being moſtly erect, and its *operculum* ending in a long recurved mucro.

The ſhape of the capſule in the plate above quoted from the Flora Danica is not ſufficiently accurate, as it does not agree either with the plant or the deſcription of it inſerted in the ſame work. I have therefore given a new figure of it from a ſpecimen ſent me ſome years ago by Dr. Swartz of Stockholm, a learned and indefatigable member of this Society, to whom I am indebted for this, and many other intereſting communications.

18. Po-

18. POLYTRICHUM *alpinum*, fol. lineari-lanceolatis denticulato-ſerratis rigidis, capſulis ovatis ſubnutantibus.

P. *alpinum Linn. Sp. Pl.* 1573. *Dill. Muſc.* 427. *tab.* 55. *f.* 4.
Hab. in cricetis montoſis, in boreali parte Europæ.

The *ſtalk* of this is from two to three inches in height, and divides into numerous branches.—The *leaves* are ſtrong, ſtiff, linear-lanceolate, and finely ſerrated on the edges with ſharp minute dents: they are generally of a dark brown on the lower parts of the plant, but light green on the upper branches, where they alſo become brown in a dried ſtate.—The *peduncles* are numerous, from an inch to an inch and half long, of a deep ſtraw-colour, and iſſue from the ſummits of the branches out of cloſe cylindrical tubes, which are about two tenths of an inch in length.—The *capſule* is ovate, tumid, and a little inclined or nodding. The *operculum* is conical and pointed.—The exterior *calyptra* is ſmall, ſubulate, of a ferruginous colour, and about a third longer than the inner one.

19. POLYTRICHUM *ſylvaticum*, fol. lineari-lanceolatis acuminatis ſerratis rigidis, capſulis oblongis cernuis ſubincurvis. TAB. 7. FIG. 6.

Hab. in ſylvis abietinis oræ occidentalis Americæ ſeptentrionalis.

This grows from two to four inches and ſometimes even to ſix inches in height, and is looſely divided into four or five branches; the lower part of the *ſtalk* is ſtiff and naked, but the upper part and branches are crowded with long narrow ſpreading leaves.—The *leaves* are linear-lanceolate, ending with ſetaceous points, and finely ſerrated on the edges, which in a dried ſtate turn in ſo as to appear channelled; the lower leaves are of a reddiſh brown colour, but the upper ones are of a dark green.—The *peduncles* are from an

inch and half to two inches long, and arise from the summits of the branches out of sheathy tubes, which are about two eighths of an inch in length; they are shining, and of a deep straw-colour at their tops, but reddish towards their bases.—The *capsule* is oblong, a little inclined and somewhat incurved, and narrower towards the rim, where it is fringed with a regular row of minute whitish dents, to the number of about sixty-four. The *operculum* is flat, with a setaceous point issuing from the centre.—The exterior woolly *calyptra* is pointed, of a light ferruginous colour, and about a third part longer than the inner one, which is of the same colour, but darker.

In reference to TAB. VI and VII. it is to be observed, that adjoining to almost every figure, the exterior *calyptra* is laid open to show the inner one.—The tubular *perichætium* that surrounds the base of the peduncle is represented both in its natural size and enlarged.—A *leaf* of each is magnified to show its figure, and the *capsule* is exhibited either in its natural size or magnified, in order to give a more accurate idea of its shape.

VII. *Ob-*

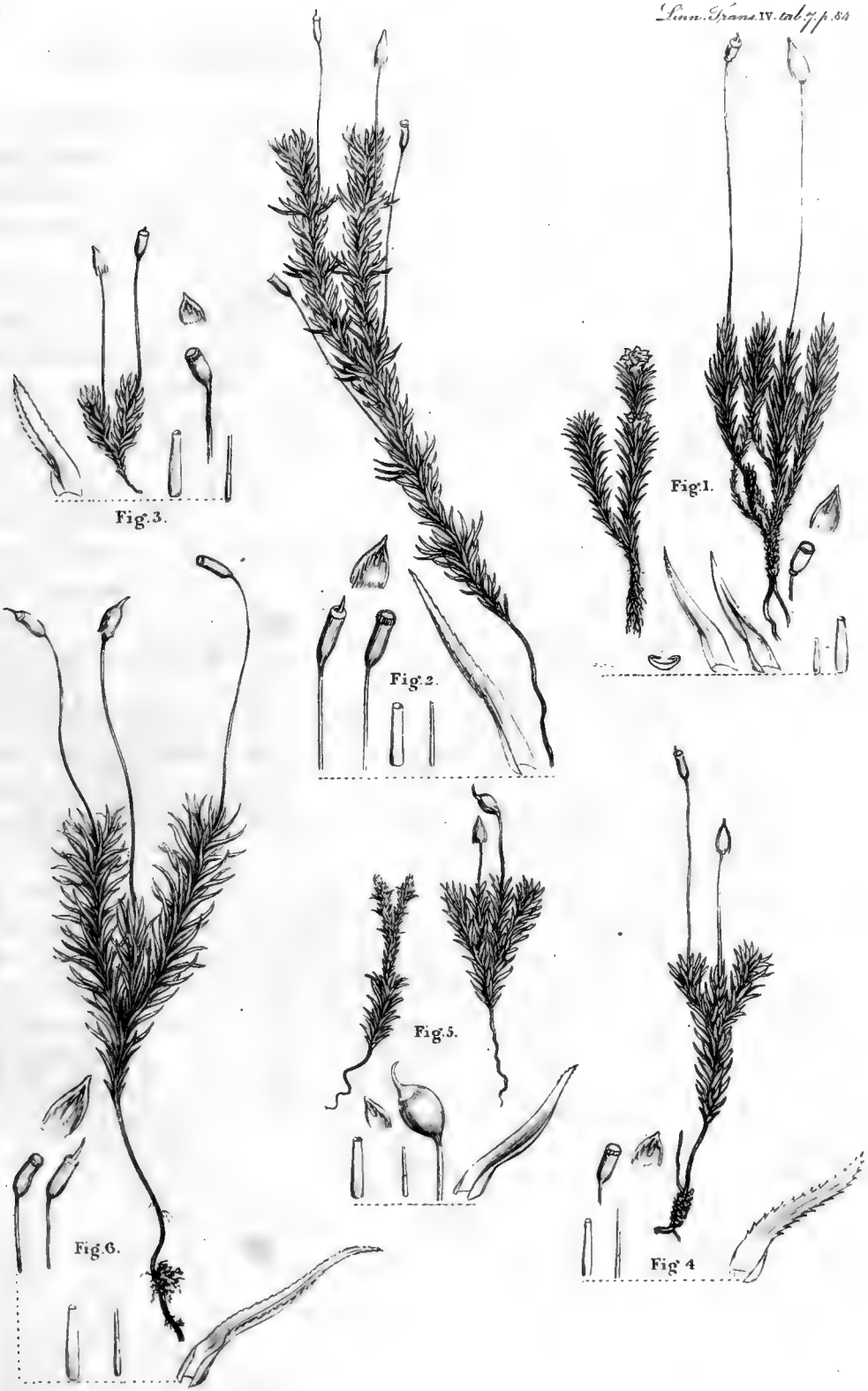


Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4
Fig. 5.
Fig. 6.

Linn. Trans. IV. tab. 8. p. 85.

Spinning Limax.

Dipus canadensis.

VII. *Obſervations on the Spinning Limax. By John Latham, M. D. F.R.S. and L.S. Romſey.*

Read February 7, 1797.

THE account of the *Spinning Limax* ſeen and well deſcribed by Mr. Hoy, in the Firſt Volume of the Tranſactions of the *Linnean Society*, and obſerved ſome years prior thereto by Dr. Shaw, could not fail to ſtrike the notice of every Naturaliſt as a circumſtance unlooked for in this tribe of beings. Amongſt others my attentive and obſerving friend, and Fellow of this Society, Colonel Montagu, has been fortunate in reſiding this ſummer at Penryn in Cornwall, where this *Limax* or *ſlug* was in conſiderable plenty, by which means he has been enabled to draw up notes of many obſervations thereon, which he has communicated to me in various letters for the purpoſe of laying them before the Society.

The reſult of the Colonel's obſervations, omitting what Mr. Hoy has before ſaid on the ſubject, is nearly as follows:—The ſpecimens which he met with were in general from three-fourths of an inch to an inch in length, the general colour a greyiſh white, and the ſhield of a yellowiſh or buff-colour, as may be ſeen in the coloured drawing thereof. TAB. 8. *fig.* 1. ſhews the *ſlug* in a ſtate of repoſe on a leaf; *fig.* 2. that of progreſſive motion on the ground: *fig.* 3. a view of the upper ſurface whilſt ſuſpended by its thread from a branch: and *fig.* 4. the ſame ſeen from beneath. That it is a cuſtom not unuſual for this ſpecies of *Limax* to paſs

from

from an height ſecurely to the ground, by means of a thread of its own conſtruction, ſeems manifeſt; for, on my friend's putting one of them on the projecting frame of a window, it immediately crawled forwards till it came to the projecting angle, from whence, without attempting to fix itſelf by its fore parts to any thing, it became viſibly ſuſpended by a thread from its tail. When it had deſcended about two feet, the Colonel took it up by the thread, and carried it to a diſtant room; but, in trying to fix it afreſh, in order more accurately to obſerve its progreſs, the thread broke. He then put it on a frame about four feet from the ground; in a few minutes it was again ſuſpended, and, obſerving by his watch, deſcended at the rate of three inches and an half in a minute. The motion was not perfectly ſmooth and regular, but at times ſlight jerks were obſerved. When the ſlug was near the ground, an attempt was made, by taking hold of the thread near to the body, to fix it afreſh, but the thread again broke, as it did likewiſe on being tried three other times with the ſame view, each time the ſlug having nearly reached the floor. At laſt he fixed the end to a ſtick, by which he was enabled, by turning the ſtick round, to wind up the thread faſter than it was produced. The thread however ſoon broke, and after theſe trials, although the ſlug made ſeveral attempts to ſpin, it as often fell to the ground; on which it was put into wet moſs, and the next day ſeemed ſo far to have recovered the property of ſpinning, as again to go through the former experiments.

By the above repeated eſſays, the Colonel, by means of glaſſes, was enabled to make the fulleſt obſervations, and found for certain that the ſecretion, of which the thread was formed, was wholly from the under parts, and not from the back or ſides, both of which appeared nearly dry; nor did it proceed from any orifice in the tail, for in ſome experiments it was ſuſpended by the tip of the tail, at other times from full an eighth of an inch on one ſide of it. This

Limax appeared to be ſenſible of its abilities, for it extended itſelf from the bottom of the frame, with its head downwards, till the tail became ſuſpended; and it was by means of an undulating motion of the belly, ſimilar to that in the act of crawling, that the flow of the viſcous ſecretion was produced towards the tail; but in doing this the belly was extremely contracted, being furniſhed with numerous tranſverſe *rugæ*; at the ſame time the body and *tentacula* were fully extended, indicating no alarm whatever: the head was occaſionally moved from ſide to ſide, which gave ſeveral turns to the right or left as the centre of gravity lay; but as it as frequently turned one way as the other, the thread was not in the leaſt twiſted. The thread, on firſt leaving the tail, conformed to the ſhape of that part, being flat, and five times as broad as at one eighth of an inch diſtant therefrom; but afterwards ſeemed of an equal ſize, and conſiderably ſmaller than the fineſt human hair. When a portion of this thread was placed under a microſcope, it appeared contracted, by its ſurface being wrinkled; it was pellucid, and ſeemed elaſtic.

Colonel Montagu adds, that he has met with numbers of them, ſome of which could not by any means be induced to ſpin, as if ſenſible of their inability ſo to do, readily turning back when approaching the projecting edge; whilſt others at once let themſelves down without heſitation; ſo that it might be known by their motion, when near the brink of the precipice, whether they were endued with the faculty or not.

The above were the principal of the obſervations communicated to me, the laſt of which were made the beginning of October. My friend, as well as Mr. Hoy, ſeems to think that the ſubject in queſtion is no other than the *Limax agreſtis* of Linnæus, to which I moſt readily aſſent; and that it is moſt probably the variety mentioned by Müller in his *Hiſt. Verm. II. p.* 9. β. viz. *Limax albidus clypeo flaveſcente*; and perhaps alſo the var. ε. in Gmelin's edition of the *Syſt.*

Naturæ

Naturæ of Linnæus, p. 3101. *Limax albus clypeo flavescente.* Lister has figured it, not inaccurately, both in his *Animal. Angliæ, p.* 130. *tab.* 2. *f.* 16. as well as in his *Synopsis Method. Conch.* as one of his *Cochleæ nudæ terrestres*, see *tab.* 101. A.: but both figures seem to correspond with the plain sort, in which the shield and body do not differ in colour; for he names it *L. cinereus parvus immaculatus.* However he is silent in respect to the faculty, in this identical species, of spinning a thread, although he has noticed the circumstance in the *Limax cinereus* of Linnæus, which he names *L. cinereus maximus striatus & maculatus, p.* 127. *t.* 2. *f.* 15. (the same figured in his *Synopsis, tab.* 101. a. f. d.) and delivers his sentiments, at p. 130, in the following words: "Eosdem Limaces alio tempore circa men-"sem Junium in sylvis opacis observavi, ex arborum ramis demis-"sos, singulos singulis funibus bipedalibus crassis & validis satis: at "e propria saliva confectis. Est sanè magna affinitas inter humo-"rem illum e quo araneorum erucarumque fila fiunt, atque horum "animalium salivam."

In respect to the quantity of glutinous matter sufficient for the purpose of suspension, according to Swammerdam the texture of the whole surface of the body is more or less disposed to furnish it *; but, by the above observations, we find that the glands of the belly and under parts are those which are materially subservient thereto.

* *Bibl. Naturæ, part* 1. *ord.* 1. *cap.* 6. where he says, "After what manner the slimy "humour distils from the glands of the skin, may be seen in this manner: The skin must "be wiped with spongy blotting paper until none of the slimy humour is seen, or till the "whole is cleared off; then the skin must be taken between the fingers and pressed "gently; and if this be done under a microscope, the slimy humour will be seen to come "out insensibly from the glandular pores of the skin like clear and minute points: these, "by continuing the pressure, will become small drops; and these, in some time, gather-"ing together, will form a considerable collection of this matter; so that the whole skin "will be moistened and become glutinous." See *Book of Nature, part* 1. *p.* 54. *(Engl. Transl.)*

From

From what has been ſaid it ſhould ſeem no difficult matter to ſuppoſe the poſſibility of *every Species of the Genus Limax* being competent to the forming threads of the like kind; ſo far from the faculty being confined to one in particular.

The firſt diſcovery of the ſingularity which has given riſe to the above eſſay, like many other things, was owing to fortuitous obſervation; and, to ſay the truth, the fact was totally unlooked for, and by many ſcarcely credited, although ſo well atteſted; but knowledge of every kind is ſlow in its progreſs. It is to be hoped, therefore, that no opportunity will be hereafter neglected by individuals of forwarding to the Linnean Society their obſervations without reſerve, although ſuch may appear at firſt trivial, for they may probably lead to more conſequential diſcoveries.

Romſey, Nov. 11, 1796.

VIII. *An Essay on the Tracheæ or Windpipes of various Kinds of Birds. By John Latham, M. D. F. R. S. and L. S. Romsey.*

Read July 4, *October* 3, *and November* 7, 1797.

THE study of Birds has for many years past occupied my attention; and I might add, that from my earliest remembrance I have had a predilection in favour of this part of Natural History, although my researches have not been totally confined thereto. I have hereby been tempted to publish my volumes of Ornithology, which, I flatter myself, are now generally known to the world.

During my progress in the description of the external appearance of each, the criterion whereby most Ornithologists have thought it sufficient to discriminate one species from another, I have also paid some attention to the structure of the internal parts; and, among other things, the difference in the formation of the *trachea* in many of the Duck genus, in particular, has not failed to strike my observation; and that this circumstance will not a little contribute to assist our researches concerning the identity of several species, hitherto not a little confused, will hereafter be made to appear. But as I wished to get as much light thrown on the subject as possible; I have postponed the publication of my observations, until by repeated dissections, and comparing many individuals with one another, I might be enabled to speak with the greater certainty. This matter has also required a much greater length of time in respect to the Duck genus, whose history will in this essay take up a material part of

of our attention, as it is only at particular seasons that some of them are to be met with, and several in mild winters do not visit this kingdom, except by seeming chance, or in very small numbers. It is not possible therefore that any person of himself, however advantageously situated, can hope to meet with a sufficient number of specimens, without the assistance of others. I speak this experimentally, as without such aid I should not have been able to have furnished matter for this essay.

Amongst the various friends to whom I am obliged in respect to this undertaking, the judicious and well-informed Naturalist, William Boys, Esq. of Deal, stands deservedly foremost, having rendered me very great assistance, not only by specimens, but by every observation in his power. I find myself greatly indebted to my friend Colonel Montagu, a most diligent observer of nature; also to Mr. Lamb, Surgeon, of Reading—all Fellows of this Society. Nor should I omit my valuable correspondent Dr. Bloch, of Berlin, who has rendered himself conspicuous by several essays on the present subject, as may be seen in the Berlin Transactions*. To which must be added the observations of Doctors Pallas†, Beckmann‡, Silberschlag§, and Otto‖, contained in the same works, all of which may be read to advantage; for although these gentlemen do not altogether coincide in their opinions, yet as they all tend to the same point, such efforts in order to ascertain truth must always be useful—Not forgetting due acknowledgment to the valuable paper of the late Dr. Parsons, who, many years prior to the above, gave an account of the structure of the *asperæ arteriæ*, or windpipes, of several Birds, and in the Land

* *Besch. der Berl. Nat. Fr.* iv. p. 579.—*Schrift. der Berl. Nat. Fr.* i. p. 51.

† *Besch. der Berl. Nat. Fr.* ii. p. 551.

‡ *Besch. der Berl. Nat. Fr.* i. p. 170.

§ *Schrift. der Berl. Nat. Fr.* i. p. 36.

‖ *Besch. der Berl. Nat. Fr.* iii. p. 456.

Tortoise, in the Philosophical Transactions*. It is by means of the above resources, added to the observations I have myself made for a number of years, that I shall endeavour to elucidate the subject as far as in my power; and although I may not be able to determine the matter with so great a degree of precision as might be wished, it is more than probable that others, hereafter, will be able to complete the structure of which I have endeavoured to lay the groundwork.

I shall begin this essay by observing, that in most birds the natural shape of the *trachea*, *aspera arteria*, or *windpipe*, by all which names this part is known, is that of a regularly uniform cylinder of equal diameter, or nearly so, throughout, from its rise at the root of the tongue, to its entrance into the hollow of the *thorax*, *sternum*, or *breast-bone*, where it divides into two branches, called *bronchiæ*, which ramify into air-vessels which compose the two lobes of the lungs. This, I say, is the general mode of construction: but Ornithologists pretty far back† have noticed nature's deviation from this usual structure, both in respect to the various curvatures of the windpipe itself, as well as the difference of some from others in respect to conformation; but their sentiments were penned in too vague a manner to determine much thereon, not answering the purpose further than to stimulate our future researches. As far as the deviation from a cylindrical shape is concerned, it is observable that the peculiar difference in structure is seen only in the *male* sex, the *female* not having the least enlargement, or increased cavity, as will hereafter be mentioned: but to what purpose nature has intended this, is, I believe, at present unknown to us. Some authors have given as their opinion, that the enlargement of the *trachea* in males, whenever

* Vol. lvi. p. 204.

† Aldrovandus, Willughby.—See also Birch's Hist. Roy. Soc. ii. p. 13

it

it happens, serves to increase the tone of voice; and that this sex is enabled, by means of it, to cry out more forcibly than those birds which have no such construction of parts—an instance of which is pointed out in the *Golden-Eye Duck*, the Latin name of which *(Clangula)* has been given to it from this supposed circumstance*. Others again have supposed that the peculiarity of structure might be of use in diving; yet no one has authenticated to us, that the male is able to stay longer under water than the female. Concerning the want or presence of an enlarged cavity, or labyrinth, as authors have called it, nothing can better suit our purpose than the examples of the *Scoter* and *Velvet Duck*, the latter of which has not only an enlargement of cavity at the bottom part, but likewise a large hollow in the middle, added to a third enlargement of hollow bone just below the *larynx*; but in the first-named not the least deviation from an uniformly cylindrical shape is seen throughout the whole of its length, in either sex:—yet, wonderful to say, the *Scoter* has by far the greater facility of the two, in respect to diving and staying under the water, and on account of this property of diving becomes one of the most difficult birds to kill in its own element, as twenty shots have been made at one of these, by a good marksman, before one has taken effect. We cannot do amiss also to remind the reader, that none of the genus of *Colymbus*, *Podiceps*, or *Uria*, which have acquired the name of *Divers* from being so often under water, do enjoy any material construction of the *trachea* different from the *Cock* and *Hen*, which are well known to avoid the water from instinct. Neither can I learn that any thing occurs to outward appearance, that should enable the *Corvorant*, *Shag*, and many others, to

* Gesner supposes the name to have been given from clapping the wings at the first rising to take flight. "Ab alarum clangore, quæ firmissimæ sunt, nec sine sono in volatu moventur." *De Nat. Av.* p. 104.

dive

dive with such facility as they are known to do. The *Wild Swan*, in which we observe a great elongation added to a peculiar curvature of the windpipe, is able to hold its head for a length of time under water in search of food; but we have no authority for saying whether it can do so a longer time than the *Tame Swan*, in which no such peculiarity is seen. Besides, the common *Crane*, and others of the *Ardea* genus, which have not in their power even to swim, are endowed with a much greater elongation and curvature of the windpipe than the *Wild Swan*. In respect to what assistance such a construction of parts as abovesaid may afford to the tone of voice, I will not venture here to affirm; yet it cannot be denied that some birds are able to utter very loud sounds without such aid—witness the *Cock*, *Peacock*, and others*. We see Nature's operations and admire them in course, yet cannot always comprehend the utility of her works; and this seems one of her designs concerning which we are not at all clear. It, too, must be confessed, that the whole we have been able to obtain by our scrutiny into this subject is, the security of a mark of distinction, in respect to several species concerning which we have been more or less in a state of uncertainty.

I am aware likewise that anatomists have done much in regard to the discovery of sex, by observing the *testicles* of the *male*, which consist of two whitish glandular bodies placed just below the lungs, close to the back-bone, and the *ovaries*, or clusters of eggs, situated in the same place, in the *female*. It is true that the *sex* may, by at-

* How far the discovery of the dispersion of air-vessels, which are found among the fleshy parts of birds, pervading more or less even the *bones* themselves, and communicating with the lungs, may contribute to their being able to dive and stay so long under water, or whether this circumstance may assist in voice, song, or flight, is not for us here to determine. The matter is certainly worth further enquiry, but cannot make any part of this essay, further than to recommend the perusal of a Treatise on the subject by our late friend Mr. John Hunter, in the Philosophical Transactions.—See vol. lxiv. p. 205.

tending

tending to the above circumstances, be most times got at the knowledge of; but we cannot thereby discriminate the *species*. And it is also more disappointing, that, at some seasons of the year, in particular subjects, these internal marks are so nearly obliterated as to deceive a very good comparative anatomist, and much less likely to be ascertained by any one who may be but slightly versed in such matters. But the particular circumstance of the *trachea*, as will hereafter be pointed out, never alters; except in being more or less complete in its period of ossification during the life of the bird. I ought not however to omit, that in a very careful comparison many traits of difference between one species and another may be detected by the skilful anatomist (although such may not have either labyrinth, or any enlargement of the *trachea* to distinguish them by), arising from the structure of the rings themselves, aided by the muscles appropriated to their motion; and it may be with confidence asserted, that one mean at least, if not the principal, of producing a loud noise, and on the contrary, may arise from the peculiar construction of these tracheal rings, which in many birds are found to be more or less complete in themselves; some of them wanting even a large portion of the circle, whilst others are not only perfect, but of a strong and elastic ligamentous nature, and some few so greatly indurated as to approach almost to the texture of bone*.—Added to which is the great difference of muscular appendages; for, in the birds which have a weak voice, the muscles are so likewise: on the contrary, very strong muscles are observable in those whose cry is loud, by which structure the rings, the strength of which is ever proportional, are put into violent action, and the bird thereby enabled to throw out the air with great force†. It is certain, also, that, in birds which

* As in the *Peacock*, *Goosanders*, *Smew*, and some others.

† See a curious and elaborate dissertation on this subject in *Magazin Encyclopédique*, tom. ii. p. 334 et seq.

sing, the muscles of the *lorynx* are stoutest in the *male*, and in the *Nightingale* are stronger in proportion than in any bird of the same size*. We have been imperceptibly led into the above discussion, although not originally meant to form any part of our plan, intending merely to illustrate such variations of *tracheæ* as palpably differed from the usual mode, either in respect to position or structure.

The deviations in respect to the windpipe from what is generally seen, may be divided into two kinds.—The *first*, wherein this organ, although of equal diameter or nearly so, differs in being somewhat longer than the neck, and thereby allowing of a double about the middle of it, as in the *Wood Grous*—or, being further elongated, forming one or more folds either within the keel-like process of the sternum, which is hollowed out for that purpose, as may be seen in the *Wild Swan*, *Demoiselle*, *Crane*, &c.—or, instead of entering the keel, runs more or less over the surface of the breast beneath the skin, as instanced in the *Marail*, *Barraka*, *Guan*, and others, as will be hereafter noticed.

The *second* deviation is where the windpipe is unequal in diameter, although not elongated, but alters in shape and size, and in some birds very considerably, in its progress to the lungs, more especially just before its divarication into the two *bronchiæ*, or lung-pipes.

This last circumstance has been met with hitherto only in the *Duck* † and *Merganser* genera, or at least it is in these only that the *labyrinth* ‡, as it has been termed by authors, has been

* Mr. Barrington supposes that the Nightingale may be distinctly heard at more than half a mile, if the evening be calm. Phil. Trans. vol. lxiii. p. 279.

† I will not take upon me to say that other, and perhaps various kinds of, conformations of the *trachea* in the *Duck* genus may not hereafter be noticed; as we have good authority in respect to one species, where the windpipe runs on the surface of the breast in the manner of the *Guan*. See No. vi.

‡ Ampulla seu Labyrinthus, *Raii Syn. Av.* p. 135. *Will. Orn.* p. 253, et alibi. Labyrinth, *Will. Orn.* (Ed. Angl.) p. 335. *Ray's Letters*, p. 163.

 found;

found: and further, that it is the *male* alone which has this mark of discrimination; for although many birds may be found having the *female* plumage, in which the labyrinth is equally conspicuous with others possessing that of the other sex, yet I will venture to affirm, that this part differs not from that of an old male, except in respect to the ossification being less complete; and again, that in every specimen with such enlargement of *trachea*, or labyrinth, the *testes*, an indubitable mark of the *male* sex, will invariably be found to accompany it.

Among other errors, the *Glaucium* of authors, or *Morillon* of the French, has been recorded as a distinct species by many. This however may easily be proved a fallacy by dissection, as the bird is no other than the *Golden Eye* in imperfect feather; for this species does not attain the adult plumage for at least the first season, perhaps longer. Another bird, passing under the name of *Morillon*, proves, by the same test, to be the young of the *Tufted Duck*; and a third called *Morillon* also, merely a young *Scaup*, which I have more than once identified. Besides, were the difference of *bill* alone in these birds attended to, it could not fail to decide the matter, as they are greatly unlike each other in this particular, notwithstanding the external colour of feather might lead a superficial observer to think them the same.

The *wild Swan* is not greatly unlike the *tame* species in respect to plumage, the difference of bill at first sight appearing to be the chief external characteristic, insomuch as to deceive some Naturalists into the supposition of their being varieties only of one and the same species*; but

* *M. de Buffon* was apprised of the difference of internal structure, but accounts for it on a singular principle, when he observes in a note: "Selon Willughby cette particularité "de conformation est propre au cygne sauvage, & ne se trouve point la même dans le cygne "domestique, ce que semble fonder ce que nous allons rapporter de la difference de leur "voix,

but under the eye of the Anatomist, who examines them internally, how widely do they differ!—In the *tame* one, little more occurs in respect to the windpipe than is to be seen in the common *Cock*, whilst in the *wild Swan* it is lengthened greatly, and, entering a hollow in the keel of the sternum, forms a doubling therein, before it returns to enter into the cavity and attach itself to the lungs, as will be hereafter shewn.

It seems unnecessary to say more on this subject in a general way, as the circumstances will occur in course under their particular heads: to avoid repetitions, therefore, I shall proceed to the descriptions themselves; and, first, of those birds in which the *trachea* or windpipe obtains a singularity, from its various inflexions in its passage to the lungs, without greatly deviating from the uniform and cylindrical shape, beginning with

I. TETRAO UROGALLUS—WOOD GROUS. *Tab.* ix. *Fig.* 1.

T. fusco-rufus, capite colloque cinereis, gulâ abdomineque nigris, axillis albis.

Tetrao Urogallus, *Linn. Syst. Nat.* p. 273.—*Ind. Orn.* 2. p. 634.—*Frisch.* t. 107, 108.—*Raii Syn. Av.* p. 53. A. 1.—*Will. Orn.* t. 30.

Auerhahn, *Besch. der Berl. Nat. Fr.* iv. p. 589. t. 18. f. 2.

Coq de Bruyere, *Buf. Oiſ.* ii. p. 191. t. 5.—*Pl. Enl.* 73, 74.

Wood Grous, Cock of the Wood, *Br. Zool.* i. t. 40, 41.—*Gen. Syn.* iv. p. 729.

In order to ascertain the species here meant, it is right to observe, that the *Wood Grous* is well represented in the *British Zoology*, and

" voix, mais cela ne suffiroit peut-être pas pour prouver que leurs espèces soient differ-
" entes: cette diversité n'excedant pas la somme des impressions tant interieurs qu'ex-
" terieurs, que la domesticité & ses habitudes peuvent produire à la longue sur une race
" assujettée." *Hist. des Oiſ.* ix. p. 24. *(f)*.

is

is also figured in the *Planches Enluminées*, as well as the Plate referred to in Frisch's work, where the reader may likewise learn the description and manners.—He will, in like manner, be directed to the synonyms of such authors as may be necessary for him to consult, in respect to the other birds mentioned in this treatise, the design of which being chiefly that of describing the organ of respiration called the *trachea* or windpipe; and as the *Wood Grous* seems to deviate from the common road, in a less degree than others which will be hereafter mentioned, it seems most proper to begin our subject with.

The windpipe in this species, otherwise than being longer than the neck, does not furnish us with any thing material in respect to general conformation: it passes in a straight direction downwards as far as the crop, where it takes a bend upwards, and again turning downwards, goes on to the lungs in the usual way.

As the bird is very rare in this kingdom, I have never been able to examine more than one, which came from the North of Europe, and of which very little of the *trachea* remains with me, except the parts composing the bend: I have therefore availed myself of the drawing of Dr. Bloch in the *Berlin Transactions* above referred to, in order to perfect my figure, in which *a* represents the *tongue*—*bb* the *os hyoides*, or bone of the tongue, with its appendages—*c* the *larynx* with the *glottis* or orifice therein for the admission of air—*dd* muscles which accompany the *trachea*, one on each side, serving to lengthen or shorten it at the will of the bird—*f* the *trachea* or windpipe itself, forking off into two parts called *bronchiæ*, which divaricate into numberless smaller tubes, and lose themselves in the various ramifications of the lungs.

This general structure of parts is greatly similar in all birds, and will serve throughout this Essay whenever we may have occasion to speak of them, having in view such readers as may not be con-

versant in anatomy; to those who are, it will be unnecessary to say more, and to the uninformed I should hope it may prove enough.

As far as I can learn, no particularity is observable in the windpipes of the three others of this genus which frequent this kingdom, viz. the *Black Cock*, *Red Grous*, and *Ptarmigan*. The two first I have myself examined; but in respect to the *Ptarmigan*, I have not as yet had an opportunity of seeing it in a recent state; however, I am informed that nothing particular has been noticed in respect to the parts in question.

II. PENELOPE MARAIL—MARAIL TURKEY. *Tab.* ix. *Fig.* 2.

P. capite subcristato, temporibus gulâque incarnatis caruncularis.

Penelope Marail, *Gmel. Syst. Nat.* i. p. 734.—*Ind. Orn.* 2. p. 620.

Faisan verdâtre de Cayenne, Le Marail, *Buf.Ois.* ii. p. 390.—*Pl. Enl.* 338.

Marail Turkey, *Gen. Syn.* iv. p. 682.

This bird inhabits the woods of Cayenne and Guiana, where it is gregarious, and not unfrequently seen about houses; it is likewise brought up tame, in the manner of our domestic poultry.

The *trachea* follows the course of the neck as far as the breast, where it rises on the outside of the flesh, being covered only by the skin and feathers, and passes downwards some way; after which it returns upwards, and, bending over the right clavicle or collar-bone, divides into the two usual portions, entering the cavity, and joins the lungs: at the part where it makes the curve on the breast, it is kept in its place by a strong muscle, which is perceivable quite to the breast-bone. The above is observed in both sexes. The general cry is said to be not inharmonious; except when irritated or wounded, when it is harsh and loud.

III. PHASIANUS PARRAKA—PARRAKA PHEASANT. *Tab.* ix. *Fig.* 3.

Ph. subcristatus fuscus subtus fulvus, caudâ elongatâ apice integrâ.

Phasianus Parraka, *Gmel. Syst. Nat.* i. p. 740.—*Ind. Orn.* ii. p. 632.

Le Parraka, *Buf.Ois.* ii. p. 394.—*Mem. sur Cayen.* i. p. 378.—*Pl. Enl.* 1. 2.

Parraka Pheasant, *Gen. Syn.* iv. p. 722.

This bird is common in the woods of Guiana, and differs from the former in having the *trachea* of a much greater length, descending on the breast more than half way before it makes a turn upwards; after which it passes over the right clavicle, into the cavity of the breast. It may be observed, that in both these birds the descent is on the left side, and the ascent on the right. The *Parraka*, however, differs from the *Marail*; for the *male* only has the elongation of the *trachea*; in the *female* it passes immediately to the breast without the least singularity. This bird is said to set up a very loud cry at sun-set, which is thought to be the loudest of all birds in the new world, and to greatly resemble the word *Parraka* repeated many times together, from which it has obtained the name.

IV. PENELOPE CRISTATA—The GUAN. *Tab.* x. *Fig.* 1.

P. capite pennis erectis cristato, temporibus violaceis.

Penelope cristata, *Gmel. Syst. Nat.* i. p. 733.—*Ind. Orn.* ii. p. 619.

Meleagris cristata, *Linn. Syst. Nat.* i. p. 269.

Jacupema *Raii Syn. Av.* p. 56. 2.—*Will. Orn.* p. 165. t. 28. *Merrem. Ic. Av.* ii. p. 42. t. 4.

Guan or Quan, *Edw. Pl.* 13.—*Gen. Syn.* iv. p. 680. 3.

The

The *Guan* frequents the same places as the two last birds, and like them is frequently domesticated: but in the singularity of the windpipe, it far exceeds them; for it not only descends much lower on the breast, but at the bottom part it doubles upwards for at least one third of its length:—it differs also in another particular; for, instead of making a descent on the left side, it passes down on the right, and, contrary to the others, returns upwards, and goes into the cavity of the thorax over the left clavicle.—I owe the drawing of the figure, from which my representation of it is copied, to the kindness of my late friend Sir Ashton Lever, who was induced, from its great peculiarity, to have the parts sketched as they appeared in the recent state.

V. CRAX PAUXI—CUSHEW CURASSOW. *Tab.* xi. *Fig.* 1 & 2.

Cr. cerâ cœruleâ, narium gibbere cristato, corpore nigricante, abdomine apiceque caudæ albis.

Crax Pauxi, *Linn. Syst. Nat.* i. p. 270.—*Ind. Orn.* 2. p. 624.—*Briss. Orn.* i. p. 302.

Hocco de Mexique, Le Pierre, *Buf. Ois.* ii. p. 348.—*Pl. Enl.* 78.—*Mem. de l'Acad. des Scien.* 1781. p. 376. pl. viii.

Cushew Curassow, *Edw. Pl.* 295. *f.* 2.—*Lath. Syn.* iv. p. 696.

The *trachea* in this species does not greatly differ from those of the *Parraka* and *Guan*, but appears to be the largest, in proportion to the bird, of any yet observed:—it extends on the outside of the breast under the skin in a similar manner, and first passes downward over the right pectoral muscle, going on straight quite to the end of the sternum, at which place it makes a convolution to the left for three inches in length, and somewhat in the shape of a ring; after which it returns again over the right pectoral muscle, and turns over the clavicle into the thorax.

The

The above account is extracted from a Dissertation on this bird, in the Memoirs of the Academy of Sciences; but no anatomical figures accompany it, although a good representation of the bird itself is given at the end of the Essay. This circumstance, however, is the less to be regretted, as I have been favoured with the two views annexed, from the rich and elegant Museum of John Heavisside, Esq. of Great George Street, who, amongst many curious anatomical subjects, possesses a preparation of the parts in very fine condition.

VI. ANAS SEMIPALMATA—SEMIPALMATED GOOSE.

A. grisea, capite collo femoribusque nigris, collari uropygio corporeque subtus albis, pedibus semipalmatis.
Habitat in Novâ Hollandiâ.

This seems to be a species not hitherto described; it is nearly of the size of the *wild Goose:* the bill is brown, and the cere passes on each side to the eyes; the head, neck and thighs are black; a collar of white encircles the lower part of the neck, and the rump and under-parts are also white; the legs are red, and the toes only webbed half-way from the base.

This is met with near Hawksbury river, in New South Wales, in flocks, and is there called *New South Wales Goose.* It is peculiar in that the windpipe forms several beautiful circumvolutions on the breast, under the skin, before it enters the thorax: its note is said to be tuneful and melodious; and it was observed sometimes to perch on trees, in the manner of the *Whistling Duck.*

I was favoured with a sight of a drawing of the bird, added to the above account of its manners, at A. B. Lambert's, Esq. Lower Grosvenor Street.

VII. CRAX

VII. CRAX ALECTOR—CRESTED CURASSOW. *Tab.* x. *Fig.* 2. 3.

Cr. cerâ flavâ, corpore nigro, ventre albo.
Crax Alector *Linn. Syst. Nat.* i. p. 269.—*Ind. Orn.* 2. p. 622.—*Briss. Orn.* i. p. 298. t. 19.
Mituporanga, *Raii Syn.* p. 56. 6.—*Will. Orn.* p. 115. t. 28.
Hocco de la Guiane, *Buf.Ois.* ii. p. 375. pl. 13.
Indian Cock, *Pitf. Mem.* t. p. 190.—*Phil. Trans.* lvi. p. 215. t. 10. fig. 3.
Crested Curassow, *Gen. Syn.* iv. p. 690.

This likewise is a bird of some peculiarity in respect to the *trachea*, which is pretty stout, and the rings in proportion: it passes in a straight direction to the bottom of the neck, at which part it loses its round form, and becomes somewhat broad and flat; it then turns backwards and upwards for more than an inch, when it doubles again forwards and downwards; after which it enters the cavity of the breast, and is distributed by its two portions into the lungs.—This circumstance takes place at the front of the keel of the sternum or breast-bone, but does not enter into the keel itself, as in the three following species.

In the Philosophical Transactions above quoted is a figure of the subject given by Dr. Parsons; it is also represented in the Plate referred to in Pitfield's translation of *Memoires pour servir à l'Histoire des Animaux.* The first of these I have thought right to copy (fig. 2.) and I have added also the figure of one which belonged to a bird in my own collection (fig. 3.), from which it differs not a little:—but I find that this part of the *trachea* is apt to vary in different specimens; for a second figure, engraved in the same Plate of Pitfield, shews the bend to be very small, appearing like a mere twist only; from which circum-

circumstance, we may conclude that other varieties may be occasionally met with.

Whether the *female* has such a conformation of parts is not in my power to determine; but it may be observed, that the two birds dissected by the Academy of Sciences, as well as my own, were *males.*

VIII. ARDEA VIRGO—DEMOISELLE HERON. *Tab.* x. *Fig.* 4.

A. superciliis albis posticè retrorsumque cristatis.
Ardea Virgo, *Linn. Syst. Nat.* i. p. 234.—*Ind. Orn.* 2. p. 673.
La Grue de Numidie, *Buf.Ois.* vii. p. 313. pl. 15.—*Pl. Enl.* 241.
Demoiselle or Numidian Crane, *Gen. Syn.* v. p. 35.—*Edw. Pl.* 134.
Pitf. Mem. t. p. 204.—*Phil. Transf.* lvi. p. 210. t. xi. f. 5.

This beautiful and elegant bird is well known in our menageries, and is frequently so tame as to mix with the poultry, though in the winter season it requires defence from cold. In it the *trachea* enters a cavity in the keel of the sternum for about three inches, when it returns after making a bend as in the two following species, and passes into the chest. I had, many years since, an opportunity of observing this circumstance in a specimen of my own; but, from the great length of time, the part had so far perished as to render it impossible to take a drawing from it. I am therefore constrained to copy the figure in the Philosophical Transactions, which I have not the least doubt of being sufficiently authentic.

IX. ANAS CYGNUS—WILD SWAN. *Tab.* xii. *Fig.* 1. 2.

A. rostro semicylindrico atro, cerâ flavâ, corpore albo.
Anas Cygnus, *Linn. Syst. Nat.* i. p. 194.—*Ind. Orn.* 2. p. 833.—*Brif. Orn.* vi. p. 292. t. 28.—*Raii Syn. Av.* p. 136. A. 2.

Cygne sauvage, *Buf.Ois.* ix. p. 3.
Der Singchwan, *Beckst. Vog. Deutsch.* ii. p. 581.
Wild or Whistling Swan, *Gen. Syn.* vi. p. 433.—*Br. Zool.* ii. No. 264.—*Edw.* t. 150.—*Phil. Trans.* lvi. pl. x. p. 215. f. 1. 2.

The *Wild Swan* is a bird much less known than the *tame* species, which is every where domesticated, for it only visits this kingdom in very severe seasons;—it differs from the last, firstly, in the bill, which may be seen by comparison; and secondly, in size, being smaller. The plumage likewise is by no means of that dazzling snowy whiteness which characterises the tame species; but the essential and specific mark of distinction is that of the *trachea*, in which, as well as in the conformation of the breast-bone itself, it is so particularly different as to prove at once that there can be no relation whatever between the two.

The windpipe in the *Wild Swan*, meant in this place to be treated of, passes down the neck the whole of its length, after which it enters the keel of the sternum, passing backwards therein nearly the whole of its length, when it bends upwards and forwards, and then enters the cavity of the breast, to communicate with the lungs. It is not necessary to mention further particulars, as the figure of the breast-bone and *trachea* in situ will sufficiently point out the circumstance; nor is it necessary to say more in this place, than that the above structure of parts is observable in both sexes indiscriminately.

To obviate every possibility of mistake between the two species, I have thought right to exhibit a front view of the breast-bone of both, in which a large cavity may be seen in that of the wild species, sufficient to admit of the entrance and exit of the *trachea*, as well as its doubling therein; whilst in that of the tame Swan (Tab. xii. fig. 3.) no other structure is observable than in the common goose.

X. ARDEA

X. ARDEA GRUS—The CRANE. *Tab.* xii. *Fig.* 4.

A. occipite nudo papillosо, pileo remigibusque nigris, corpore cinereo, tectricibus intimis laceris.

Ardea Grus, *Linn. Syst. Nat.* i. p. 234.—*Ind. Orn.* 2. p. 624.—*Raii Syn. Av.* p. 95. A. 1.—*Will. Orn.* p. 294. t. 48.

La Grue, *Buf.Ois.* vii. p. 287. fol. 14.—*Pl. Enl.* 769.

Der Kranich, *Besch. der Berl. Nat. Fr.* iv. p. 586. t. xvi.

The Crane, *Gen. Syn.* v. p. 50.—*Br. Zool.* ii. App. p. 629. pl. 6.—*Phil. Transf.* lvi. p. 208. t. 11. f. 4.

In this bird the *trachea* enters the keel of the sternum in like manner as in the *Wild Swan*; with this difference, that it is doubly reflected*, as may be seen by consulting the figure. As in the *Wild Swan*, so in the *Crane*, we find that both sexes have the same conformation of parts, excepting that, in respect to the *Crane*, the *trachea* in the female does not pass near so far into the keel of it as in the male, nor is the doubling nearly so considerable.

WE now pass to birds in which the *trachea* enlarges in various parts, especially just at the angle of divarication, where it goes to the lungs; and which last circumstance, for want of a better name, authors have agreed to call by the name of *Ampulla*, or *Labyrinth*, as before observed, p. 96.

* To use the expression of Dr. Parsons, "This may be compared to a French-horn, "whereas that of the Wild Swan is straight within the bone, and may be compared to a "Trumpet; yet the entrance of this into the sternum and its exit, and its passage into the "cavity of the thorax, are similar to those of the Wild Swan." See *Phil. Transf.* l. c.

XI. ANAS CRECCA—The TEAL. *Tab.* xiii. *Fig.* 1.

A. speculo alarum viridi, linea alba supra infraque oculos.

Anas Crecca, *Linn. Syst. Nat.* i. p. 204.—*Ind. Orn.* 2. p. 872.—*Raii Syn. Av.* p. 147. A. 6.

Petite Sarcelle, *Buf.Ois.* ix. p. 265. pl. 17. 18.—*Pl. Enl.* 947.

Krikente, *Besch. der Berl. Nat. Fr.* iv. p. 600. t. 18. f. 6.

Common Teal, *Gen. Syn.* vi. p. 551.—*Br. Zool.* ii. No. 290.—*Will. Orn.* p. 377. t. 74.

The Teal is a well known bird, and perhaps the smallest of the Duck kind. The labyrinth is in proportion to the size, as big as a large pea on one side, and spreading on the opposite part into a kind of convex shape, at the bottom of which the *bronchiæ* or lung-pipes are attached.—The *female* has no labyrinth.

XII. ANAS QUERQUEDULA—The GARGANEY. *Tab.* xiii. *Fig.* 2. 3.

A. macula alarum viridi, linea alba supra oculos.

Anas Querquedula, *Linn. Syst. Nat.* i. p. 204.—*Ind. Orn.* 2. p. 872. *Raii Syn. Av.* p. 148. 8.

Sarcelle, *Buf.Ois.* ix. p. 260.—*Pl. Enl.* 946.

Winterholbente, *Besch. der Berl. Nat. Fr.* iv. p. 600. t. 18. f. 4?

Garganey, *Gen. Syn.* vi. p. 550.—*Br. Zool.* ii. No. 289. pl. 101.—*Will. Orn.* p. 377. pl. 74.

This bird measures, from bill to tail, seventeen inches, being three inches longer than the *Teal.* The labyrinth is larger, and differs considerably in shape, being nearly oval, and placed perpendicularly, so as to appear rather as a continuation of the *trachea*, than an appendage to it, as in several other species. It is externally a trifle indented on one side, in which furrow a muscle* passes, making it ap-

* Two muscles, one on each side, are seen in all fresh specimens; but, when dry, these are many times scarcely to be detected.

pear

pear as divided into two unequal portions; on the opposite part, or that situated next the breast, it is flattened, and from the upper part of it the two *bronchiæ* have their origin.

I have some reason for affirming, that authors have unnecessarily divided the Teals into more species than really exist; for the *Teal* so called, and the *Summer Teal*, certainly constitute but one; and although *males* have been met with of the latter, it is probable that the external distinction of feather may not be fixed till the second year, or even beyond that period: it is not enough that the *testes* are visible; for, as above mentioned, that circumstance of itself can only prove the *sex:* it is to the labyrinth alone that we must have recourse in all birds which possess it; for this remains nearly the same during life. I scarcely need here observe, that the *male* alone possesses the labyrinth, not only in this, but also in every other species of Duck hitherto examined.

XIII. ANAS CLYPEATA—The SHOVELER. *Tab.* xiii. *Fig.* 4. 5.

A. rostri extremo dilatato rotundato, ungue incurvo.

Anas clypeata, *Linn. Syst. Nat.* i. p. 200.—*Ind. Orn.* ii. p. 856.—*Raii Syn.* p. 144. A. 9. *et* 13.—*Brif. Orn.* vi. p. 329. t. 32. f. 1.

Le Souchet, *Buf. Oif.* ix. p. 191.—*Pl. Enl.* 971. 972.

Die Löffelente, *Schr. der Berl. Nat. Fr.* iii. p. 373. t. 7. f. 2.

Shoveler, *Gen. Syn.* vi. p. 509.—*Br. Zool.* ii. No. 280.

This bird is about two inches longer than the last, and is far from being uncommon. The end of the *trachea* is furnished with a labyrinth, which is small in proportion to the size of the bird, being scarcely more than half the size of that of the *Garganey*. It is of nearly equal dimensions throughout, except near the bottom, where it slightly enlarges; on the left side is a kind of bony bladder a little irregular in shape, about the size of a large rounceval pea, with two or three slight indentations on the sides;—from this springs one

one of the *bronchiæ*; the other arises from a kind of bony arch, with which the *trachea* ends, and which is a trifle above the level of the top of the labyrinth.

XIV. ANAS ACUTA—The PINTAIL DUCK. *Tab.* xiii. *Fig.* 6.

A. cauda acuminata elongata subtus nigra, occipite utrinque linea alba, dorso cinereo undulato.

Anas acuta, *Linn. Syst. Nat.* i. p. 201.—*Ind. Orn.* 2. p. 864.—*Raii Syn. Av.* p. 147. A. 5.—*Brif. Orn.* vi. t. 34. f. 1. 2.

Canard à longue queue, *Buf. Oif.* ix. p. 199. t. 13.—*Pl. Enl.* 954.

Pfeilschwanz, *Besch. der Berl. Nat. Fr.* iv. p. 601. t. 18. f. 5.

Pintail, *Gen. Syn.* vi. p. 526.—*Br. Zool.* ii. No. 282.—*Will. Orn.* p. 376. t. 73.

This species measures twenty-eight inches in length, and is common in our markets in the winter season. The *trachea* finishes in a bony arch like the former, from which one of the branches of divarication springs: attached to the side of this is a nearly round bony bladder, delicate in texture, and about the size of the end of the thumb; the upper surface of it about even with the top of the bony arch, but the bottom greatly below it: from which circumstance it is, independent of size, particularly distinguished from the same part in the *Wigeon*, though at first sight appearing somewhat similar. It may not be amiss here to observe, that, in young birds, this roundish bladder will suffer itself to be indented by pressure, but at mature age becomes very brittle, so as not to be handled without some care; from the under and inner part of this, the second division of the *trachea* takes rise. The opposite side is formed not greatly different, but puts on the appearance of an oval obliquely placed, in the same manner as in the opposite side of the *Gadwal*, or next species.

XV. ANAS STREPERA—The GADWAL. *Tab.* xiii. *Fig.* 7. 8.

A. speculo alarum rufo nigro albo.

Anas strepera, *Linn. Syst. Nat.* i. p. 200.—*Ind. Orn.* ii. p. 859.—*Raii Syn. Av.* p. 145. A. 2.—*Brisf. Orn.* vi. p. 339. t. 33. f. 1.

Chipeau, *Buf. Oiſ.* ix. p. 187. t. 12.—*Pl. Enl.* 958.

Gadwal or Grey, *Gen. Syn.* vi. p. 515.—*Br. Zool.* ii. No. 288.—*Will. Orn.* p. 374. t. 72.

This ſpecies is about 15 inches long, but is much leſs common than the former. The windpipe is long, and furniſhed with a bony bladder and arch as in the laſt ſpecies, but differs in ſhape, and the globular part is not near ſo large; it is likewiſe elongated upwards and downwards in an oblique direction, and is a little compreſſed on the ſides: it is alſo diſtinguiſhed from the *Pintail* in another particular, which is, that the bony orb in that ſpecies adheres to the ſide of the arch by a ſmall portion only, whereas in the *Gadwal* it is firmly fixed to it at the bottom; that portion of it which lies next to the *trachea* is flat, and in the recent ſtate joined thereto cloſely by a membrane. The bony arch too is full half an inch in height, differing in this particular from that of the *Pintail*, which is ſcarcely three-eighths of an inch; and this proportion of parts holds good in every ſpecimen which has come under my inſpection.

XVI. ANAS PENELOPE—The WIGEON. *Tab.* xiii. *Fig.* 9.

A. cauda acutiuſcula criſſo nigro, capite brunneo, fronte alba, dorſo cinereo undulato.

Anas Penelope, *Linn. Syſt. Nat.* i. p. 202.—*Ind. Orn.* ii. p. 860.—*Raii Syn. Av.* p. 146. A. 3.—*Brif. Orn.* vi. t. 35. f. 2.

Canard ſiffleur, *Buf. Oiſ.* ix. p. 169. t. 10, 11.—*Pl. Enl.* 825.

Pfeifente,

Pfeifente, *Besch. der Berl. Nat. Fr.* iv. p. 601. t. 18. f. 5.
Wigeon, Whewer, Whim, *Gen. Syn.* vi. p. 518.—*Br. Zool.* ii. No. 286.—*Will. Orn.* p. 375. t. 72.

The total length is 20 inches. The *trachea* at first sight does not seem materially to differ from that of the *Pintail*, yet on a more narrow inspection will be found not to accord with it. In the first place the bony orb is smaller, not being larger than the end of the finger—both indeed seem globular, but that of the *Wigeon* is most perfectly so. They both differ likewise in point of attachment. In the *Pintail* it is united to the side of the arch on a line above the centre, in the *Wigeon* somewhat below it, and the bottom of both the orb and arch are nearly even, but in the *Pintail* the bottom of the arch is higher of the two—besides which, the bony arch itself is a little different in shape, as may be seen by comparing the two figures. The opposite parts of both put on an appearance not greatly different from those of the *Gadwal*, which makes it unnecessary to give a figure of them in that situation.

From the above comparison, it is presumed that no one will hereafter confound the last three birds together.

XVII. ANAS BOSCHAS—The MALLARD. *Tab.* xiii. *Fig.* 10.

A. rectricibus intermediis (maris) recurvatis, rostro recto.
Anas Boschas, *Linn. Syst. Nat.* i. p. 204.—*Ind. Orn.* ii. p. 850.—*Raii Syn. Av.* p. 145. A. 1. 150. 1.
Canard sauvage, *Buf.Ois.* ix. p. 115. t. 7. 8.—*Pl. Enl.* 776. 777.
Die zahme und die wilde Ente, *Besch. der Berl. Nat. Fr.* iv. p. 601. t. 18. f. 5.
Mallard and Wild Duck, *Gen. Syn.* vi. p. 489.—*Br. Zool.* ii. No. 279. t. 97.—*Will. Orn.* p. 308. t. 72. 75.

This

This species is larger than any of the *Duck* genus before mentioned, except the *Swan* and *Semipalmated Goose*, and the *trachea* is stouter in proportion. The globular part is a trifle bigger than in the *Pintail*, but loses its round shape in some measure at the lower portion of it: it is likewise much less smooth on the surface, being somewhat furrowed, and marked with minute wrinkled lines. The bony arch is much deeper than in any of the foregoing, is attached to the globular part almost the whole of its length, and in some specimens measures full three-fourths of an inch. The whole of this part likewise is stronger than in any species before described. The labyrinthic or globular part of the *trachea* indeed varies a little in respect to size, both in the wild and tame sorts, but is in general larger in the domesticated ones. Much controversy has been held concerning the *Curved-billed Duck*; some supposing it to be a variety only of the *Mallard*, and others wishing to make it a distinct species. This bird has not come under our view anatomically, having only met with it in menageries, or preserved in collections; but it is to be wished that a strict comparison may be made in respect to the *trachea*, by means of which I have not a doubt of the different opinions being at once settled.

XVIII. ANAS MOSCHATA—MUSCOVY DUCK. *Tab.* xiv. *Fig.* 1, 2. *Tab.* xvi. *Fig.* 5, 6.

A. facie nuda papillosa.

Anas moschata, *Linn. Syst. Nat.* i. p. 199 —*Ind. Orn.* ii. p. 846.—*Raii Syn. Av.* p. 148.—*Frisch.* t. 180.

Le Canard musqué, *Buf.Ois.* ix. p. 162. pl. 9.—*Pl. Enl.* 989.

Die Turkische Ente, *Schr. der Berl. Nat. Fr.* iii. p. 372. t. 7. f. 1.

Muscovy Duck, *Gen. Syn.* vi. p. 476.—*Will. Orn.* p. 381, 382.

The *trachea* in this bird is stout, and nearly of equal diameter, but a trifle

a trifle ſmaller towards the bottom: the bony arch, as in others, finiſhes the bottom part, and ſeems as if furniſhed with rings, but they are not moveable as in the reſt of the *trachea*. The orbicular labyrinth is attached to the ſide of it; this is not ſmooth on the ſurface as in the *Pintail* and *Wigeon*, but univerſally rough, and irregularly furrowed with fine indented lines. The oppoſite ſide runs into a pear ſhape, and is placed obliquely, with the pointed end loweſt, as in the two laſt named birds, but is flatted conſiderably on the ſurface. The bony arch on this ſide is ſmooth, having no appearance of rings, and is bent at a ſmall angle from the *trachea*, although it conſtitutes a continuance of it: this is the deſcription of the organ in a young bird.

In a ſpecimen ſomewhat more advanced in age, with which I was favoured by Mr. Lamb of Reading, the bony labyrinth approaches more to a rounded ſhape, and is larger, but ſtill retains the rough ſurface, and the appearance of bony rings on the arch ſeems leſs diſtinct;—and in an old bird, the drawing of which I was favoured with by Mr. Boys, the labyrinth is not only much larger in ſize, but is nearly globular, and the bony arch quite ſmooth: yet Mr. Boys obſerves, that the labyrinthic part is finely granulated and faintly wrinkled, and the texture firm and bony; but in this laſt circumſtance it does not differ from the younger ones. As to that figured by Dr. Bloch, in the *Berlin Tranſactions*, it ſeems at firſt ſight too large by many degrees; yet I will not venture to ſay that his figure of it is faulty, for in caſe the *Muſcovy Ducks* ever arrive at twice the ſize we uſually ſee them in England, which they are ſaid to do in warm climates, no doubt but the labyrinth will bear its due proportion.

XIX. ANAS

XIX. ANAS MARILA—SCAUP DUCK. *Tab.* xiv. *Fig.* 3, 4.

A. nigra, humeris cinereo-undulatis, abdomine speculoque alari albis.

Anas Marila, *Linn. Syst. Nat.* i. p. 196.—*Ind. Orn.* ii. p. 853.—*Raii Syn.* p. 142. A. 6.

Die Bergente, *Besch. der Berl. Nat. Fr.* iv. p. 602. t. 17. f. 3, 4.

Scaup Duck, *Gen. Syn.* vi. p. 500.—*Br. Zool.* ii. No. 275. pl. 100.—*Will. Orn.* p. 365.

The breadth of the *trachea* of this species, in the middle, is full half an inch; it lessens a trifle towards the top, but diminishes very considerably as it approaches the bottom, so as not to measure more than three lines where it joins the labyrinthic part; the total length is from $7\frac{1}{2}$ to 8 inches. We find the name of *labyrinth* generally given to this portion of the *windpipe* of the foregoing Ducks; and we continue the appellation, although the corresponding part in many may be more aptly compared to a *drum*, and in course the word *tympanum* might be substituted for that of *ampulla;* as this part, instead of being globular, presents a more or less flatted surface, covered over with a membrane similar to that of a drum-head, and stretched in the same manner. This drum-like labyrinth exists on the left side of the *trachea*, in respect to its situation in the neck of the bird, in the same manner as the globular labyrinths, and in the *Scaup* seems to be the most conspicuous of any that possess it. The flatted surface of the labyrinth is for the most part open, except round the rim, and has an irregular bony arch crossing it from side to side; independent of these, the surface is covered with a delicate fine elastic membrane stretched over the surface, giving the idea of the head of a drum in miniature. The lower part of the

bony rim is much stronger than any other part of it, and is curved backwards, taking into its middle one of the *bronchiæ*. The other side consists of a bony box, swelling in the middle, and furrowed by several transverse bands: from this springs the other *bronchia*.

XX. ANAS FERINA—The POCHARD. *Tab.* xiv. *Fig.* 5, 6.

A. cinereo-undulata, capite brunneo, fascia pectorali crisso uropygioque nigro.

Anas ferina, *Linn. Syst. Nat.* i. p. 203.—*Ind. Orn.* ii. p. 862.—*Raii Syn. Av.* p. 143. A. 10.—*Brisf. Orn.* p. 384. pl. 35. f. 1.

Millouin, *Buf. Oiſ.* ix. p. 216.—*Pl. Enl.* 803.

Der Rothhals, *Besch. der Berl. Nat. Fr.* iv. p. 602. t. xvii. f. 5, 6.

Poker, Pochard, Red-headed Wigeon, *Gen. Syn.* vi. p. 523.—*Br. Zool.* No. 284.—*Will. Orn.* p. 367. t. 72.

The *trachea* of the *Pochard*, at first sight, seems to be similar to that of the *Scaup*, but, on investigation, will be found to differ considerably. In the first place, it is full two inches shorter; it is also of very nearly the same dimensions throughout, or narrowing very little at the bottom. The drum-like labyrinth approaches greatly to that of the *Scaup* in texture, but is more round on the upper side; it is however crossed by a small bony partition as in that bird—in both cases, as may be supposed, by way of strengthening the membrane which covers the cavity. The bony box, of which the other portion of the labyrinth consists, is scarcely elevated on this side, and on the other much less so than is seen in the *Scaup*; it likewise forms an obtuse angle with the rest of the *trachea*, but in the *Scaup* it does not deviate from a continuation of a straight line, although forming a considerable enlargement.

XXI. ANAS

XXI. ANAS FULIGULA—TUFTED DUCK.

A. cristâ dependente, corpore nigro, abdomine speculoque alarum albis.

Anas Fuligula, *Linn. Syst. Nat.* i. p. 207.—*Ind. Orn.* ii. p. 869.—*Raii Syn. Av.* p. 142. A. 7.—*Brisf. Orn.* vi. p. 411. t. 37. 1.

Morillon, *Buf. Ois.* ix. p. 227. t. 15.—*Pl. Enl.* 1001.

Europaische Haubente, *Besch. der Berl. Nat. Fr.* iv. p. 603.

Tufted Duck, *Gen. Syn.* vi. p. 540.—*Br. Zool.* No. 274.—*Will. Orn.* p. 365. pl. 73.

The *trachea* in the *Tufted Duck* is similar in some respects to that of the *Scaup*, in others to that of the *Pochard*. The drum-like portion of it resembles the same part in the last-named bird, insomuch as scarcely to be distinguished from it; but the bony box-like portion of it is elevated, and not otherwise to be distinguished from that of the *Scaup*, than in being smaller. The *trachea* itself is of equal dimensions throughout, though smaller than either of the foregoing. By attending to these particulars it cannot be mistaken for any other, and in course will prevent the occasion of giving a representation in order to identify it.

XXII. ANAS TADORNA—The SHIELDRAKE. *Tab.* xv. *Fig.* 8, 9.

A. rostro simo, fronte compressa, capite nigro-virescente, corpore albo variegato.

Anas Tadorna, *Linn. Syst. Nat.* i. p. 195.—*Ind. Orn.* ii. p. 854.—*Raii Syn. Av.* p. 140. A. 1.—*Brisf. Orn.* vi. p. 344. pl. 33. f. 2.

Die Brandente, *Schr. der Berl. Nat. Fr.* iii. p. 373. t. vii. f. 3, 4.

Shieldrake, *Gen. Syn.* vi. p. 504.—*Br. Zool.* ii. No. 278.—*Will. Orn.* p. 363. pl. 70, 71.

The

The *Shieldrake* is one of the most beautiful of the Duck genus, and the lower part of the *trachea* in the male is of a singular construction, being not strictly similar to any of the foregoing; it is pretty long, and nearly of equal dimensions, except towards the bottom part, where it lessens somewhat: just above the divarication are two bony kind of roundish bladders, one larger than the other, of unequal surface, and most delicate texture, being of so tender a fabric as scarcely to bear the pressure of the finger, without indenting in young subjects, or breaking in older ones; and, when dry, putting on more or less of a shrivelled appearance, though in a recent state they appear to be nearly transparent. Though so greatly different from the same part in the *Mallard*, as before described, yet its voice is said not to be unlike that bird.

WE now proceed to some birds, in which not only an enlargement at the lower end of the *trachea* is observable, but likewise the *trachea* itself is either dilated, or otherwise enlarged, and sometimes in more places than one.

XXIII. ANAS CLANGULA—The GOLDEN EYE DUCK.

Tab. xv. *Fig.* 1, 2.

A. nigro alboque varia, capite tumido violaceo, sinu oris macula alba.

Anas Clangula, *Linn. Syst. Nat.* i. p. 201.—*Ind. Orn.* ii. p. 867.—*Raii Syn. Av.* p. 142. A. 8.—*Brisf. Orn.* vi. p. 416. t. 37. f. 2.—*Frisch.* t. 183, 184.

Le Garrot, *Buf. Ois.* ix. p. 222.—*Pl. Enl.* 802.

Die Quackerente, *Besch. der Berl. Nat. Fr.* iv. p. 599. t. xvii. f. 1, 2.

Golden Eye, *Gen. Syn.* vi. p. 535.—*Br. Zool.* No. 276.—*Will. Orn.* p. 368. t. 73.

In

In the *Golden Eye* the windpipe is of a curious and wonderful structure, for the labyrinth is not only of a different and much more complicated form than any of the foregoing, but a singular enlargement takes place about the middle of the *trachea* itself. This ventricose part consists of divers joints or plaits placed obliquely, and folding over each other so as to admit of its being contracted into a very short compass, or dilated to a great distance, as the lengthening or shortening of the neck may require. In the recent state, these rings are easily, by compression, folded into a space of little more than an inch, and, by drawing out, may be made to occupy the length of four inches, or even longer; and being of a cartilaginous nature, they recover their tone after being drawn out, if left to themselves.

It is manifest that the structure of the *trachea* in this bird being so very unlike that of any other, will ever prevent its being confounded with a different species; and on this account I can with confidence assert, that the *Anas Glaucion* of Linnæus, or *Morillon*, commonly so called, has no existence taking it as a species, for it is merely the *Golden Eye* in incomplete plumage. But this is not the only one known by the name of *Morillon*, for a specimen put into my hands for that bird has proved to be the young of the *Tufted Duck*, and others that of the *Scaup*. Whatever share the structure of this singular kind of *trachea* may have in promoting the loudness of the voice, I will not here insist on; but it is notorious that the cry is heard further off than in many others of the genus.

XXIV. ANAS FUSCA—VELVET DUCK. *Tab.* xv. *Fig.* 3——7.

A. nigricans, palpebrâ inferiore speculoque alarum albis.

Anas fusca, *Linn. Syst. Nat.* i. p. 196.—*Ind. Orn.* ii. p. 848.—*Raii Syn.* p. 141. A. 4.—*Frisch.* t. 165.

Grande Macreuse, *Buf.Ois.* ix. p. 242.—*Pl. Enl.* 956.

Velvet Duck, *Gen. Syn.* vi. p. 482.—*Br. Zool.* No. 272. t. 96.—*Will. Orn.* p. 363. t. 70.

The *trachea* here is more conspicuous on account of the bony dilatation in the middle of it than for any other circumstance: indeed a manifest difference from any other may be observed just below the *larynx*, being an oblong bony cavity of nearly an inch in length. From this part the *trachea* descends for near two-thirds of its length, when it swells out into a strong bony hollow, flat on one side, and moderately convex on the other, about the size of a small walnut. At the divarication the parts again lose their rings, and become bony, not greatly enlarged, but equally so on both sides—the two *bronchiæ* taking rise at the under part of this last bony hollow. I have observed some diversity in the *tracheæ* of this species, and in one in particular the hollow round bone was less ossified; besides which, the oblong bone next the *larynx* differed much in being shorter, (Fig. 6.) as also the bony part at the bifurcation of scarcely more than half the dimensions, (Fig. 7.)—which last circumstances taken together seemed to prove its being a young bird.

WE now close the account of such species of the *Duck Tribe* as the males of them have somewhat in the conformation of the *trachea* differing from the other sex; and I flatter myself, that, by means of the preceding descriptions, aided by engravings of the parts in question, the reader will find every thing as clear as was meant to be.

Endeavouring to add to this list, I have examined several others of the Duck genus, as the *Grey Lag*, *White-fronted*, *Bean*, *Bernacle*, *Brent* and *Scoter*; in none of which have I ever found any thing remarkable.—But I mean not to desist from the enquiry, and recommend attention to it by others; for I trust that many singular and curious occurrences will be disclosed on a further investigation of the subject.

WE

WE pass now to the *Merganser* or *Goosander* tribe, in every species of which frequenting this kingdom somewhat occurs worthy of notice.

XXV. MERGUS SERRATOR—RED-BREASTED MERGANSER.
Tab. xvi. *Fig.* 1, 2.

M. crista dependente, pectore rufescente variegato, collari albo.
Mergus Serrator, *Linn. Syst. Nat.* i. p. 208.—*Ind. Orn.* ii. p. 829. *Raii Syn. Av.* p. 135. A. 4.—*Brisf. Orn.* vi. p. 237. pl. 23.
Le Harle huppé, *Buf. Oiſ.* viii. p. 273.—*Pl. Enl.* 207.
Der Haubentaucher, *Schr. der Berl. Nat. Fr.* iii. p. 374. t. 7. f. 5.
Meerachen, *Beckst. Vog. Deutsch.* ii. p. 732, Note *.
Red-breasted Merganser, *Gen. Syn.* vi. p. 423.—*Br. Zool.* No. 261. t. 93.—*Will. Orn.* p. 336. t. 64.—*Edw.* t. 95.

The whole of the *Merganser* genus, on outward inspection, seems greatly allied to that of the *Duck*, and to differ chiefly in the bill, which, instead of being flattish, thick, and rounded at the end, is long and narrow, having the edges furnished with numerous sharp processes like the teeth of a saw, which has given rise among sportsmen to the name of *Saw-billed Ducks* or *Divers*. In the *Duck* genus the *trachea* will be found to be more or less composed of gristly rings, approaching indeed in many very nearly to bone, and connected to each other by means of cartilaginous membranes, except in the labyrinthic parts, which are truly bone; but in the *Merganser* tribe the whole seems to be composed of little else than bone, and, in the species now before us, the bony rings or plaits fold over one another in a remarkable manner, as may be seen in the figure. It is in this too, as in the genus of *Duck*, that the singularities observed in the *trachea* are only in the *male* sex. But, to the point——

The *Red-breasted Merganser* has an enlargement of the *trachea* about the middle of its length, imitating that of the *Golden Eye*, in the same place, but differing, as before observed, in being bony instead of cartilaginous, and the bony plaits of which it consists being most curiously furrowed or channelled transversely: besides this, the lower part of the *trachea* ends in a large and remarkable bony cavity, of an irregular heart shape, with two openings on one side, and one on the other; all of which are covered with fine membranes, in the same manner as before observed in the *Scaup*, *Gadwal*, and *Tufted Ducks:* from the bottom of this triangular bony box the two *bronchiæ* arise, and from thence lose themselves in the lungs, as in other subjects.

XXVI. MERGUS MERGANSER—GREATER GOOSANDER.

M. crista longitudinali erectiuscula, pectore albido immaculato, rectricibus cinereis scapo-nigricante.

Mergus Merganser, *Linn. Syst. Nat.* i. p. 208.—*Ind. Orn.* ii. p. 828. *Raii Syn. Av.* p. 134. A. 1.—*Brisf. Orn.* vi. p. 231. t. 32.

Le Harle, *Buf. Ois.* viii. p. 267. t. 23.—*Pl. Enl.* 951.

Tauchergans, *Besch. der Berl. Nat. Fr.* iv. p. 594. t. 18. f. 3.—*Beckst. Vog. Deutsch.* ii. p. 724, Note *.

Merganser or Goosander, *Gen. Syn.* vi. p. 418.—*Br. Zool.* No. 260. t. 92. f. 1.—*Will. Orn.* p. 335. t. 64.

A sufficient idea of the *trachea* of this species may be formed by a comparison with that of the foregoing. In respect to the large bony case at the bottom, it is greatly similar; but the upper part of the *trachea* differs in having two enlargements instead of one: the first placed about one third from the *glottis*, or entrance at the top; the second nearly midway between the first and the bottom. This is

is figured, among others, in the *Berlin Transactions*, by Dr. Bloch, as above referred to in the Synonyms.

From the scarcity of the *Merganser* tribe in this kingdom, sufficient opportunities rarely occur to enable us to ascertain many points about them as might be wished for. I am, however, now inclined to believe, as hinted in another place*, that the *Goosander* and *Dun Diver* form but one species, and that the former is the *male* bird. What has, I believe, led us hitherto to suppose otherwise, is the custom of this species of the two sexes separating after breeding time; the *old males* associating together in one flock, and the *females*, with the *young birds* without discrimination, forming a separate company; sufficiently accounting for the flocks of these latter being most numerous: from this cause, and the plumage of the *male* being for a certain season not unlike that of the *female*, and especially dissection proving that many males are always among them, the wonder ceases that the birds in question should have been set down by many writers for different species.

In *Germany* these birds are sufficiently plentiful, and the ornithologists of that country have written much concerning them; the result of which is, that the *Merganser* is considered by them as the *male*, and the *Dun Diver* the *female*, and the *Castor* of Linnæus not at all distinct, nor otherwise than the young bird. It would take up too much room here, in this Essay already sufficiently long, to detail what Dr. Pallas †, Professor Beckmann ‡, and Dr. Otto §, have said on this subject in the *Berlin Transactions*; but I should not do these Gentlemen justice, did I not recommend the perusal of their various Dissertations, which may be read with equal pleasure and advantage.

* *Gen. Syn.* vi. p. 423.

† *Besch. der Berl. Nat. Fr.* ii. p. 551.

‡ *Besch. der Berl. Nat. Fr.* i. p. 170.

§ *Id.* iii. p. 456.

XXVII. MERGUS ALBELLUS—The SMEW. *Tab.* xvi. *Fig.* 3, 4.

M. crista dependente, occipite nigro, corpore albo, dorso temporibusque nigris.

Mergus Albellus, *Linn. Syst. Nat.* i. p. 209.—*Ind. Orn.* ii. p. 831. *Raii Syn. Av.* p. 135. A. 3.—*Brisf. Orn.* vi. p. 245. t. 24. f. i.

Petit Harle huppé, La Piette, *Buf. Oiſ.* viii. p. 271. pl. 24.—*Pl. Enl.* 449.

Die weiſſe Nonne, *Beſch. der Berl. Nat. Fr.* iv. p. 596. t. 18. f. 7.

Die weiſſe Tauchente, *Beckſt. Vog. Deutſch.* ii. p. 738.

Smew or White Nun, *Gen. Syn.* vi. p. 428.—*Br. Zool.* No. 262.—*Will. Orn.* p. 255. t. 64.

This beautiful bird is conſiderably ſmaller than the two laſt deſcribed, and the authors above referred to will point it out ſhould any one be ignorant of the ſpecies. The ſize of the *trachea* is ſmalleſt near the upper part, but enlarges as it approaches towards the middle; from whence to the bottom part it continues of nearly equal dimenſions, the texture conſiſting of bony rings, with ſcarcely any cartilage appearing to intervene. At the bottom part is a bony cavity as in the others, but of a different form, being much ſmaller in proportion, and differing in ſhape, the greater expanſe being from ſide to ſide, whereas in the others it is almoſt upwards and downwards: on one ſide is a round hole covered by a drum-like membrane, and on the oppoſite an oval ſmooth hollow bone uniting with it; from the bottom of theſe ariſe the *bronchiæ*.

In this, as in the former, two ſpecies have been created out of one, and owing preciſely to the ſame cauſe; which is, that of the *young male* having the *female* plumage for ſome length of time after growing to ſize. I have detected this ſome time ſince by the laby-

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rinth of the supposed *male* of the *Mergus minutus* of Linnæus being in all respects similar to that of the *Male Smew*, added to the assurance of some later writers, who have likewise ascertained the fact, and penned their thoughts on the subject. It therefore may be concluded that we have no more than three distinct species of *Merganser* which migrate into this country.

THERE are several other birds, besides the above, concerning which I fear we shall hereafter find ourselves mistaken; but this is not the place for such investigation. The great increase in number of Gentlemen who make Natural History their study, will no doubt greatly contribute to detect many errors which have hitherto been received as facts for want of due enquiry.

EXPLANATION OF THE PLATES.

TAB. IX.

Fig. 1. The *trachea* or windpipe of the *Wood Grous*, or *Cock of the Wood*, with its several appendages.—*a.* the tongue; *b b.* the the *os hyoides*, or tongue bone, with its parts; *c.* the *larynx*, with the orifice therein for the admission of air; *d d.* muscles which accompany the windpipe, one on each side; *e e e.* the *trachea.*

2. The *Marail Turkey*, serving to shew the circumstance of the *trachea* rising above the flesh on the breast before it goes to the lungs.

3. The *Parraka Pheasant*, in which the same singularity is observed in respect to the *trachea*, but in a greater degree, running down the breast the greater part of its length.

TAB.

TAB. X.

Fig. 1. The *Guan*—In this the *trachea* is much more elongated than in either of the foregoing, insomuch as to double upwards in a remarkable manner.

2. Part of the windpipe of the *Indian Cock*:—*a a.* the two *bronchiæ*, or lung-pipes.

3. A figure of the same taken from a different subject, serving to shew how this part appears in some specimens.

4. The *trachea* of the *Numidian Crane*, or *Demoiselle*.

TAB. XI.

Two views of *Cushew Curassow*.

Fig. 1. A side view of the parts as they appear on dissection:—*a.* pectoralis minor muscle; *b.* its tendon; *c.* the sternum; *d.* pectoralis major muscle; *e.* the clavicle; *f.* the *glottis*; *g.* the *trachea* descending; *h.* the part where it begins to form the convolutions; *i.* the convolutions; *k.* the *trachea* where it dips into the thorax; *l.* strong elastic fibres continued almost the whole length of the *trachea*, which has a fleshy origin in the thorax (see o. fig. 2); *m.* the part which answers the same office as the ribs in other animals; *n.* muscles terminating in fascia.

2. The parts seen in a nearly opposite situation:—*a.* pectoralis minor; *c.* the sternum; *d.* pectoralis major; *e.* the clavicle; *g.* the descending part of the *trachea*; *h.* the part where it begins to form the convolutons; *i.* the convolutions; *k.* the part where it has entered the thorax; *l.* the fibres which are continued from o. where they are fleshy; *m.* the parts which answer to the ribs; *n.* a muscle terminating in fascia;

fascia; *o.* the muscle (one on each side), which assists in respiration and in straitening the *trachea.*

TAB. XII.

Fig. 1. The sternum or breast-bone of the *Wild Swan*, with the *trachea* in its proper situation.—The outer part of one side of the keel is taken off, in order the better to expose the internal contents to view.

2. The sternum with the keel seen in front, serving to shew the opening into which the *trachea* enters and returns.

3. A similar view of the same parts in the *Tame Swan.*

4. A view of the sternum of the *Crane*, with the *trachea* in situ, —part of the keel taken away as in fig. 1.

TAB. XIII.

Fig. 1. The *trachea* of the *Teal*, the whole of its length.

2. The *trachea* of the *Garganey.*

3. An opposite view of the same:—*a a.* two muscles, placed one on each side the labyrinth, very conspicuous while recent.

4. The *trachea* of the *Shoveler.*

5. The same seen in an opposite direction.

6. The lower part of the *trachea* of the *Pintail.*

7. Ditto of the *Gadwal.*

8. The last shown on the opposite side.

9. The *trachea* of the *Wigeon.*

10. Ditto of the *Mallard.*

TAB. XIV.

Fig. 1. The *trachea* of the young *Moscovy Duck.* (See that of the old one in TAB. XVI. f. 5, 6.)

2. The same seen on the other side.

Fig. 3.

Fig. 3. The *trachea* of the *Scaup Duck.*

4. The opposite side of the same:—*a a.* an oblique muscle serving to unite the base of the *bronchiæ* or lung-pipes, and may be traced in most subjects whilst recent.

5. *Trachea* of the *Pochard.*

6. The same in an opposite direction.

TAB. XV.

Fig. 1, 2. Two views of the windpipe of the *Golden Eye.*

3. *Trachea* of the *Velvet Duck.*

4. The bony case of the last below the *larynx*, seen on the opposite side.

5. An opposite view of the bony hollow of the middle part.

6. View of the uppermost bony case taken from a different subject, serving to shew how this part appears in some specimens.

7. View of the bottom part of the same *trachea.*

8. *Trachea* of the *Shieldrake.*

9. View of the same, seen on the opposite side.

TAB. XVI.

Fig. 1. *Trachea* of the *Red-breasted Merganser.*

2. Ditto seen in the opposite direction.

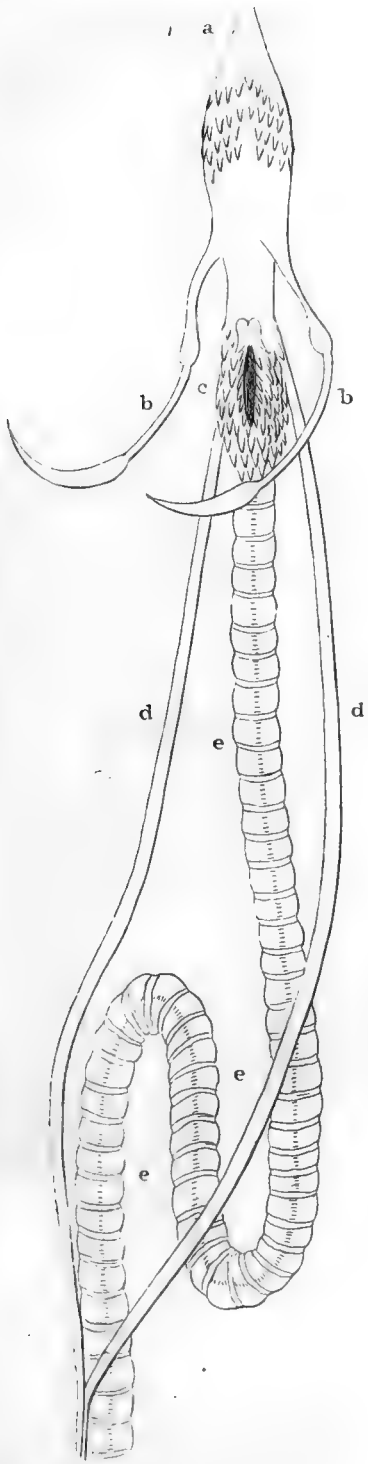
3. *Trachea* of the *Smew.*

4. An opposite view of the same.

5. The *trachea* of an *Old Muscovy Duck.* (See that of a younger one in TAB. XIV. f. 1, 2.)

6. The same seen on the other side.

IX. *Ob-*



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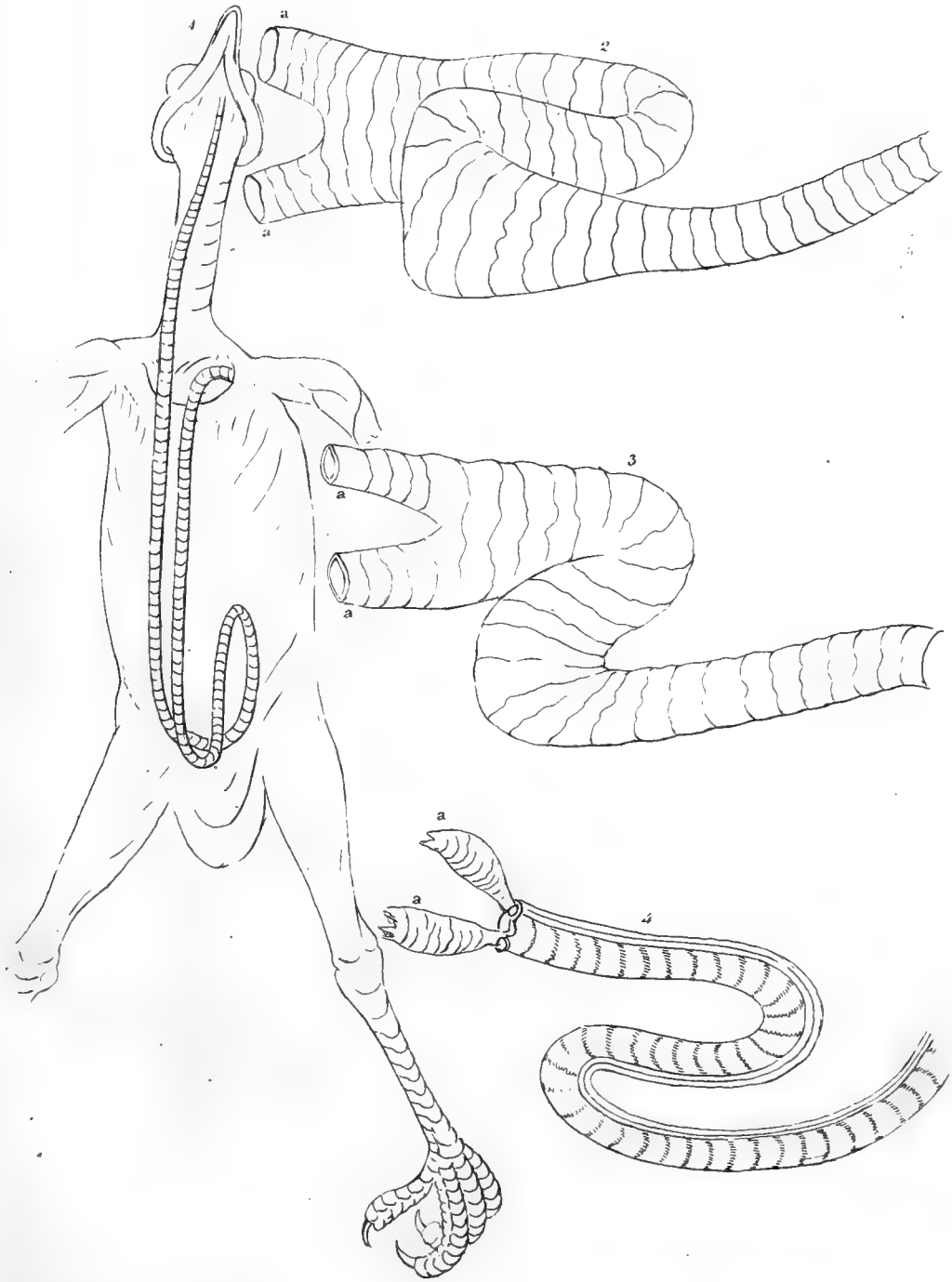

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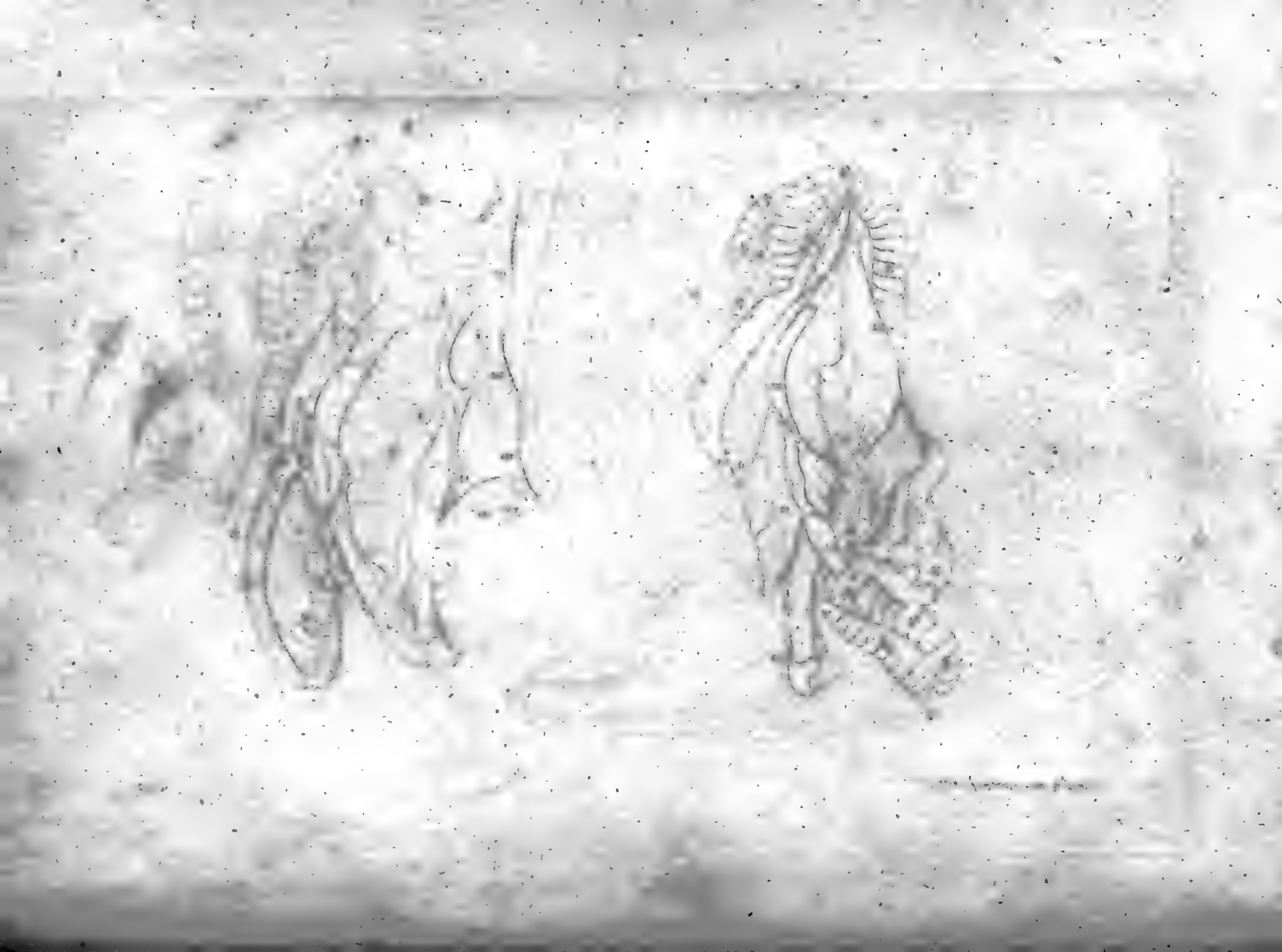

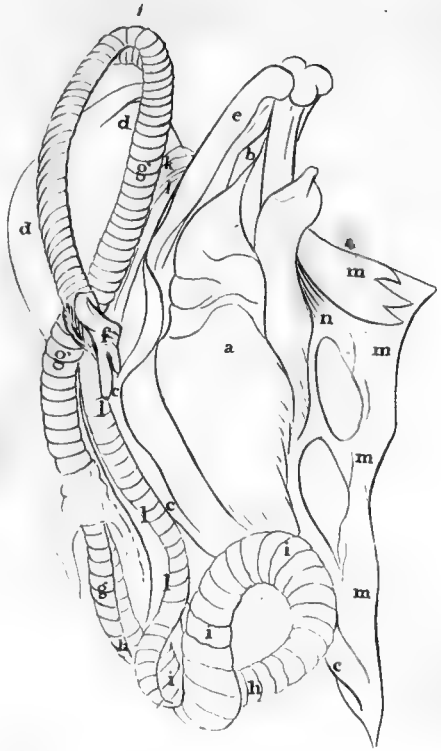
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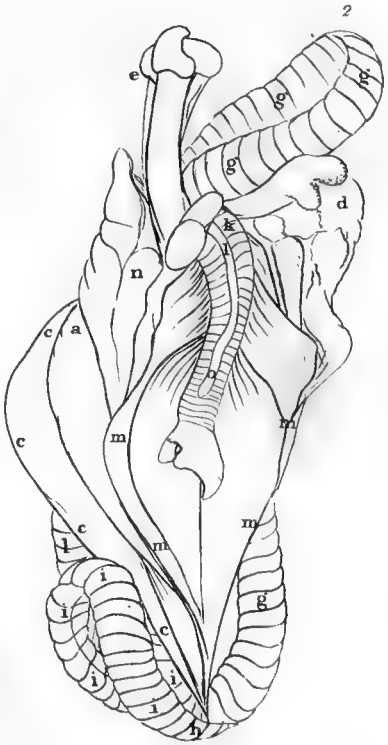
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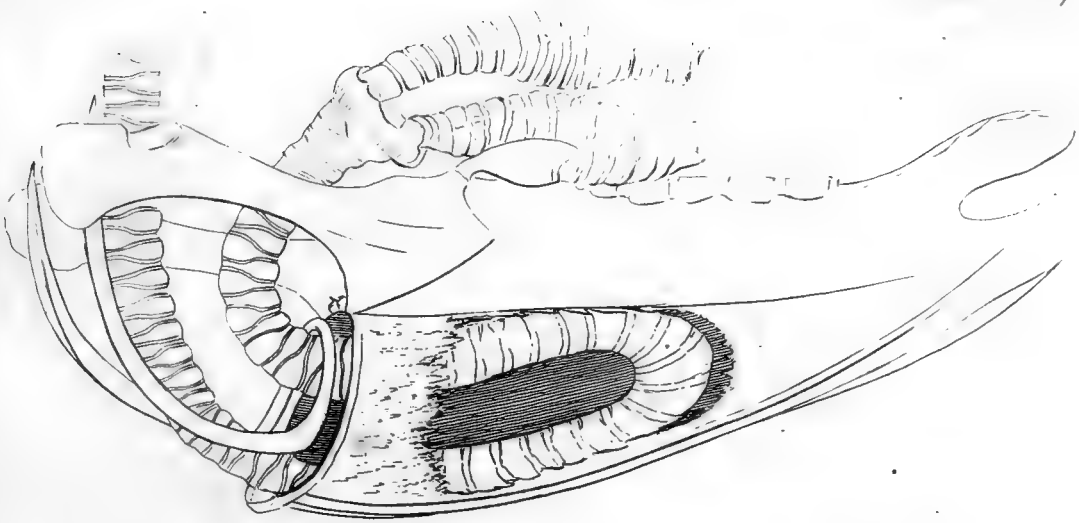

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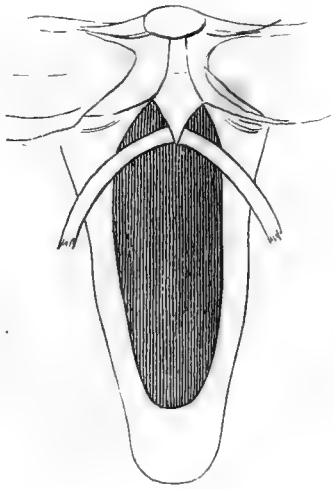

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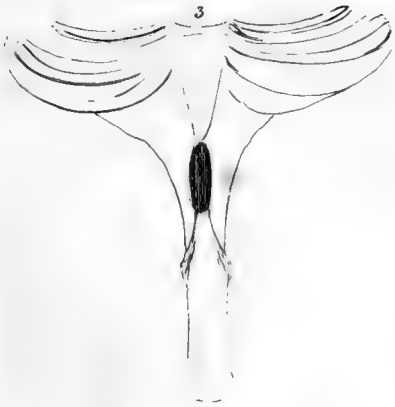

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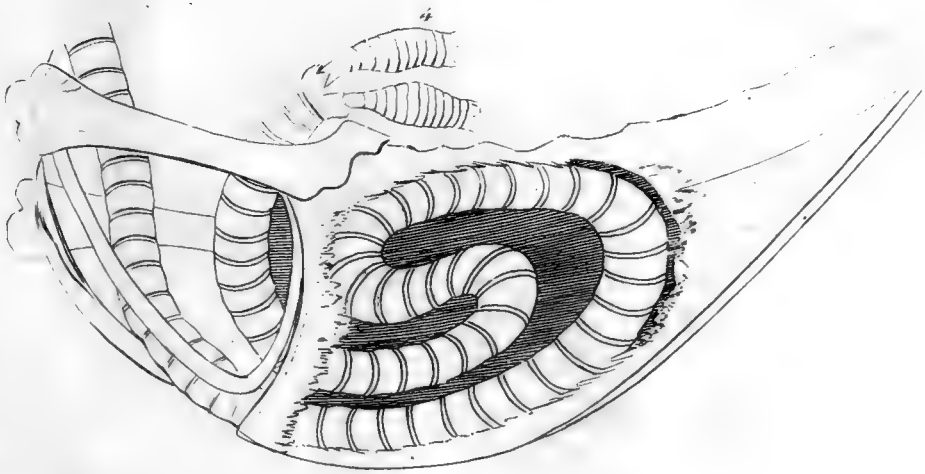

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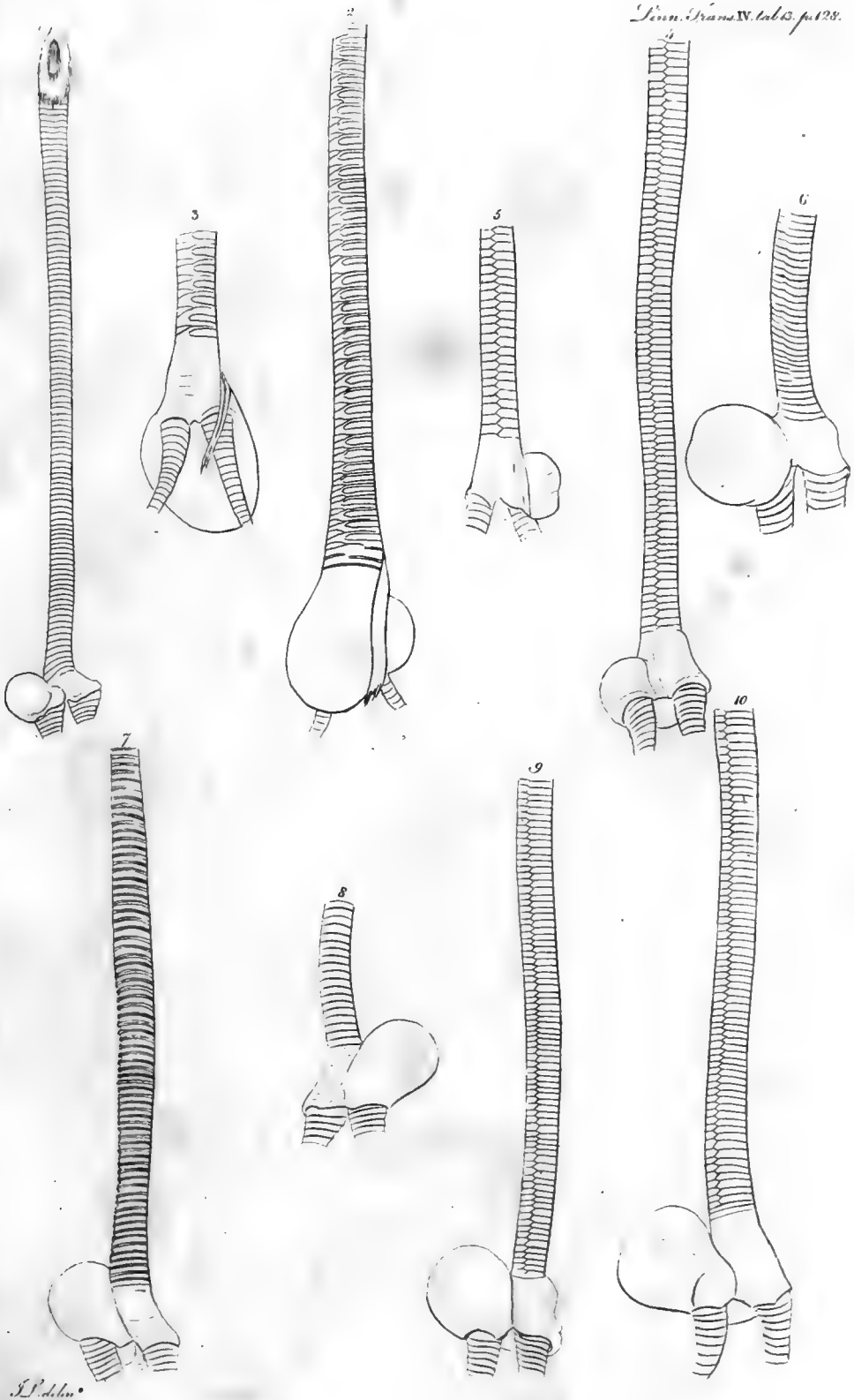

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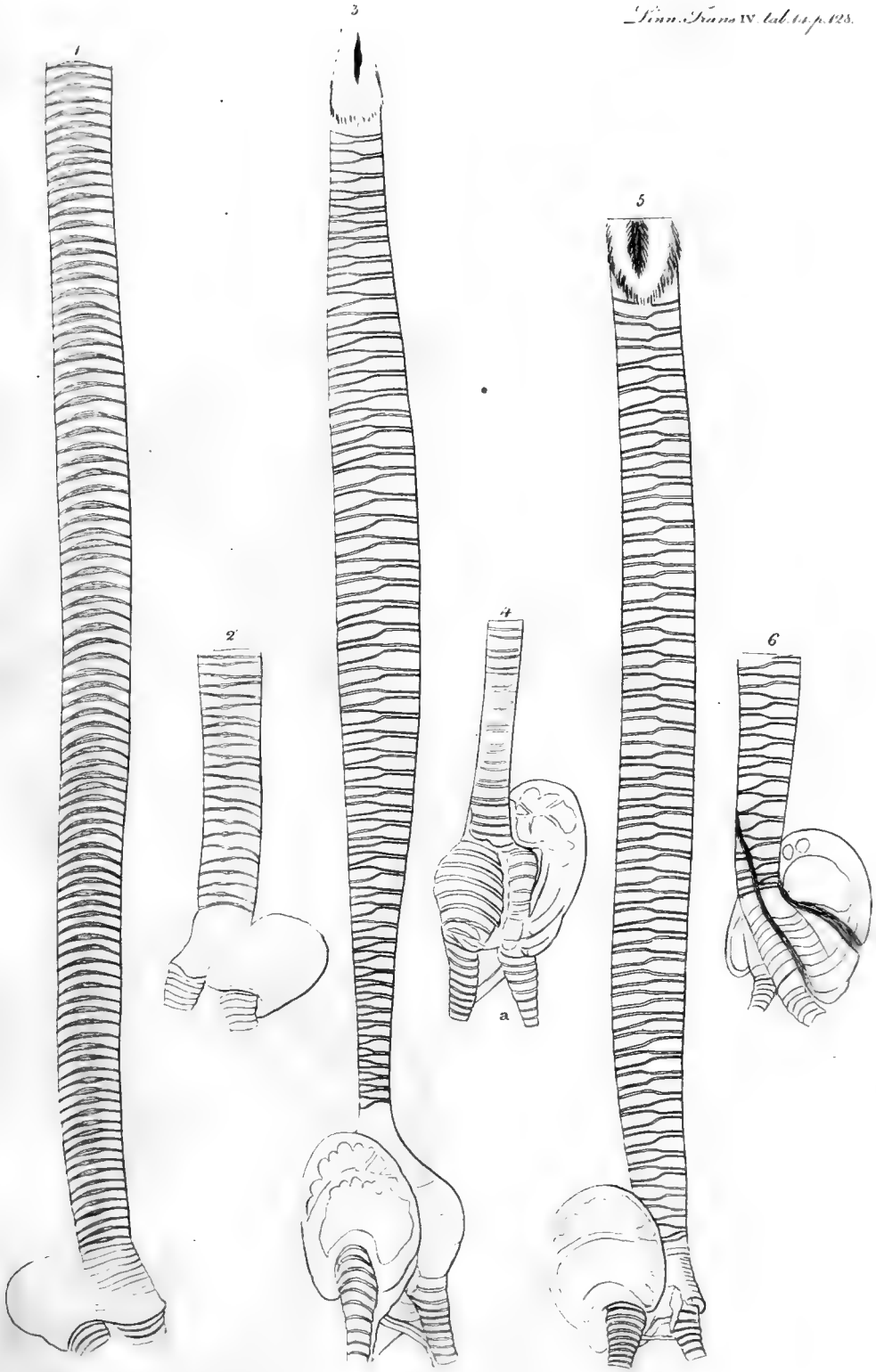

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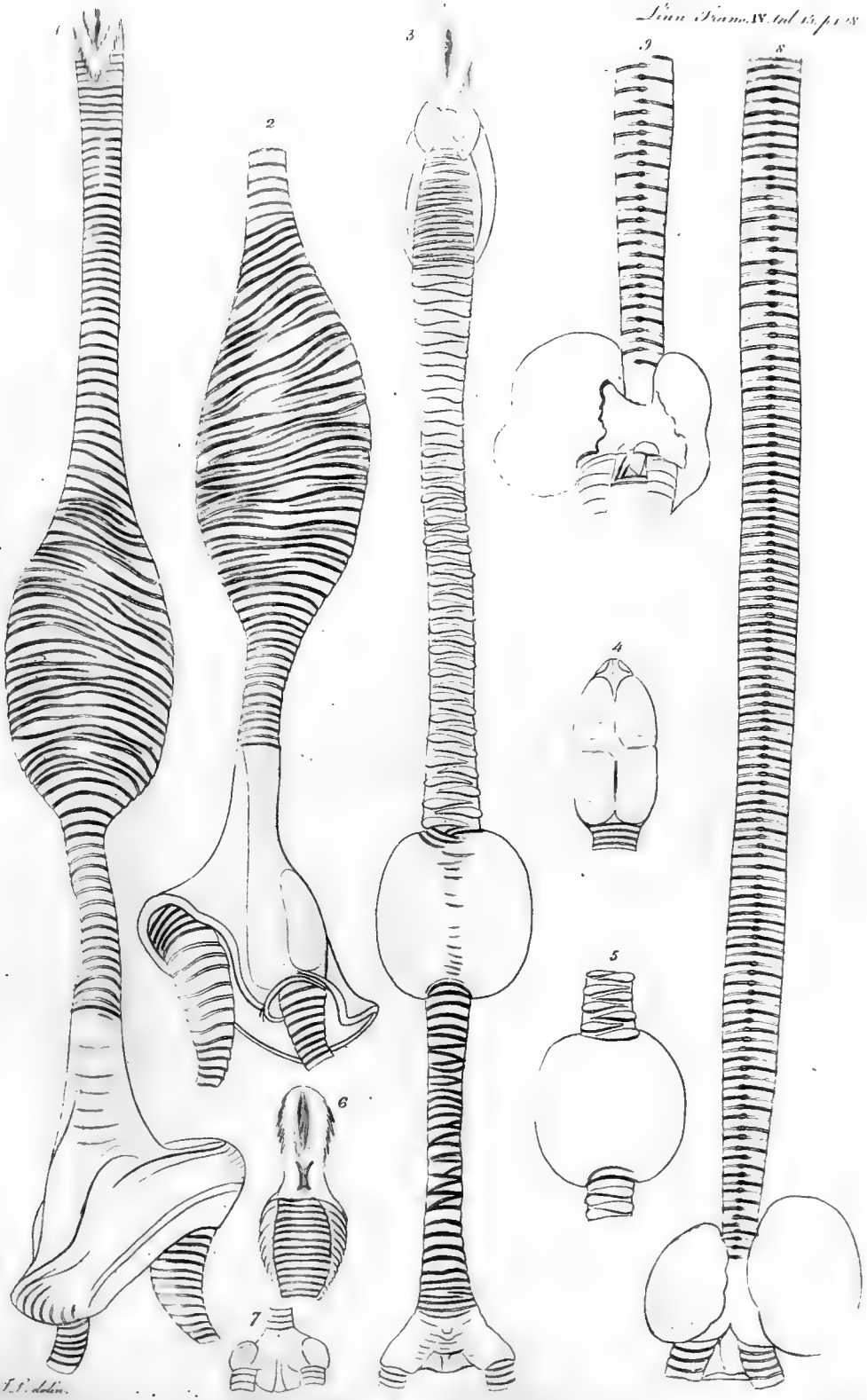
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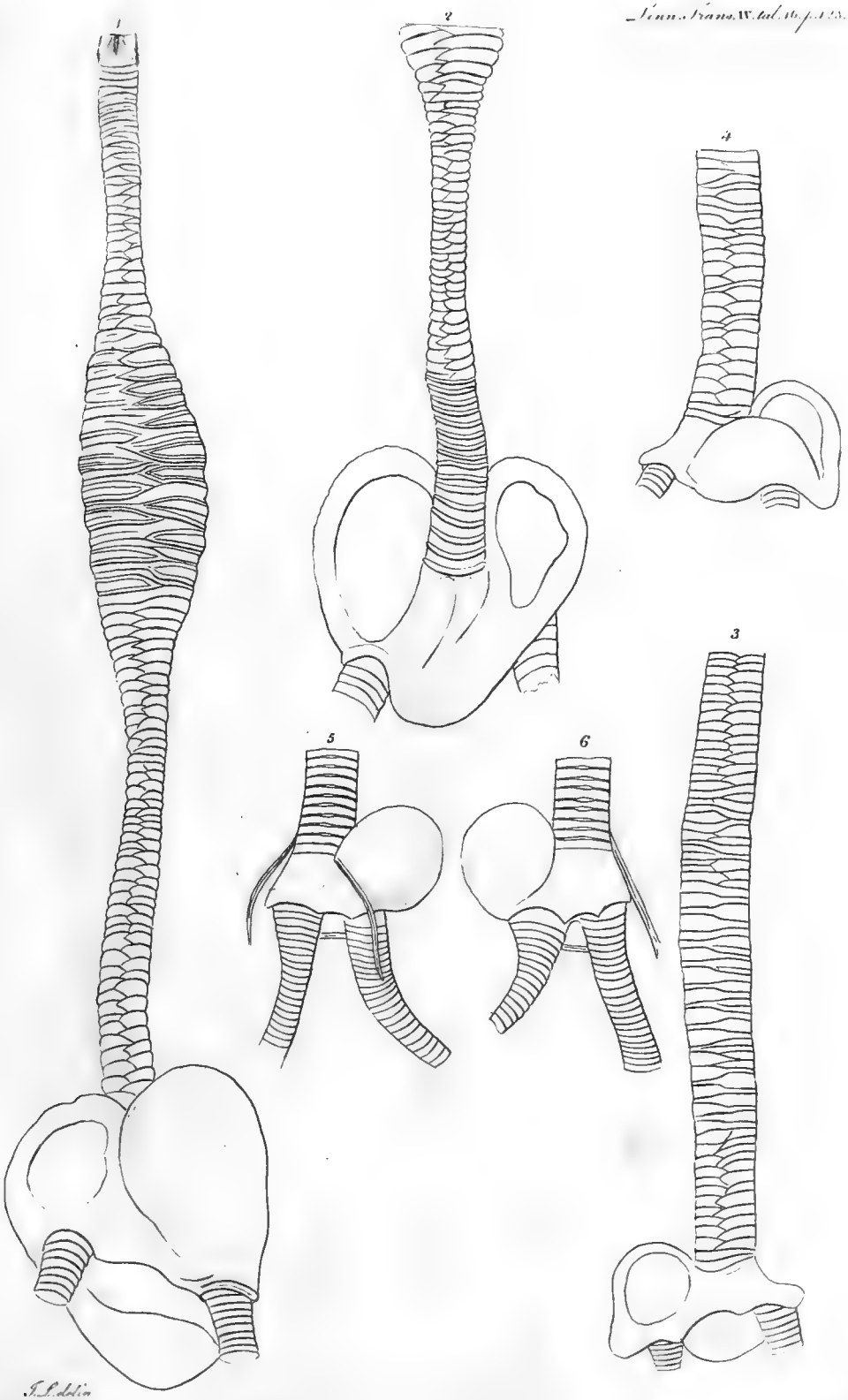

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IX. *Obſervations on Bituminous Subſtances, with a Deſcription of the Varieties of the Elaſtic Bitumen. By Charles Hatchett, Eſq. F. R. S. Lond. and Edinb. F. L. S. &c.*

Read May 2, June 6, and July 4, 1797.

§ 1.

IT is now generally believed that the bituminous ſubſtances are not of mineral origin, but that they have been formed from certain principles of ſubſtances belonging to the organized kingdoms of Nature, which, after the loſs of animal and vegetable life, have ſuffered conſiderable changes by long contact and union with mineral bodies.

Theſe changes have been however ſo conſiderable, that the bitumens can no longer be referred to their firſt origin, and they are therefore regarded by general conſent as forming part of the preſent mineral ſyſtem.

The bituminous ſubſtances are:

Naptha,
Petroleum,
Mineral Tar,
Mineral Pitch,
Aſphaltum,

Jet,
Pit Coal,
Bituminous Wood,
Turf,
Peat, and
thoſe combinations of the oxides of certain metals with bitumen called Bituminous Ores*.

Thoſe who are acquainted with the nature of theſe ſubſtances will immediately perceive, that they may be formed into two diviſions: the firſt of which conſiſts of ſimple ſpecies, or unadulterated bitumens: and the ſecond is compoſed of bitumen mixed or combined with the earths, vegetable matter, and metallic oxides; ſo that theſe appear to merit the name of compound ſpecies.

I ſhall now firſt conſider how the ſimple ſpecies are connected with each other.

§ 2.

IT has been the opinion of ſome eminent Naturaliſts and Chemiſts, that naptha is an ethereal oil produced from the more compact and ſolid bitumens by a ſort of natural diſtillation. This however appears to be an hypotheſis founded upon analogy, and ſupported only by a few local facts which may often be queſtioned. But many facts and obſervations concur to prove that the contrary moſt frequently happens, and that the compact bitumens are often, if not always, formed from naptha and petroleum by inſpiſſation. I will not however now inſiſt upon the proofs of this, as the varie-

* As I intend only here to notice the modifications of naptha and petroleum, I have not mentioned amber and the honey-ſtone.

ties

tics of the elaſtic bitumen, which I ſhall ſoon deſcribe, will be ſufficient for the purpoſe*.

NAPTHA.

NAPTHA is a ſubſtance well known to Mineralogiſts as a light, thin, often colourleſs oil, highly odoriferous and inflammable, which is ſometimes found on the ſurface of the waters of ſprings, and at other times iſſuing from certain ſtrata.

When expoſed to the air, it becomes at firſt yellow, afterwards brown, and in the like proportion it thickens, and paſſes into

PETROL OR PETROLEUM.

THIS has a greaſy feel, is thicker than the preceding ſubſtance, is tranſparent or ſemitranſparent, and of a reddiſh or blackiſh brown colour. By air it becomes like tar, and then is called

MOUNTAIN OR MINERAL TAR, BITUMEN PETROLEUM TARDE FLUENS.

THIS ſubſtance is viſcid, and of a reddiſh or blackiſh brown or black. When burned, it emits a diſagreeable bituminous ſmell, and by expoſure to the air it paſſes into

* Bergman was of opinion, that the liquid bitumens were often, if not always, formed from thoſe which are ſolid, by the means of ſubterraneous heat; and expreſſes himſelf thus: "Cæterum ad fidem pronum eſt, naptham, petroleum, bituminoſoſque liquores, quibus abundat Aſia, plures harum materierum exhibens non tantùm ſcaturigines, ſed rivulos quoque, quibus etiam, parcius licet diſtributis, Auſtralis Europa non caret; probabile, inquam, eſt, has pinguedines liquidas variis antea terris inhæſiſſe exſiccatas, et mediante calore ſubterraneo, ſi non ſemper, ſæpe tamen fluiditatem recuperâſſe. Novimus ignem in alto haud raro agere, quamvis in ſuperficie vix obſcura ejuſdem indicia inveſtigare liceat: novimus præterea e ſicco aluminari ſchiſto petroleum extorqueri juſto caloris gradu, cui arte exponitur.—*Bergman de Productis Vulcaniis Opuſcula*, tom. iii. p. 238.

MOUNTAIN OR MINERAL PITCH—BITUMEN MALTHA.

THE mineral pitch much reſembles common pitch, and, when heated, emits a ſtrong unpleaſant odour, like the former ſubſtance. When the weather is cold, it may be broken, and then exhibits, internally, a glaſſy luſtre; but when warm, it is ſoftened, and poſſeſſes ſome tenacity. It is however ſuſceptible of a ſuperior degree of induration, and then becomes

ASPHALTUM—BITUMEN ASPHALTUM—PETROLEUM INDURATUM.

THIS is a light, brittle ſubſtance, of a browniſh black, or black. When broken, it ſhews a conchoidal fracture with a glaſſy luſtre. It has little of the bituminous odour, unleſs it is rubbed or heated. It eaſily melts, is very inflammable, and, when pure, burns without leaving any aſhes.

In this manner, naptha, by inſpiſſation, paſſes ſucceſſively through different ſtates until it becomes aſphaltum, which appears to be the ultimate degree of induration which the pure bitumens derived from naptha can receive.

I have at this time ſpecimens before me which prove theſe gradations; and I have ſeen a remarkable inſtance in a bitumen brought from the Iſland of Trinidad, which exhibits mineral tar paſſing into mineral pitch, and laſtly into aſphaltum *.

§ 3.

* The progreſſive changes of naptha into petroleum, mineral tar, mineral pitch, and aſphaltum, appears to be cauſed by the gradual diſſipation of part of the hydrogen of the bitumen, and the conſequent development or diſengagement of carbon. Hence, I am inclined to believe, ariſe the changes of colour, the degrees of inſpiſſation, and the increaſed proportion of carbon found in thoſe ſubſtances by chemical analyſis.

I would

§ 3.

THE division which comprehends the simple bituminous substances derived from naptha, may therefore be considered as terminating in asphaltum; but Nature appears to have glided on by an uninterrupted chain which connects the simple bitumens with those which we have called compound; and this effect is produced by the gradual increase of the carbonic principle, and the introduction of extraneous matter, the different quantity of which, together with the greater or less degree of mixture or of chemical union, occasion considerable changes in these substances, so that they are gradually removed from those characters which distinguish the pure bitumens.

To form an accurate table of these gradations, it would be necessary to have comparative analyses of the different bituminous substances, and also to contrast the analyses with the properties of these bodies. But at present these analyses, for the greater part, are wanting; and although at some future time I intend to attempt a series of such experiments, I must now content myself with the observations and facts which I have been able to collect *. From these I am of opinion, that the most immediate gradation from asphaltum (which is the last of the simple bitumens) into those which are compound, takes place in the substance called

I would be understood however to mean that the carbon is only relatively increased, in respect to the other ingredients, in a given quantity of these bitumens, and that it predominates in proportion to the dissipation of a certain portion of the hydrogen, which was originally necessary to the forming of the bitumen in conjunction with the carbon.

* This paper was written and read before I had seen the ingenious experiments which the celebrated Mr. Kirwan has published, in the last edition of his Elements of Mineralogy.—Vide vol. ii. p. 514.

JET.

JET.

JET is a ſubſtance well known to be of a full black, ſometimes however inclining to brown. It is conſiderably harder and leſs brittle than aſphaltum. It breaks with a conchoidal fracture, and the internal luſtre is glaſſy. It has no odour except when heated, and it then reſembles aſphaltum. It melts in a ſtrong heat, and, when burned, leaves an earthy reſiduum.

Wallerius conſidered jet as aſphaltum which had become indurated by time, and Mr. Fourcroy is of the ſame opinion *. Others again have arranged it with the varieties of coal †. I am inclined however to believe, that it is neither aſphaltum nor coal, but an intermediate ſubſtance which may be regarded as the firſt gradation from the ſimple bitumens into thoſe which are compound. The matter of aſphaltum undoubtedly enters into it in a large proportion, and has conſequently ſtamped ſeveral of its characters upon it; but the increaſe of carbon, and of the extraneous or earthy matter which is intimately mixed or rather combined with it, has had ſo much influence, that the characters of coal are alſo in ſome meaſure apparent, and are rendered the more ſtriking by the ſimilarity of certain local circumſtances which attend theſe two ſubſtances. The characters of coal are however by no means fully eſtabliſhed in jet, but from this we paſs immediately to another, in which theſe characters cannot be queſtioned.

This is the ſubſtance called

CANNEL COAL,

which is of a full black, of a ſmooth, ſolid, even texture; it breaks in any direction, and the tranſverſe fracture is conchoidal. It

* *Elémens d'Hiſt. Nat. et de Chimie*, tom. iii. p. 456.

† *Widenmann's Handbuch der Mineralogie*, p. 628.

burns

burns well, and is ſo compact that it is often employed, like jet, to be formed into trinkets.

The great reſemblance which cannel coal has to jet in many of its properties, induces me to regard it as the next gradation of the compound bituminous ſubſtances, and as the leading variety of coal from which the others follow according to the degree of their bituminous character.

The limits of this paper will not allow me to enter into a circumſtantial account of all the other varieties of pit-coal; neither is it neceſſary, after the gradations of aſphaltum to jet, and of jet to coal, have been noticed. I ſhall not therefore deſcribe the varieties of coal known by divers names in different countries, and even in different provinces, ſuch as thoſe called in England caking coal, rock coal, ſplent coal, &c. &c.; but ſhall only obſerve, that the pit-coals in general appear to be compoſed of bitumen intimately mixed, or rather combined, with various proportions of carbon and earthy matter; and according to the intimacy of the union, and the exceſs of one or other of the ingredients, ſo the compound poſſeſſes more or leſs the characters of perfect coal, or, by various ſhades, paſſes into certain earthy or ſtony ſubſtances, which, although impregnated with bitumen, do not merit the appellation of coal, and theſe alſo at length gradually loſe the bituminous character *.

It is likewiſe worthy of notice, that the quantity of earthy matter does not appear to be the principal cauſe why pit-coals do not burn with the rapidity which is to be perceived in ſome other earthy ſubſtances impregnated with bitumen. For we may conclude, that

* From Mr. Kirwan's experiments it appears that carbon is a conſtituent principle of coal, and that the preſence of it is a principal cauſe of thoſe modifications which produce the ſpecies. It even ſeems chiefly to form the Kilkenny coal.—*Kirwan's Elements of Mineralogy*, vol. ii. p. 521.

the

the ſlow combuſtion of coal proceeds from the joint effects produced partly by the relative proportions of the bituminous, carbonaceous, and earthy ingredients, and partly by the more or leſs perfect degree of mixture which connects them together, and which degree of mixture, I believe, in many caſes, nearly approaches to chemical union, if not actually ſo: when, therefore, the degree of mixture is ſo perfect as that every particle of bitumen is connected with much carbon or earthy matter, it is not ſurpriſing that the rapid combuſtible property of the former ſhould be checked in a conſiderable degree; and, by a parity of reaſoning, when the mixture is groſs and imperfect, ſo that it conſiſts of a ſtony or earthy ſubſtance, which has ſimply imbibed bitumen, it is natural to expect that the bitumen (although leſs abundant than in coal) ſhould enter readily into combuſtion, which is vehement in proportion to the ſhortneſs of its duration; and this we find to be the caſe in many earthy ſubſtances, and looſe ſand-ſtones which are ſimply impregnated with bitumen.—To return, however, to the varieties of coal, I muſt obſerve, that, from the cauſes above-mentioned, the different characters and properties of coal appear to me to be produced. That in this manner, perfect pit-coal paſſes into ſchiſtoſe or ſlaty coal, and this again, by certain gradations, paſſes into the varieties of combuſtible or bituminous ſchiſtus, which alſo, by the gradual decreaſe of the bituminous ingredient, become at length confounded with the varieties of the common or argillaceous ſchiſtus.

We have a remarkable example of this in the gradations of bituminous ſchiſtus into argillaceous ſchiſtus, which are to be obſerved at Kimmeridge, on the coaſt of Dorſetſhire, where a peculiar bituminous ſchiſtus is found, which is uſed as fuel by the inhabitants, and is improperly called Kimmeridge coal.

By the ſeries of gradations which have been noticed in the foregoing

going pages, the ſimple bituminous ſubſtances appear to paſs into thoſe which are compound; and theſe alſo, by declining ſhades, at laſt paſs into ſubſtances appertaining to the claſs of earths and ſtones.

In the compound bituminous ſubſtances the prevalent earthy ingredient is for the greater part generally, if not always, argillaceous; and although certain calcareous grits (ſuch as the Portland ſtone*) as well as limeſtones and marbles are found impregnated with bitumen, yet I know not of any inſtance in which this happens to the degree requiſite to form a combuſtible ſubſtance.

This curſory view of the ſimple bitumens, and of their combinations, would be ſufficient as an introduction to the principal ſubject of this paper; but, to complete the ſeries, I ſhall make ſome obſervations on the vegetable ſubſtances which contain bitumen, and ſhall afterwards mention the mixtures of bitumen with metallic oxides.

§ 4.

WHEN we conſider the facts which apparently prove that vegetables have contributed principally to the formation of bitumen, we have every reaſon to expect that mixtures of vegetable matter with bitumen ſhould frequently occur. But by the mixture of bitumen with the parts of vegetables, we underſtand the remains and parts of vegetables mixed and connected with the bitumen which they themſelves have produced.

This ſeems to be the nature of the ſubſtance called

* The Portland ſtone, when recently broken in the quarries, emits a ſtrong bituminous odour, like the bituminous limeſtone or ſtink-ſtone. It is alſo full of extraneous foſſils, or at leaſt the veſtiges of them.

BITUMINOUS WOOD, as well as of TURF and PEAT.

BITUMINOUS or foſſil wood is found in many places; but in reſpect to that which is found at Bovey, near Exeter, and which is therefore called Bovey coal, there are ſome peculiarities which deſerve to be mentioned. The Bovey coal is a dark brown, light, brittle ſubſtance, which in texture and other external properties much reſembles wood which has been half charred. It is not found as ſcattered logs or trunks, but forms regular ſtrata.

The pits are on a heath which is flat and ſandy; the ſtratum of ſand is however but thin, after which a pale brownith grey clay is found mixed with quartz pebbles. This prevails to about ſix feet, at which depth the firſt ſtratum of the coal commences. The quality of this is however much inferior to that of the ſubſequent ſtrata, which in all amounnt to ſeventeen, producing a depth of nearly ſeventy-four feet from the ſurface. Between each ſtratum of coal is a ſtratum of clay. The direction of the ſtrata is from eaſt to weſt, and the inclination or dip is from north to ſouth. The inferior ſtrata are thought to afford the beſt coal, and the coal is more ſolid and of a better quality towards the ſouth. The thickeſt ſtratum of coal is from ſix to eight feet *.

The Bovey coal burns readily with a flame like half charred wood: it does not crackle, and, if but moderately burned, forms charcoal; or if completely burned, it leaves a ſmall quantity of white aſhes exactly ſimilar to thoſe of wood. The ſmell of it when burning alſo reſembles that of wood, with a faint diſagreeable odour. It is certainly very remarkable that this ſubſtance ſhould form regular ſtrata, although it poſſeſſes the texture and moſt of the

* In the winter, twelve men can raiſe about 120 tons of this coal in a week, the whole of which is employed in a neighbouring Pottery.

properties

properties of wood; and that theſe ſtrata do not exhibit any of thoſe irregularities on their ſurfaces, which might be expected, on the ſuppoſition that they were formed by the roots, trunks, and branches of trees long buried in the earth. It is alſo difficult to imagine wood to have been tranſported and depoſited in this place at ſeventeen different periods, and yet it muſt be allowed that theſe ſtrata have been formed by ſucceſſive operations. I muſt confeſs, that after having twice viſited and examined the ſpot expreſsly for the purpoſe, I ſtill find myſelf utterly unable to offer any opinion upon the ſubject.

The characters of bitumen are but little apparent in the Bovey coal, and the ſuperior ſtrata even appear to have loſt a portion of their combuſtible principle, while the inferior ſtrata poſſeſs it. The lower parts alſo of theſe ſtrata are more compact and more combuſtible than thoſe parts which are immediately upon them *.

Another remarkable ſort of foſſil wood, which much reſembles the Bovey coal, and in like manner is arranged among the bituminous woods, is that found in Iceland, which is called by the inhabitants *Surturbrand*. This is rather harder than the Bovey coal, but in every other reſpect is the ſame. It alſo forms ſtrata many feet in thickneſs; but it is very extraordinary that theſe ſtrata appear to be formed of trunks of trees, which, in their tranſverſe

* At about 100 yards to the weſt of the pits, is a bog of conſiderable extent, where peat is cut, and decayed roots and trunks of trees are found, which do not, however, in the leaſt approach to the nature of the Bovey coal. Whether this bog has been in any manner connected with the formation of the above-mentioned ſubſtance, I do not pretend to determine.

A yellowiſh brown compact ſubſtance, which in colour and fracture reſembles ferruginous clay, is alſo found occaſionally with the Bovey coal: it is brittle, and is highly inflammable; it melts like a bitumen, and emits a ſmoke which in ſmell reſembles amber. This ſubſtance is but rarely found.

ſection, exhibit the concentric circles of their annual growth, with this difference, that the trunks have been ſo compreſſed as to be nearly flat, ſo that the circles appear like parallel lines connected at their extremities by a ſhort curve.

I did not obſerve ſuch an appearance at Bovey; but this would depend upon the poſition of the trunks of the trees, in reſpect to the ſection of the ſtrata.

Chaptal *, Troil †, Bergman ‡, and many others, have been of opinion that the ſurturbrand is wood which has been charred by the heat of the lava. But I cannot diſcern why it ſhould be ſuppoſed that it has been acted upon by fire, any more than that the Bovey coal has been ſubjected to the effects of the ſame agent. The qualities of the two ſubſtances are the ſame; and as (from Archbiſhop Troil's and Profeſſor Bergman's account) the ſurturbrand is ſtratified, I think we may venture to pronounce that the circumſtances

* *Elements of Chemiſtry*, vol. iii. p. 199.

† *Von Troil's Letters*, p. 43.

‡ Quid de ligno foſſili Iſlandiæ ſentiendum ſit, gnaro in loco natali contemplatori decidendum relinquimus. Interea, ut cum Vulcani operationibus nexum credamus, plures ſuadent rationes, quamvis huc uſque modum ignoremus, quo ſitum texturamque adquiſiverunt hæc ſtrata. Scilicet truncis arborum perquam craſſis conſtant, qualis in Iſlandiâ nullibi reperiuntur, et ne quidem hoc tempore creſcere poſſe videntur. Hi ſitu horizontali in ſtratis multorum pedum craſſitiei congeſti ſunt et petroleo plus minus penetrati, non jam molli, ſed optimè indurato, a quo tam nigrorem, quam flammæ ſub deflagratione qualitatem mutuantur. Sed quod in primis attentionem meretur, eſt truncorum in lamellas planas compreſſio.

Ponamus truncum arboris cujuſdam tranſverſim ſectum, hinc, uti notum eſt, figura oritur in orbem rediens circiter circularis, quæ omnia monſtrat annotina incrementa, extimo propemodum parallela. Fingamus jam talem ſectionem in tenuem laminam compreſſam, et veram habebimus ligni foſſilis, de quo heic agitur, ideam; nam in magnis hujus materiæ fruſtis, tranſverſim ſectis, quemlibet annotinorum orbium viſu perſequi licet, ita plerumque coactum, ut duas lineas fere parallelas exhibeat, quarum extrema brevi

ſtances under which they are found, are alſo ſimilar*. The whole, therefore, of the opinion in favour of fire, appears to reſt on the volcanic nature of Iceland; but it ſurely would be going too far were we to aſcribe to fire all the phænomena which are obſerved in volcanic countries.

Bovey coal, like the ſurturbrand, reſembles half-charred wood; and I will allow, and indeed am diſpoſed to believe, that it is in a ſtate nearly ſimilar; but from this it does not follow that fire has been the cauſe.

Carbon is known to be one of the grand principles of vegetables, and alſo as that which is the moſt fixed, excepting the ſmall portion of the earths contained in them. As a fixed principle, carbon appears to form, in great meaſure, the vegetable fibre; and after a certain degree of combuſtion, (by which the other principles have been diſſipated,) it remains, and the particles of it keep the ſame arrangement which they poſſeſſed when the vegetable was complete. If, however, the combuſtion has been carried on with the

brevi flexura ſunt adunata.—Quæ autem immanis requiritur vis, ut truncus cylindricus ita complanetur? Nonne antea particularum nexus putredinis quodam gradu fuerit relaxatus? Certe, niſi compages quodammodo mutatur, quodlibet pondus incumbens huic effectui erit impar. Cæterùm idem obſervatur phænomenon in omni ſchiſto argillaceo.

Orthoceratitæ, quæ in ſtrato calcareo conicam figuram perfectè ſervant, in ſchiſto planum fere triangulare compreſſione efficiunt. Idem valet de piſcibus, conchis, inſectiſque petrefactis. Cauſa adhuc latet, ſed in utroque caſu ſine dubio eadem eſt, et digna quæ exploretur. Obſervatu quoque dignum eſt, quod idem reperiatur effectus, quamvis ſtratum calcareum ſub ſchiſto collocatum ſit et majori ideo pondere comprimente onuſtum.——*Bergman de Productis Vulcaniis Opuſcula*, tom. iii. p. 239.

* "It is found (the ſurturbrand) in many parts of Iceland, generally in the mountains, in horizontal beds; ſometimes more than one is to be met with, as in the mountain of Lack in Bardeſtrand, where four ſtrata of ſurturbrand are found alternately with different kinds of ſtone."—*Troil's Letters*, p. 42.

free acceſs of air, the carbon enters into combination with oxygen and caloric, and forms carbonic acid.

We have many examples in which carbon is formed or rather liberated from thoſe ſubſtances with which it was combined in vegetables; and theſe are now explained as effects ſimilar to thoſe of combuſtion, although fire has not been the cauſe. In both caſes the carbon has been freed from the more volatile principles; and under circumſtances not favourable to the union of carbon with oxygen, the former muſt neceſſarily remain more or leſs undiminiſhed.

During the combuſtion of vegetable matter, the more volatile principles contained in the vegetable fibre (which with carbon alſo form the reſinous and other ſimilar ſubſtances) appear to be firſt ſeparated; and in proportion to this ſeparation, the other more fixed ſubſtance, which we call carbon, is developed.

Thus, by the progreſs of combuſtion, wood becomes brown, and afterwards black; ſo that the ſtate of the wood ſhews the degree of combuſtion to which it has been ſubjected, or, in other words, how far the ſeparation of the other principles from carbon has been effected.

Combuſtion is therefore a ſpecies of analyſis by which the principles of vegetables are ſeparated, according to their affinities, and according to their degree of volatility. By this operation hydrogen and azote (if it be preſent in the vegetable) are firſt diſengaged and form new combinations, while the carbon is the laſt which is acted upon; ſo that unleſs a ſufficient quantity of oxygen be preſent, it remains fixed and unchanged.

But the ſame ſeparation of the vegetable principles happens whenever vegetables in the full poſſeſſion of their juices are expoſed to circumſtances which favour the putrid fermentation.—As in

combuſtion,

combuſtion, ſo by the progreſs of putrefaction does the vegetable loſe its colour, become brown, and afterwards black; at the ſame time a gas is diſcharged, which is compoſed of hydrogen, azote, and carbonic acid.

When combuſtion is long continued with the free acceſs of air, the whole of the carbon is diſſipated in the ſtate of carbonic acid; but in the proceſs of putrefaction a conſiderable portion of carbon commonly remains even long after the putrid fermentation has ceaſed. Although, therefore, it is as readily developed by putrefaction as by combuſtion, it is not, however, when liberated from the other principles, ſo ſpeedily diſſipated by the former as by the latter proceſs.

According to the degree of combuſtion within certain limits the carbon is more or leſs apparent, and the like prevails according to the degree of putrefaction; ſo that whenever the cauſes which have promoted this ſpecies of fermentation have ceaſed, the vegetable ſubſtance will remain with more or leſs of its firſt principles, and with more or leſs viſible carbonic matter, according to the degree of putrefaction which has prevailed, and the vegetable ſubſtance will conſequently have the appearance and properties of wood which has been charred more or leſs.

To this cauſe, therefore, I am inclined to attribute the formation and appearance of the Bovey coal and ſurturbrand; and I believe that the portion of oily and bituminous matter, which I have obtained from them by diſtillation, is nothing more than the remainder of the vegetable oils and juices which have been partly modified by mineral agents*.

The

* "Coal not only forms the reſiduum of all vegetable ſubſtances that have undergone a ſlow and ſmothered combuſtion, that is, to which the free acceſs of air has been prevented,

The characters of bitumen are much more apparent in turf and peat, than in the greater part of the foſſil woods. Turf is well known to be compoſed of the parts of vegetables, ſuch as ſmall roots, twigs, &c. mixed with a portion of petroleum; and peat is the ſame, excepting that it generally contains more of earthy matter, or that the vegetables have undergone a more complete decompoſition.

The boggy nature of the places in which they are found, proves that a certain degree of maceration is neceſſary to form the bituminous matter which they contain; and I have already noticed, that every fact appears to demonſtrate, that the bitumen is a product of thoſe vegetables, the remains of which conſtitute the other ingredient of turf and peat.

The different proportion of vegetable matter, of bitumen, and of earth, together with the different ſtate of the bitumen, as well as the degree of perfection reſpecting the formation of it from the vegetable principles, contribute to alter the properties and characters of the compound, and thus produce varieties. It is believed that theſe ſubſtances have been materially concerned in the formation of pit-coal, and ſome eminent mineralogiſts maintain that there is an uninterrupted ſeries which connects the varieties of turf and peat with thoſe of coal*.

§ 6.

vented, but alſo of all putrid vegetable and animal bodies: hence it is found in vegetable and animal manures that have undergone putrefaction, and is the true baſis of their ameliorating powers; if the water that paſſes through a putrefying dunghill be examined, it will be found of a brown colour, and if ſubjected to evaporation, the principal part of the reſiduum will be found to conſiſt of coal. All ſoils ſteeped in water communicate the ſame colour to it in proportion to their fertility; and this water being evaporated, leaves alſo a coal, as Meſſrs. Haſſenfraz and Fourcroy atteſt."—*Kirwan on Manures*, p. 154, Vol. v. of *The Tranſactions of the Royal Iriſh Academy.*

* Man findet in der natur einen ununterbrochenon übergang von dem raſen und papiertorf

§ 5.

LITTLE need be ſaid concerning thoſe mixtures of bitumen with metals or their oxides which are ſometimes called the bituminous ores of mercury, copper and iron, for they ſhould rather be arranged with the adulterated or impure bitumens. Few of them contain the metallic ingredient in a proportion ſufficient to cauſe the compound to be worked as an ore; and the only exception with which I am acquainted, is the ſubſtance found at Idria, in Carniola, compoſed of mercury mixed with bituminous matter, a quintal of which, according to Mr. de Born, affords from fifteen to twenty pounds of mercury *.

§ 6.

FROM the preceding obſervations it will appear, that although I have firſt mentioned naptha in order that I might be better underſtood in reſpect to the degree of connection prevailing between the bituminous ſubſtances, yet, to have followed them from their origin and the period of their formation, I ſhould rather have begun with thoſe ſubſtances which moſt clearly point out how much the vegetable kingdom has contributed to the production of them, with the probable occaſional concurrence of animal ſubſtances.

That the latter have contributed in ſome meaſure to the forming of bitumen, we can only infer from the veſtiges and exuviæ of animals, which ſo commonly accompany bituminous ſubſtances;

papiertorf durch den moor oder ſumpftorf in den pechtorf, und von dieſem in die braun ſchiefer und pechkohle.—*Widenmann*, p. 630.

* *Catalogue de la Collection des Foſſiles de Mlle. de Raab*, tom. ii. p. 294, 348, & 400.

but no doubt can be entertained in reſpect to vegetables, for it appears that bitumen is formed from them by long maceration, and by other proceſſes at preſent unknown to us:

That when certain portions of vegetable matter remain undecompoſed, and are mixed with the petroleum thus produced, the varieties of turf and peat are formed:

That wood in general contributes to the production of bitumen; but does not ſeem to retain it, after the formation of it, in ſo conſiderable a proportion as the foregoing ſubſtances:

That the bituminous matter thus formed, and occaſionally ſeparated, is in different ſtates according to the degree of inſpiſſation:

And laſtly, with various proportions of carbonic and earthy matter, it forms jet, coal, and bituminous ſchiſtus; and with metallic ſubſtances it produces thoſe compounds called bituminous ores.

§ 7.

ABOUT the year 1786 a new ſpecies of bitumen was diſcovered near Caſtleton, in Derbyſhire, which much reſembles, in elaſticity and colour, the ſubſtance known by the name of cahout-chou, or Indian rubber.

Mr. de Born was, I believe, the firſt who mentioned it*; but as he appears to have known only one variety of this ſingular ſubſtance, I am induced to hope that a deſcription of many other varieties, which have ſince been found, will not be unacceptable to this Society.

The elaſtic bitumen, which reſembles the cahout-chou, was firſt diſcovered in the cavities of a vein in the lead-mine called Odin, which is near the baſe of Mamtor, to the north of Caſtleton. The

* *Catalogue de la Collection de Mlle. de Raab*, tom. ii. p. 77.

ore

ore of this mine (which is ſuppoſed to be one of the moſt ancient in England) is galena, accompanied by fluor, calcareous and heavy ſpars, quartz, blende, calamine, ſelenite, aſphaltum, and the elaſtic bitumen, although the latter is now rarely found*. Another ſpecies of the elaſtic bitumen has within about three years been found in a neighbouring rivulet; but I ſhall not at preſent notice it, as I intend firſt to deſcribe the varieties of that which was firſt diſcovered, and which reſembles the cahout-chou. In order to do this with more perſpicuity, I ſhall deſcribe the ſpecimens belonging to my collection, according to the mode in which I have arranged them.

SPECIES THE FIRST.

A, No. 1.

ELASTIC bitumen of a yellowiſh brown colour, part of which is almoſt liquid like petroleum, and adheres to the fingers; the other part is of a darker colour, of a mammillary form, does not adhere to the fingers, and is ſoft and elaſtic. This is on a grey bituminous limeſtone, with white calcareous ſpar in the figure of hexaedral pyramids, forming that which is called the dog-tooth ſpar.

A, No. 2.

Bitumen of a yellowiſh brown, partly liquid, and partly elaſtic, which, however, adheres to the fingers; on pale grey limeſtone, with cryſtals of white fluor ſpar, blende, and galena.—On another part of the limeſtone are ſome globules of bitumen of a reddiſh brown, perfectly hard and brittle.

* I am indebted to the ingenious Mr. White Watſon, of Bakewell, for much information reſpecting the local circumſtances which attend this bitumen.

A, No. 3.

Dark brown bitumen of a ſtalactitical form, hard, but in ſome degree elaſtic.

A, No. 4.

Bitumen of a reddiſh brown, in the form of globules, ſome of which are elaſtic, and others hard: on browniſh-grey limeſtone, accompanied by cryſtallized white fluor, dogtooth calcareous ſpar, and pyrites in ſmall cryſtals, ſome of which are on the ſurface of the globules of bitumen.

A, No. 5.

The ſame of a darker brown, of a ſtalactitical form, hard and brittle; on pale brown calcareous ſpar, impregnated with bitumen.

A, No. 6.

Bitumen of a dark reddiſh brown, very hard; on pale brown ſparry ſtink-ſtone, with grey limeſtone, in which are ſome coralloides.

A, No. 7.

Bitumen of a dark yellowiſh brown, elaſtic, but very ſoft, ſo that it adheres to the fingers.

A, No. 8.

The ſame thinly ſpread over grey ſparry ſtink-ſtone.

A, No. 9.

Bitumen of a browniſh olive colour, which becomes reddiſh brown by the air, but when oppoſed to the light it appears ſemi-

tranſparent,

tranſparent, and of a yellowiſh brown inclining to orange. It is ſoft, very elaſtic, and (when recently cut) adheres to the fingers.

A, No. 10.

The ſame of a darker brown, and harder in a ſmall degree. The ſpecific gravity of this ſpecimen is 0,9053; water being eſtimated at 10,000 at temp. 60°.

A, No. 11.

Bitumen of a dark brown, harder than the former. This exactly reſembles the cahout-chou in the degree of elaſticity, and in the property which it poſſeſſes of removing the traces of black-lead.

A, No. 12.

The ſame, but rather harder.

A, No. 13.

The ſame of a blackiſh brown, which is ſlightly elaſtic when the weather is warm, but is brittle when cold.

A, No. 14.

The ſame of a blackiſh brown, nearly black, which ſcarcely poſſeſſes any elaſticity; it breaks, and reſembles aſphaltum in luſtre, colour and fracture.

A, No. 15.

The ſame of a reddiſh brown, perfectly hard and brittle. The characters of aſphaltum are complete in this ſpecimen.

The ſpecific gravity is 10,233.

The other ſpecies of elaſtic bitumen, which I ſhall diſtinguiſh by the

the letter B, has been found during the laſt three years in a rivulet which runs at the baſe of Mamtor, from Weſt to Eaſt, at a ſmall diſtance from Odin mine.—The varieties of it, in my poſſeſſion, are as follow:——

SPECIES THE SECOND.

B, No. 1.

ELASTIC bitumen, which, recently cut, exactly reſembles fine cloſe cork in colour and texture, but, by the air, in a few days it becomes of a pale reddiſh brown.—This forms a thin coat, which completely covers a maſs of elaſtic bitumen, which is ſoft, and of a browniſh olive colour, like A, No. 9.

B, No. 2.

The ſame, excepting that the coat or cruſt is much thicker.

B, No. 3.

The ſame, but the coating is thicker than that of No. 2, and the browniſh olive-coloured bitumen much leſs in quantity.

B, No. 4.

The ſame, excepting that the greater part of the maſs reſembles cork, ſo that only a very ſmall nucleus of the brown bitumen remains*.

B, No. 5.

The ſame, excepting that the bitumen, which is coated, is in the ſtate of aſphaltum.

The ſpecific gravity of this ſpecimen is 0,9881.

* One of the ſpecimens in my poſſeſſion, ſimilar to B, No. 4, weighs between 13 and 14 pounds.

B, No. 6.

Elaſtic bitumen, the whole maſs of which reſembles fine cork.—The ſpecific gravity is 0,9748.

B, No. 7.

The ſame, but friable, and apparently paſſing by decompoſition into an ochraceous coloured powder.

THE varieties of the firſt ſpecies of the elaſtic bitumen, or that which is like the cahout-chou, evidently appear to be formed from a naptha or petroleum, which, like that which produces the other ſimple bituminous ſubſtances formerly mentioned, is ſuſceptible of various degrees of inſpiſſation.

All the varieties of the firſt ſpecies, from No. 1, to No. 15, may be regarded as thus formed, for in theſe we can trace all the modifications comprehended between petroleum and aſphaltum; with this difference, that the intermediate modifications of this ſpecies have the remarkable property of elaſticity, which is the moſt complete in the variety which occupies the middle place between petroleum and aſphaltum.

The ſecond ſpecies B, or that which reſembles cork, appears ſo different from that marked A, that it is not at firſt eaſy to conceive how they are connected, or at leaſt the difficulty muſt appear great to thoſe who have only ſeen ſpecimens of each ſpecies complete in their reſpective characters. But, from an attentive examination of many ſpecimens, and particularly of thoſe which I have deſcribed, I am convinced that the varieties of the ſpecies B are only modifications of the ſpecies A, produced probably by long maceration in the water of the rivulet in which this ſpecies is found, to the effects of which we may, with ſome appearance of reaſon, add the

viciſſitudes

viciſſitudes of the ſeaſons, of air, and of the weather in general, as well as thoſe of reiterated moiſture and dryneſs occaſioned by the riſe and fall of the water of the rivulet; and what ſeems to corroborate this opinion is, that the ſubſtance, like cork, incruſts the ſpecies A, and appears to be only a change which has penetrated deeper into the ſubſtance of it in proportion to the duration of the cauſes which I have mentioned, ſo that at length the original ſubſtance no longer remains in its primitive ſtate. I do not believe, however, that this change ariſes from any alteration in the conſtituent principles, but merely from a partial and minute diſunion or diſintegration of the particles of the original ſubſtance, as both ſpecies melt into one which is perfectly ſimilar. I muſt alſo add, that the ſpecies A burns eaſily, and with rapidity; but the ſpecies B burns with ſome difficulty, and crackles as if it had imbibed a quantity of water.

I have remarked, when the different varieties of the elaſtic bitumen were melted, that they completely loſt the elaſtic property, and a quantity of air or gas appeared to be diſengaged, particularly from the ſpecies B. I alſo obſerved, that the ſubſtances which remained after this operation, correſponded, in reſpect to conſiſtence, with thoſe which had been employed, as the following Table will ſhew:——

A, No. 7 and 8. ...	produced a thick liquid petroleum, not apparently different from that which is commonly known.
A, No. 9.	produced a thicker petroleum, approaching to mineral tar.
A, No. 11 and 12.	produced mineral tar.
B, No. 6.	produced the ſame, approaching to mineral pitch.
A, No. 13.	produced mineral pitch.
A, No. 14 and 15.	did not ſuffer any change, but remained as at firſt, with all the characters of aſphaltum.

 From

From what I have related, I ſuſpect that the elaſtic property is occaſioned by the interpoſition of very minute portions of air or ſome other elaſtic fluid between the parts of the bitumen, and that this takes place by reaſon of ſome unknown cauſe at the time of formation; but when theſe bitumens are melted, the elaſtic fluid is liberated, and the maſs loſes that fine ſpongy texture which I ſuſpect to have been the cauſe of the elaſtic property *.

Derbyſhire is well known as a country which exhibits, in the moſt ſtriking manner, the remarkable changes which our globe has ſuffered. In every part of it, the moſt indiſputable evidences appear of ſome great and extraordinary revolution; and there is not any place where extraneous foſſils, ſuch as the remains and impreſſions of vegetables and animals, are more abundant.

Bitumen, in other countries, is moſt commonly found where theſe preſent themſelves; and, in like manner, there are few countries which abound ſo much with bitumen as Derbyſhire.

Whoever has examined the limeſtone rocks about Matlock, and moſt other places in this county, muſt be convinced of the truth of this aſſertion.

The limeſtone and calcareous ſpars alſo, where the elaſtic bitumen is found, are, for the greater part, in the ſame ſtate; ſo that no doubt can be entertained but that this bitumen has had the ſame origin as thoſe which are more generally known; and it would

* The elaſtic bitumen, A, No. 9. when digeſted in ſulphuric ether in a temperature of about 55°, is partly diſſolved. The ſolution is yellowiſh brown when oppoſed to the light; but when otherwiſe viewed, is like the bitumen, that is, of a browniſh olive colour. By ſpontaneous evaporation, the etheric ſolution leaves a yellowiſh brown bitumen, which is totally devoid of elaſticity. The undiſſolved portion (like the cahout-chou under ſimilar circumſtances) is ſoftened, and is much increaſed in bulk.

The ſpecies B, No. 6. cut into very thin ſlices, communicates a yellow tinge to ſulphuric ether; in other reſpects it is but little affected.

 undoubtedly

undoubtedly have been confounded with them, had it not been diſcovered when paſſing from the liquid to the ſolid ſtate.

The elementary principles of bitumen are, hydrogen, carbon, ſometimes azote, and probably ſome oxygen, which, by its action on the other principles, tends to form the concrete bitumens, and alſo produces that portion of acid obtained by chemical operations. Theſe ſame principles, hydrogen and carbon, conſtitute the vegetable oils and reſins; and the ſame, with ſome azote, form the oils and greaſe of animals. Now it is known that very ſmall changes in the reſpective proportions of theſe ingredients, and in the circumſtances which attend the combination of them, will cauſe conſiderable variations in the nature of the products; and in like manner, it appears very probable, that when the organized bodies in their recent ſtate, and in the full poſſeſſion of the above-mentioned principles, have been buried in a ſituation where theſe principles have been long elaborated under certain favourable circumſtances, and ſubjected to the action of mineral bodies; I ſay that it appears highly probable, that a new combination, which we call bitumen, may be formed, which, although different in ſome reſpects from the vegetable and animal products, ſtill, however, retains many characters of thoſe ſubſtances from the principles of which it has been formed.

HAMMERSMITH,
April 26, 1797.

X. *An*

X. *An Account of the Jumping Mouse of Canada. Dipus Canadensis. By Major General Thomas Davies, F. R. S. and L. S.*

Read June 6, 1797.

AS I conceive there are very few persons, however conversant with Natural History, who may have seen or known there was an animal existing in the coldest parts of Canada, of the same genus with the Jerboa, hitherto confined to the warmer climates of Europe and Africa; I take the liberty of laying before this Society the following observations (accompanied by a drawing) on an animal of that kind, procured by myself in the neighbourhood of Quebec, during my last residence in that country. As I do not recollect to have seen this animal either figured or described by any author in Natural History, I flatter myself, these observations may afford some satisfaction to the President and Members of the Linnæan Society. The specimens from which I made the drawing are now in my collection. With respect to the food, or mode of feeding of this animal, I have it not in my power to speak with any degree of certainty, as I could by no means procure any kind of sustenance that I could induce it to eat; therefore, when caught, it only lived a day and a half. The first I was so fortunate to catch was taken in a large field near the Falls of Montmorenci, and by its

 having

having ſtrayed too far from the ſkirts of the wood, allowed myſelf, with the aſſiſtance of three other gentlemen, to ſurround it, and after an hour's hard chaſe to get it unhurt, though not before it was thoroughly fatigued, which might in a great meaſure accelerate its death. During the time the animal remained in its uſual vigour, its agility was incredible for ſo ſmall a creature. It always took progreſſive leaps of from three to four, and ſometimes of five yards, although ſeldom above 12 or 14 inches from the ſurface of the graſs; but I have frequently obſerved others in ſhrubby places and in the woods, amongſt plants, where they chiefly reſide, leap conſiderably higher. When found in ſuch places, it is impoſſible to take them, from their wonderful agility, and their evading all purſuit by bounding into the thickeſt cover they can find.

With reſpect to the figure given of it in its dormant ſtate, I have to obſerve, that ſpecimen was found by ſome workmen, in digging the foundation for a ſummer-houſe, in a gentleman's garden about two miles from Quebec, in the latter end of May 1787. It was diſcovered encloſed in a ball of clay, about the ſize of a cricket-ball, nearly an inch in thickneſs, perfectly ſmooth within, and about 20 inches under ground. The man who firſt diſcovered it, not knowing what it was, ſtruck the ball with his ſpade, by which means it was broken to pieces, or the ball alſo would have been preſented to me. The drawing will perfectly ſhew how the animal is laid during its dormant ſtate. How long it had been under ground it is impoſſible to ſay; but as I never could obſerve theſe animals in any parts of the country after the beginning of September, I conceive they lay themſelves up ſome time in that month, or beginning of October, when the froſt becomes ſharp; nor did I ever ſee them again before the laſt week in May, or beginning of June. From their being enveloped in balls of clay, without any appear-

appearance of food, I conceive they sleep during the winter, and remain for that term without sustenance. As soon as I conveyed this specimen to my house, I deposited it, as it was, in a small chip-box, in some cotton, waiting with great anxiety for its waking; but that not taking place at the season they generally appear, I kept it until I found it begin to smell: I then stuffed it, and preserved it in its torpid position. I am led to believe its not recovering from that state arose from the heat of my room during the time it was in the box, a fire having been constantly burning in the stove, and which in all probability was too great for respiration. I am led to this conception from my experience of the Snow Bird of that country, which always expires in a few days (after being caught, although it feeds perfectly well) if exposed to the heat of a room with a fire or stove; but being nourished with snow, and kept in a cold room or passage, will live to the middle of summer.

The animal above described belongs to Schreber's genus of *Dipus*, and may be characterised

DIPUS CANADENSIS,

palmis tetradactylis, plantis pentadactylis, caudâ annulatâ undique setosâ corpore longiore.

Tab. viii. *Fig.* 5. represents the *Dipus canadensis*, of its natural size, in an erect position.

Fig. 6. shews it in a torpid state.

XI. *Ob-*

XI. *Obſervations on the Flowering of certain Plants. By the Rev. Thomas Martyn, B.D. F.R.S. V.P.L.S. Regius Profeſſor of Botany in the Univerſity of Cambridge.*

Read July 4, 1797.

THE improvements in the phyſiology of plants, ſince the days of Malphigi and Grew, have by no means kept pace with thoſe which have been made in the nomenclature, and in the aſcertaining of genera and ſpecies by accurate characters, deſcriptions and figures, under Linnæus and his followers. The reaſon is obvious: in order to aſcertain a plant, it is only neceſſary to ſee and deſcribe it once or twice in its ſtate of greateſt perfection; but we are not likely to become acquainted with the internal ſtructure and functions of vegetables, till a ſeries of accurate experiments ſhall have been gone through; or with their life, actions and manners, if we may ſo ſpeak, till we have got together a fund of laborious reſearches and obſervations. And there are very few perſons who can ſacrifice all the numerous calls of buſineſs or pleaſure, to beſtow a conſtant and regular attention to one object, and to become almoſt as ſtationary as the plants they are obſerving. Even the following obſervations, which are almoſt too trifling to offer for the conſideration of the Linnæan Society, required a regular attention ſeveral repeated times morning and evening during upwards of ſix weeks.

The

The three plants (*Anagallis arvenſis*, *Oenothera biennis*, *Hibiſcus trionum*) which were ſelected for theſe obſervations, were taken rather for the convenience of their ſituation, from their vicinity to the houſe, than for any other reaſon. *Anagallis arvenſis*, however, is a delicate wild plant, that has long ſince attracted notice, as indicating rainy weather or a moiſt atmoſphere by the cloſing of its flowers, and the contrary by their opening. Hence its name among the country people, of *Shepherd's* or *Poor man's weather-glaſs*. And *Oenothera biennis* has been generally regarded, from an early period, for the regular opening of its flowers in the evening, and has thence obtained the name of *Evening* or *Nightly Primroſe*.

The flowers of the *Oenothera* are collected in a very cloſe corymbus at the top of the ſtalk till the time of flowering. The upper flowers expand firſt; and as they expand ſucceſſively, the ſtalk is advancing in height, and ſeparating the flowers; inſomuch that when the flowering time is paſt, there is the ſpace of a foot or eighteen inches interpoſed between thoſe flowers which were originally contiguous. Whilſt each flower is preparing for expanſion, the peduncle gradually diverges from the ſtem, and, before the flower opens, arches downwards like a ſwan's neck: the corolla ſwells out at bottom, and is very apparent there between the leaflets of the calyx, which keep it cloſe together for a conſiderable time at top, by means of the hooks at the extremity of the calycine leaflets, till at length the corolla burſts its bonds inſtantaneouſly, opens to a certain point, and then having made a ſtand for a few ſeconds, expands very ſlowly to its full extent. This critical moment is very intereſting to the botanical obſerver, and may be ſeen with eaſe and pleaſure between ſix and ſeven within the houſe, by gathering the flowers and ſetting them in water. In hot weather the flowers grow

grow flaccid, and wither before noon the next day; but in cool and cloudy weather they will last two days.

The flowers of *Hibiscus trionum*, when once expanded, continue open till they close finally. They then droop; and when the corolla is withered and fallen, the peduncle again becomes erect. In warm weather the corolla folds up wholly at night, and decays on the second day; but in cool weather it will last a day or two half folded up, but never opening so as to show the rich purple eye at its base.

The height of the barometer and thermometer, with the state of the weather on each day, are given with a view of ascertaining whether there be any connection between them and the time in which the flowers open.

The barometer was observed between 8 and 9 A. M. and the thermometer at the same time, and again about 3 P. M. The latter instrument was within the house, but in a hall, the door of which was commonly open, and not at all exposed to the sun.

Observations on the Opening and Closing of the Flowers of Anagallis arvensis, Oenothera biennis, Hibiscus trionum, *&c. during the Autumn of* 1796.

	Barom.	*Therm.*	*Weather.*	*Observations.*
Aug. 16.	$29\frac{9}{10}$	66°	Dry, sunshine and clouds alternately. Wind N. E.	Hibiscus trionum open from 8 to 4.
17.	$29\frac{9}{10}$	61 to 64	The same, only more cloudy.	Hibiscus trionum open from 8 to 4.
18.	$29\frac{9}{10}$	61 to 64	The same, morning covered.	Hibiscus trionum open from 10 to 4.
19.	$29\frac{7}{10}$	62 to 66	The same, but warmer.	Hibiscus trionum open from 9 to 4.
20.	$29\frac{7}{10}$	62 to 68	Fog, soon cleared, hot.	Hibiscus trionum open from 9 to 4.
21.	$29\frac{6}{10}$	64 to 70	Clear, hot. Wind E.	Hibiscus trionum open from 8 to 4.
22.	$29\frac{13}{20}$	64 to 71	The same.	Hibiscus trionum open from 8 to 4.

	Barom.	*Therm.*	*Weather.*	*Observations.*
Aug. 23.	$29\frac{7}{10}$	65 to 71	Clear, hot. Wind E.	Anagallis arvensis open from 9 to 3. Apargia hispida closed at 12. Hibiscus trionum 8 to 4.
24.	$29\frac{7}{10}$	63 to 70	The same.	Anagallis arvensis 10 to 3. Apargia hispida 8 to 12. Hibiscus 8 to 3.
25.	$29\frac{6}{10}$	63 to 68	Fog, cleared before 10. Wind S. W.	Anagallis 10 to 3. Oenothera biennis open at 7 p.m. Bellis perennis shut at 7 p. m. Hibiscus 8 to $2\frac{1}{2}$.
26.	$29\frac{7}{10}$	65 to 69	Light clouds and airs. Wind S.W. Great clouds at noon, announciug a distant storm. Flowers not affected by it. Afternoon very cloudy, with a sprinkling of rain. Heavy rain and wind at night.	Anagallis 10 to 2. Oenothera 7 p. m. open. Bellis 7 p. m. shut. Hibiscus 8 to 4.
27.	$29\frac{9}{20}$	63 to 71	Wind N. N. W. Cloudy with sunshine. Windy afternoon. A shower at 2 P. M.	Anagallis $9\frac{1}{2}$ to 2. Oenothera 6 p. m. open. One flower of Hibiscus not shut at 6 p. m.
28.	$29\frac{6}{10}$	61 to 63	Windy, clear morn, N. W. Cloudy at 10. Very cloudy the rest of the day, Wind N. Evening clear.	Hibiscus $9\frac{1}{2}$ to 4. Anagallis half open at 12, quite open at 1, closed before 2. Oenothera 7 p. m. open
29.	$29\frac{11}{20}$	60 to 62	Wind N. Light clouds and flying showers. N. E.	Hibiscus open 9 to 5. Anagallis 8 to 3. Oenothera 7 p. m. open. Some flowers of Hibiscus not finally closed at 7.
30.	$29\frac{6}{10}$	61 to 62	Wind N. E. Cloudy, windy. Rain at 2. Afternoon and evening wet.	Hibiscus $9\frac{1}{2}$ to 4. but never fully opened. Anagallis not open. Oenothera 7 p. m. open. Flowers of the 27th only flaccid; of yesterday contracted, but not flaccid.
31.	$29\frac{6}{10}$	60 to 61	Wind E. covered. Windy with some wet.	Hibiscus 9 to 4. Anagallis 11 to 1, but never perfectly expanded. Oenothera $6\frac{1}{2}$ open. Flowers of the 28th not withered till 9 a. m. this day.
Sept. 1.	$29\frac{5}{10}$	60 to 62	Wind N. W. Clear with some flying clouds and wind. More cloudy towards afternoon.	Hibiscus and Anagallis not open. Oenothera $6\frac{1}{2}$ open.
2.	$29\frac{3}{10}$	59 to 62	Sunshine, with white clouds, Wind E. N. E. Dry all day.	Hibiscus $9\frac{1}{2}$ to 4. Anagallis 12 to 2. Oenothera 7 p. m. open.

	Barom.	*Therm.*	*Weather.*	*Observations.*
Sept. 3.	29 $\frac{6}{10}$	59 to 63	Sunshine, with white clouds, Wind N. W. Fine weather with much sun till evening; then very cloudy. Gentle rain in the evening.	Hibiscus 9 to $4\frac{1}{2}$. Anagallis only half open at noon. Oenothera 6 p. m. open. Hibiscus $9\frac{1}{2}$ to 5. Anagallis 11 to 3. Oenothera 7. p. m. open.
4.	29 $\frac{5}{10}$	60 to 62	Gentle rain in the morning. Wind W. N. W. Cloudy all day and warm.	Hibiscus $9\frac{1}{2}$ to $5\frac{1}{2}$. Anagallis half open at noon for a little time. Oenothera $6\frac{1}{2}$ p. m.
5.	29 $\frac{11}{20}$	60 to 62	Wind W. Covered, with heavy clouds. Sun appeared about 1, and the afternoon continued fair.	Hibiscus $10\frac{1}{2}$ to $6\frac{1}{2}$, but never fully open. Anagallis 11 to 2, but not quite open. Oenothera 7 p. m.
6.	29 $\frac{5}{10}$	60 to 63	Wind W. Covered, windy. Afternoon very cloudy, with strong wind.	Hibiscus $9\frac{1}{2}$ to $4\frac{1}{2}$. Anagallis 10 to $2\frac{1}{2}$. Oenothera 7 p. m.
7.	29 $\frac{9}{10}$	61 to 63	Wind W. Heavy rain in the morning; afterwards fair; evening very clear.	Hibiscus 12 to 6. Anagallis $1\frac{1}{2}$ to 3. Oenothera 7 p. m.
8.	29 $\frac{5}{10}$	59 to 71	Clear sunshine. Wind W.	Hibiscus $9\frac{1}{2}$ to 6. Anagallis 10 to 3. Oenothera 6 p. m.
9.	29 $\frac{6}{10}$	62 to 66	Covered, but sun appears before 10. Wind W. Clouds.	Hibiscus $8\frac{1}{2}$ to 5. Anagallis 10 to 3. Oenothera 6 p. m.
10.	29 $\frac{11}{20}$	62 to 68	Morning clear sunshine. Wind S. W. Cloudy. Evening covered.	Hibiscus $8\frac{1}{2}$ to $4\frac{1}{2}$. Anagallis $9\frac{1}{4}$ to 3. Oenothera $6\frac{1}{2}$ p. m.
11.	29 $\frac{11}{25}$	65 to 67	Wind S. W. Covered. A shower. Clear at noon and the whole day after.	Hibiscus $8\frac{1}{2}$ to $5\frac{1}{2}$. Anagallis at $10\frac{1}{2}$ half open. Quite open from 12 to 3. Oenothera $6\frac{1}{2}$ p. m.
12.	29 $\frac{7}{10}$	63 to 67	Wind W. S. W. White clouds. Heavy clouds at noon. Fair all day.	Hibiscus $8\frac{1}{2}$ to 5. Anagallis $9\frac{1}{2}$ to $2\frac{1}{2}$. Oenothera $6\frac{1}{2}$ p. m.
13.	29 $\frac{7}{10}$	61 to 68	Wind S. W. Strong dew. Morning clear; cloudy before 10. White clouds all day.	Hibiscus $8\frac{1}{2}$ to $5\frac{1}{2}$. Anagallis 10 to $2\frac{1}{2}$. Oenothera $6\frac{1}{2}$ p. m.
14.	29 $\frac{6}{10}$	63 to 69	Wind W. S. W. Heavy clouds and sunshine.	Hibiscus 8 to $4\frac{1}{2}$. Anagallis $9\frac{1}{2}$ to $2\frac{1}{2}$. Oenothera $6\frac{1}{4}$ p. m.
15.	29 $\frac{5}{10}$	65 to 68	Wind W. S. W. Heavy clouds and wind. Fair all day.	Hibiscus $8\frac{1}{2}$ to 4. Anagallis $9\frac{3}{4}$ to $2\frac{3}{4}$. Oenothera $6\frac{3}{4}$ p. m.
16.	29 $\frac{6}{10}$	66 to 68	Wind W. S. W. Covered. Heavy clouds with some wind. Fair all day.	Hibiscus 8 to 5. Anagallis 9 to 2. Oenothera past 7.
17.	29 $\frac{11}{20}$	64 to 73	Wind W. S. W. Clouds with sunshine and wind.	Hibiscus $8\frac{1}{2}$ to $4\frac{1}{2}$. Anagallis $9\frac{1}{2}$ to $2\frac{3}{4}$. Oenothera $6\frac{3}{4}$ p. m.

Sept.

	Barom.	*Therm.*	*Weather.*	*Observations.*
Sept. 18.	$29\frac{5}{10}$	66 to 68	Wind S. W. Covered. Still. Small ſhowers.	Hibiſcus $8\frac{1}{2}$. Anagallis 10 to $1\frac{3}{4}$. Oenothera paſt 7.
19.	$29\frac{4}{10}$	63 to 66	Wind E. Covered. Gentle rain in the morning. Very moiſt all day.	Hibiſcus and Anagallis not open. Oenothera paſt 7.
20.	$29\frac{2}{10}$	64 to 66	Wind S. S. W. Heavy clouds. Rain at 4.	Hibiſcus 9 to 5. only half open. Anagallis 12 to $2\frac{1}{2}$, half open. Oenothera 6 p. m.
21.	$29\frac{3}{10}$	64 to 67	Heavy rain. Clearer at $\frac{1}{2}$ af. 10. Wind W. S. W. Sunſhine, with heavy white clouds.	Hibiſcus $12\frac{1}{2}$ to 6. Anagallis 1 to $2\frac{1}{2}$ but never quite open. Oenothera $6\frac{1}{2}$.
22.	$29\frac{3}{10}$	62 to 63	Strong dew. Still E. N. E. Heavy clouds with ſunſhine. Covered at noon.	Hibiſcus 10 to 5, half open. Anagallis $10\frac{1}{2}$ to $1\frac{1}{2}$, half open. Oenothera after 7.
23.	$29\frac{4}{10}$	60 to 63	Wind E. Covered.	Hibiſcus and Anagallis not open. Oenothera after 7.
24.	$29\frac{4}{10}$	59 to 61	Wind E. Covered. Still.	Hibiſcus and Anagallis ſcarcely open. Oenothera after 7.
25.	$29\frac{4}{10}$	59 to 61	Wind E. Covered. Windy. Some rain in the evening.	Hibiſcus ſcarcely open. Anagallis not open. Oenothera 6 p. m.
26.	$29\frac{4}{10}$	59 to 61	Wind N. E. Windy with rain.	Hibiſcus and Anagallis not open. Oenothera after 7.
27.	$29\frac{6}{10}$	59 to 61	Wind E. Windy. Light clouds with ſunſhine. Covered at noon.	Hibiſcus ſcarcely open. Anagallis at 11, half open.
28.	$29\frac{13}{20}$	58 to 59	Wind E. Covered.	Nothing open.
29.	$29\frac{7}{10}$	57 to 59	Wind N. E. Strong dew. Morning clear, but covered before noon.	Hibiſcus not open. Anagallis half open at 11.
30.	$29\frac{8}{10}$	56 to 59	Wind N. E. Morning clear, afterwards great white clouds.	Hibiſcus 12 half open. Anagallis 11 to 3 quite open.
Oct. 1.	$29\frac{13}{20}$	55 to 56	Wind N. W. Covered. Sun broke out at noon.	Hibiſcus not open. Anagallis $11\frac{1}{2}$ to near 2.

After this to the 13th the barometer ſunk to $\frac{3}{10}$ and $\frac{1}{10}$. The thermometer varied from 50 to 58. The wind was chiefly W. to W. N. W. The weather was moſtly covered and windy. And the flowers did not open.

XII. *Remarks on ſome Foreign Species of Orobanche.* By *James Edward Smith, M.D. F.R.S. P.L.S.*

Read October 3d, 1797.

THE Britiſh ſpecies of *Orobanche* have till lately been very ill underſtood, and it appears upon examination that the foreign ones ſtill require elucidation. The very firſt ſpecies in Linnæus, *Orobanche lævis*, when put to the teſt of botanical criticiſm, is found to be a non-entity; its hiſtory having been fabricated, partly from ſynonyms which belong to *Orchis abortiva*, and partly from thoſe of a real *Orobanche*, which however Linnæus never knew, and which does not anſwer to the name or character of his ſuppoſed *lævis*.

The original authority for the *Orobanche lævis* is the firſt edition of *Species Plantarum*, p. 632, where it is taken up entirely from other authors, who have deſcribed it as being found near Montpellier, of which place Linnæus accordingly gives it as a native, nor does he mention its being known in any other country. He had no ſpecimen from thence in his collection, though he had then before him a ſpecimen of a Siberian plant, figured in the *Flora Sibirica* of Gmelin, (who ſent it to Linnæus,) *vol.* iii. *tab.* 46. *fig.* 2, as an *Orobanche*, which Linnæus ſuſpected might be the ſame with the Montpellier ſpecies, and therefore marked it *lævis*, with a mark of interrogation, as it ſtill remains in his herbarium. It anſwers indeed

deed to the ſpecific definition of *lævis, caule ſimpliciſſimo* lævi, *ſtaminibus exſertis*; but there is no reaſon to believe that definition was made from the contemplation of this ſpecimen, rather than from the ſynonyms and figures quoted in the *Species Plantarum:* and as Linnæus never farther deſcribed the ſpecimen, nor referred to Gmelin, neither did he ever mention Siberia as the native country of his *Orobanche lævis*, this can never be taken for ſuch, even though there ſhould prove to be no other exiſting, as we now hope to demonſtrate; more eſpecially as this Siberian ſpecimen proves a *Lathræa*, having a monophyllous quadrifid calyx, and the true habit of that genus.

In order clearly to underſtand the hiſtory of this miſtaken ſpecies, the *Orobanche lævis*, it is neceſſary to analize its ſynonyms chronologically. We begin therefore with

OROBANCHE magna purpurea monſpeſſulana. *Bauhin's Hiſt. Plant.* vol. ii. p. 782.

This plant is evidently taken up by John Bauhin from Lobel, in whoſe *Icones*, p. 269, we find two figures. The firſt repreſents, I think unqueſtionably, though rudely, the *Orchis abortiva* of Linnæus, and is marked *Orobanche major e Gramuntio luco Monſpelliensium.* The ſecond exhibits a true *Orobanche*, and is marked *Orobanche quarta.* Now it appears that the deſcription of John Bauhin belongs to the firſt of theſe plants, though he, or his editor, has by miſtake annexed to that deſcription a copy of the ſecond figure. Whether the deſcription be taken from any of Lobel's other publications, I have not been able to determine, nor is that point of any conſequence; it is ſufficient that it agrees altogether with the *Orchis* above mentioned, and not with any *Orobanche*, the flowers being deſcribed "like thoſe of an *Orchis* with ſhort ſpurs, and the root like the upper part of that of an *Orchis*, but without any *teſticuli* or bulbs."

Bauhin

Bauhin justly censures Lobel's figure, as wanting the spurs; he also enquires whether this plant may not be what Clusius mentions in his *Historia*, as "a plant like his *Pseudo-leimodoron*, but much paler, found in the wood of Gramont, and several other woods about Montpellier." There can be no doubt of the *Pseudo-leimodoron* of Clusius, *Hist. Plant.* 270, being the *Orchis abortiva*, though a figure of *Ophrys Nidus Avis*, by an error common in books with wooden cuts, is put for it*. The description in that work is indeed copied from his *Stirpes Pannonicæ*, where the plant is named *Limodorum austriacum*, without any figure; and the paler variety, which he remembered to have seen formerly near Montpellier, is also there mentioned. I consider therefore the descriptions of John Bauhin and Clusius, and the first or left-hand figure of Lobel's *Icones*, p. 269, as clearly belonging to *Orchis abortiva*, and having nothing to do with any *Orobanche*. With respect to the second or right-hand figure of Lobel, copied into Bauhin's work by mistake, it as indubitably, I think, represents the *Orobanche* lately published in *Tab.* 423 of *English Botany*, by the name of *cærulea*, which several authors there mentioned have taken for the Linnæan *lævis*: it cannot however remain, when the above errors are cleared away, as the true *lævis*, because it is not in fact smooth, neither do the stamina project out of the flower; though Morison, in his copy of this figure, *sect.* 12. *t.* 16. *f.* 2, has in one flower so represented them; for the compiling and copying tribe of authors are sure to add something every now and then to the general stock of error, how little soever they may supply to that of solid knowledge. The style indeed projects in Lobel's figure, and all its copies; the stem too is represented smooth, and the form of the corolla is very ill expressed: yet these figures can be designed for nothing else than our *O. cærulea*.

* Villars points out this error in his *Plantes de Dauphiné*, vol. ii. p. 40.

The

The next ſynonym in the *Species Plantarum*, that comes under conſideration, is that of Caſpar Bauhin:

OROBANCHE majore flore. *Bauhin. Pin.* 88.

This author quotes only the *Orobanche quarta* of Lobel's *Icones*, and an *Orobanche* of the *Hortus Eyſtetenſis*, a work I have not in my poſſeſſion. We muſt conclude that he intended the *Orobanche cærulea*, eſpecially as he has the *Orchis abortiva* in the preceding page, by the name of *Orobanche Monſpeliaca floribus oblongis*, under which he properly cites Lobel and Cluſius.

Moriſon's figure, mentioned above, is alſo referred to by Linnæus, in the ſame paragraph in which he quotes C. Bauhin. What this author has ſaid, p. 502, likewiſe refers to the *Orobanche cærulea*; and he rightly quotes another paragraph of Cluſius, who, in his *Hiſtoria*, p. 271, in a ſlight and ſuperficial way mentions having ſeen the ſame plant growing in corn-fields at Montpellier, upon common thiſtles.—Moriſon has the *Orchis abortiva* in the ſame plate with the above, *fig.* 4, and, in p. 502 of his letter-preſs, copies John Bauhin's account of it as an *Orobanche*. He deſcribes this very plant over again, *p.* 503, *n.* 19, but without a figure.

The only remaining ſynonym in the *Species Plantarum* is that of Sauvages, from his *Methodus Foliorum*, which is an arrangement of the Montpellier plants, both wild and cultivated, according to their leaves:

OROBANCHE caule ſimplici cæruleo bracteis brevibus. *Sauv. Meth.* 4.

This author quotes John Bauhin only; and as he has the *Orchis abortiva* in the ſame page, under the name of *Limodorum*, there can be

no doubt of his having, in the paragraph above referred to, intended the *Orobanche cærulea*, though he either did not read, or did not attend to, Bauhin's deſcription. He has moreover a repetition of *Orchis abortiva*, *p.* 23, *n.* 114.

I beg leave to conclude with a reference to one original author at leaſt, who really ſtudied and underſtood the plants he enumerated, as well as the books he quoted, Magnol in his *Botanicum Monſpelienſe.*

This writer, *p.* 195, evidently deſcribes the *Orchis abortiva* by the name of *Orobanche magna purpurea Monſpeſſulana*, I. B, referring alſo to Lobel and Cluſius. He mentions having often gathered the plant in the wood of Gramont in April and May, and juſtly criticiſes the figures of the above authors. "The lower lip of the flower in Cluſius's figure," he obſerves, "is cloven, which is not the caſe in the Montpellier plant." This figure I have already pointed out as repreſenting the *Ophrys Nidus Avis.* Magnol farther remarks, that "the figure of Bauhin is faulty, there being no proportion between the ſtem and flowers; and that it is a copy of the *Orobanche quarta* of Lobel. The figure of Lobel," he adds, "would have been better if the roots had been drawn as in that of Cluſius, and the flowers repreſented with ſhort ſpurs."—From all this there can be no queſtion about the plant of Magnol; and Gouan, though he quotes him under *Orobanche lævis*, *Hort. Monſp.* 308, expreſſes a ſuſpicion that he meant the *Orchis abortiva:* but neither of theſe writers, nor any following one that I can find, has hit upon the true cauſe of all the confuſion that has enveloped the plants in queſtion, which is John Bauhin's having copied one figure of Lobel for the other. Magnol has our *Orobanche cærulea*, *p.* 196, by the name of *Orobanche ſubcæruleo flore, ſive ſecunda Cluſii*; and mentions having

having often found it, in the month of May, in graſſy places near the ſea—the very ſituation in which it occurs in Norfolk. Gouan very erroneouſly refers to this ſynonym of Magnol as belonging to *Orobanche ramoſa.* The *Botanicum Monſpelienſe* of Magnol being to the Montpellier botaniſts what Ray's *Synopſis* is to our Engliſh ones, they are neceſſarily ſuppoſed to know every plant it contains; and what they really do not underſtand, they refer to ſome other ſpecies as varieties, but too often on inſufficient grounds.

To contribute ſomething more towards the hiſtory of this confuſed genus of *Orobanche*, I ſhall add the characters of two foreign ſpecies not hitherto aſcertained. The Britiſh ones will ſoon be more fully elucidated than they have hitherto been, by the labours of the Rev. Mr. Sutton, a member of this Society. Our joint obſervations, particularly the characters we have diſcovered for diſcriminating the ſpecies, may perhaps be of uſe to botaniſts of other countries, who may make ſtill farther diſcoveries than we have made; ſo that in time a tolerably complete hiſtory of the genus may be obtained, for which we have ſcarcely materials at preſent ſufficient.

1. OROBANCHE *caryophyllacea.*

O. caule ſimplici, corolla inflata fimbriato-criſpa; labio inferiore laciniis obtuſis æqualibus, ſtaminibus intùs baſi hirſutis.

O. major. *Pollich Palatin.* v. ii. 200.

O. major, garyophyllum olens. *Bauhin. Pin.* 87.

Gathered on ſhrubby hills near Valcimara at the foot of the Apennines, in April 1787. *Tour on the Continent, vol.* ii. 308. *Linnæus received the ſame from Siberia.*

This has very much the habit of the *Orobanche major* of *Engl. Bot. t.* 421. and all other Britiſh authors, and has been ſo univerſally

 con-

confounded with it by foreigners, that it is utterly impoſſible to allot to each its proper ſynonyms, no botaniſt having as yet properly deſcribed the ſtamina, in which the true character reſides; much leſs do the figures of old authors lend any aſſiſtance towards this diſcrimination. I here quote Caſpar Bauhin, merely on account of his mentioning the clove-like ſmell: in his ſynonyms he appears to confound theſe two, and poſſibly ſeveral more ſpecies. We have no reaſon to think that Linnæus intended the one more than the other for his O. *major*, he having preſerved no Swediſh ſpecimen; but I have retained that name for the Engliſh plant, which is alſo the more common of the two throughout Europe. When ſome Engliſh writers tell us it has "a faint ſmell of cloves," I believe that remark has been made rather from regard to books than to nature; for the O. *caryophyllacea* has indeed not a *faint*, but a very ſtrong and fragrant ſmell of cloves when freſh, as I can witneſs: but I never met with any body who could perceive the leaſt degree of the ſame ſmell in any *Orobanche* found in Britain.

With reſpect to more modern ſynonyms of theſe two ſpecies, Villars in his *Plantes de Dauphiné*, vol. ii. 407, evidently appears to have known them both, but thought them one ſpecies; he having only been anxious to diſtinguiſh from them the O. *cærulea*, *Engl. Bot. t.* 423, about which indeed there can be no diſpute. Pollich's moſt excellent deſcription leaves no doubt of his O. *major* being my *caryophyllacea*; I have therefore quoted him without any heſitation. Haller under his No. 295 ſeems to have intended neither of theſe, but rather the O. *minor*, *Engl. Bot. t.* 422, except that he mentions the clove-like odour. He refers to Micheli, who publiſhed a little Italian work in octavo at Florence, in 1723, upon this *genus*, chiefly to indicate a method of extirpation. This book enumerates many varieties, among which probably our new ſpecies are all to be found.

The

The O. *minor* is the only one I have ever met with growing in such situations, or in such abundance as to be deemed a weed; and it attaches itself, as Haller observes, to the roots of *Diadelphous* plants, particularly clover. Gmelin in his *Flora Sibirica* mentions several varieties of what he took for O. *major*; but it is not possible to determine what they really are.

β Haller has recorded as a variety of his 295, a Swiss *Orobanche*, of which a drawing had been sent him, "with a very dense conical spike, a very short flower, and style projecting considerably out of it," which, he adds, "is so remarkable as to deserve being reckoned a species, provided more specimens could be discovered." This same plant is to be found in the Linnæan herbarium, gathered in eastern Pomerania by a Mr. Brunnemann, and very well preserved. If a variety of any thing, it must be O. *caryophyllacea*, with which the stamina precisely agree; nor does it differ from the other specimens in my possession, except in being more luxuriant, with a greater number of flowers in a younger, and therefore conical, spike, and in the corolla and stamina being not half so long as usual, while the style protrudes considerably. The germen is smooth; style slightly pubescent, incurved, with a dark-coloured stigma; bracteæ, calyx, and divisions of the corolla exactly as in the species to which I have ventured to refer it.

I have only to observe farther, that the *Orobanche caryophyllacea* agrees very nearly with O. *major* in habit and size, as well as the appearance of its flowers; but differs from the latter in having the three segments of the lower lip obtuse, and much more fringed and curled. The germen also is entirely smooth, which in O. *major* is hairy in the upper part, and the style is much less downy than in that species. The most striking mark, however, of O. *caryophyllacea* consists in the lower part of the stamina, on the inside, being thickly

 clothed

clothed with hairs, whereas that part in O. *major* is always perfectly ſmooth. The ſtigma of O. *caryophyllacea* is brown or purpliſh; that of O. *major* yellow.

2. OROBANCHE *gracilis*.

O. caule ſimplici, corolla inflata; labio inferiore breviſſimo laciniis obcordatis inæqualibus fimbriato-criſpis; ſtaminibus ſtyloque piloſis exſertis.

Gathered in hilly paſtures at St. Orſeſe near Genoa, in July 1787.

I can meet with no ſynonyms for this ſpecies. It has a taller and more ſlender ſtem than O. *major*, and is upon the whole leſs pubeſcent. The bracteæ are ſhorter than the flower. Corolla the ſize of O. *major*, but the upper lip is of a dark or purpliſh colour, and leſs fimbriated or criſped than in that ſpecies. The lower lip is remarkably ſhort, in three obcordate fimbriated ſegments, of which the middle one is larger than the other two, and is connected at its baſe with the very prominent two-lobed palate of the flower. The ſtamina are ſlender, thinly clothed all over, as well as the ſtyle, with ſcattered hairs, and project out of the mouth of the flower. The germen is ſmooth. I do not recollect its having, when freſh, peculiar ſmell.

The O. *gracilis* has moſt affinity to the *minor* in ſome of its characters; but differs in its larger inflated corolla, ſhort lower lip, longer ſtamina and hairy ſtyle.

XIII. *A Deſcription of Five Britiſh Species of Orobanche. By the Rev. Charles Sutton, B. D. A. L. S. late Fellow of St. John's College, Cambridge.*

Read December 5, 1797.

FROM the deſire of exciting a more accurate inveſtigation and deſcription than has hitherto been made of the ſeveral ſpecies of *Orobanche*, both Britiſh and Foreign, I tranſmit to the Society a deſcription of thoſe which are found in the county of Norfolk: I ſhall premiſe only a ſhort obſervation or two upon their general habit and manner of growth.

The firſt thing that is apt to ſtrike us with reſpect to theſe plants, is, that they are *Paraſitic*; but they are not altogether ſo, like the ſeveral ſpecies of Epidendrum, Viſcum, &c. They acquire ſuſtenance and ſtability not only from the foſter-plants to which they are attached, but alſo, and that in no ſmall degree, from the ſoil, into which they ſend forth radical fibres.

All the ſpecies exhibit an ungraceful formality from the defect of leaves, and have their ſurface more or leſs beſet with minute pellucid glanduliferous hairs, which project perpendicularly from the ſtems, ſquamæ, bracteæ, calyces, corollæ, and are ſometimes found within the flowers, upon the very ſtamina and piſtilla: theſe, according to the remarks of Guettard, have each an articulation at the

the diſtance of about two-thirds from their baſe, and are tipped with a globular ſort of cup, bearing a viſcid gland: we may ſuppoſe them to be intended to carry off ſecretions, and to anſwer the purpoſes of leaves in performing the office of reſpiration, &c. It is to the volatility of theſe ſecretions that we are to attribute the difficulty of preſerving living ſpecimens for any length of time, and the harſh ungracious appearance they aſſume in an herbarium.

They emit no ſmell (I ſpeak of thoſe only which I am about to deſcribe), have an acrid aſtringent taſte, and are rejected by all kinds of animals, except the minuter tribes of *Cimices* and *Thripſes*.

They are acotyledons; for, when a ſeed has attached itſelf to the root of any living plant, to which it is ſuited by its nature to adhere, it ſwells into a pellucid ſquamoſe gem or bulb; and after throwing out around the point of adheſion ſeveral tender fibres, it puſhes up at once into a perfect plant, without any lateral lobes or cotyledons; developing firſt the ſquamæ and then the ſtalk, with a capitulum of flowers concealed by bracteæ, in form reſembling a young head of aſparagus: the flowers afterwards expand in ſucceſſion upwards, and the capitulum becomes a ſpike. See Tab. xvii. fig. 1 and 2. —Adanſon has claſſed this genus among his monocotyledons.

Notwithſtanding what has been ſaid of the banefulneſs of the *Orobanche*, that it deſtroys the plants which feed it, I have had no experience of the fact: to me it has ever ſeemed to

"Grow with their growth, and ſtrengthen with their ſtrength."

Dr. William Turner, one of our earlieſt and moſt judicious herbaliſts, has given us the following account of it: he calls it Choke-weed, and ſays, "It is called about Morpeth in Northumberland (the place of his nativity) Newe Chappel Flower, becauſe it

grewe in a chappel there, in a certaine place called Bottell-bankes, whereas the unlearned people dyd worſhyppe the image of St. Marye, and reckoned that the herbe grewe in that place by the vertue of that image.—Beſides it that Dioſcorides wryteth, I have marked myſelfe that this herbe growethe muche aboute the rootes of broome, ye whych it claſpeth aboute with certaine lyttel rootes on everye ſide lyke a dogge holdying a bone in his mouth: notwithſtanding I have not ſeen any broome choked with this herbe, howebeit I have ſeen the herbe called three-leved graſſe or claver utterly ſtrangled, al the natural juice clene drawne oute by thys herbe."

It is not improbable that more than one ſpecies is included in this account, for which reaſon I have given the extract, and that the "Choke-weed" of the clover may be different from the "Choke-weed" of the broom, and that the "Newe Chappel Flower" diſtinct from both, may be a ſpecies not yet defined. Be this ſo or not, it will at leaſt be worth while to make further reſearches, and inveſtigate what may yet remain; in particular to make enquiry after that which Mr. Curtis ſpeaks of, on the information of Mr. Thomas White, as growing upon walls in Pembrokeſhire and the decayed floor of an old caſtle; for none of thoſe with which we are at preſent acquainted are found in ſuch ſituations.

* *Corollis Quadrifidis.*

1. OROBANCHE *major.*

Caule ſimpliciſſimo. Corollis quadrifidis, inflatis. Staminibus inferne nudis. Stigmate bilobo, lobis diſtantibus. Stylo ſuperne pubeſcente.

O. *major*, caule ſimpliciſſimo pubeſcente, ſtaminibus ſubexſertis. *Curtis Fl. Lond. faſc.* 4. *tab.* 44.

O. *major*,

O. *major*, *Withering Bot. Arr. 3d edit. p.* 557.

O. *major*, ſtem ſimple, corolla inflated; its upper lip undivided; lower in three equal ſegments. Stamina ſmooth. Style downy. *Smith in Engl. Bot. tab.* 421.

Radix craſſa, carnoſa, interdùm bulboſa, perennis, paraſitica; radici lignoſæ *ſpartii ſcoparii*, et *ulicis uropæi* imprimis adhærens; radiculis ſimplicibus, fragiliſſimis inſtructa; plures emittens caules. *Caulis* ſimpliciſſimus erectus, carnoſus, angulatus, piloſus *, craſſitie digiti, altitudine pedali et ultra, ex luteo fuſcus, dilutè purpuraſcens, ſquamis lanceolatis ſparſis, ſub ſolo confertioribus. *Flores* ſpicati, piloſi, fuſci, interdùm purpuraſcentes, ſtigmatibus flavis; perſiſtentes rigidi, ſordidè-ferruginei. *Bracteæ* ſimplices, lanceolatæ, piloſæ, floribus interdùm longiores. *Calyx*, perianthium ſubæquale, piloſum, diphyllum, laterale foliolis profundè bifidis, laciniis acutis inæqualibus.—Variat perianthio monophyllo quadrifido a parte poſteriori uſque ad baſin partito. *Corolla* tubuloſa, quadrifida, piloſa, tubo ſurſum inflato, incurvo, dorſo ſubcarinato; faux valdè aperta; limbus bilabiatus obſoletè denticulatus; labium ſuperius fornicatum, obtuſum, integrum, parùm reflexum; inferius trilobum, lobis ferè æqualibus, acutis, planiuſculis, intermedia dependente. *Nectarium*, glandulæ † tres anticè germini inſertæ. *Stamina*, filamenta quatuor ſubulata, ſupernè piloſa, infernè omninò nuda, canaliculata plana, duo breviora lateribus, duo longiora anticæ parti tubi inſerta, decurrentia, apice recurva; antheræ didymæ, altero apice mucronatæ, ad-

* Si quas plantarum partes in his deſcriptionibus uno verbo *piloſas* vel *piloſiuſculas* dixero, pilos glanduliferos intelligat lector.

† Sic Curtis, & ſic amicus noſter accuratiſſimus D. Rob. B. Francis:—Ipſe autem nullum offendi.

hærentes,

hærentes,—defloratæ unà cum ſtylo exſertæ. *Piſtillum*, germen oblongum, nitidum, piloſiuſculum; ſtylus filiformis, piloſiuſculus, apice pubeſcens, purpuraſcens; ſtigma bilobum, lobis globoſis, flavis, diſtantibus, medio tranſversè rimoſum. *Pericarpium*, capſula ovato-oblonga, longitudinalitèr dehiſcens, unilocularis bivalvis; *Semina* minuta, numeroſa, ſubturbinata, reticulato-celluloſa. *Receptacula*, quatuor linearia lateralia, adnata.

Floret Junio. ♃.

Habitat in dumetis ſterilioribus, et in locis incultis—Thorp, Brook, Baconſthorp.

As this ſpecies has generally paſſed for O. *major*, and has been figured and deſcribed as ſuch by the authors of the *Flora Londinenſis* and *Engliſh Botany*, I have retained that trivial name, though it is now ſuſpected not to be that of Linnæus, nor the O. *major Garyophyllum olens*, ſo often mentioned, of C. Bauhin. Of the many ſynonyms to O. *major*, quoted by Reichard in his edition of the *Syſtema Plantarum* of 1780, vol. 3. p. 183, it is extremely difficult which to refer to our plant: we may ſafely however exclude thoſe from Bauhin *Pin.* 87.—Loefling, p. 151, original edition,—and Pollich, No. 600. Dr. Withering, in his 3d edition of the *Bot. Arrangement*, has judiciouſly excluded the long deſcription of Loefling. I dare not quote any of his ſynonyms, for want of ſufficient marks of diſcrimination: the figures he refers to in Morriſon xii. 16. 1. Gerard em. p. 1311, Cluſius i. p. 270, Dodonæus p. 552, and Lobel *Ic.* ii. 89, are copies of each other, and, if meant for our plant, are very bad repreſentations of it. J. Bauhin's ii. p. 780, is equally uncertain; that of Matthiolus p. 536, copied in *Gerard*'s *Herbal*, 1ſt edition, p. 1130, and that of *Tabernæmontanus*, p. 684, though not ſatisfactory, are a great deal better.

2. OROBANCHE *elatior.* *Tab.* 17.

Caule ſimpliciſſimo. Corollis quadrifidis. Staminibus infernè piloſis. Stigmate obcordato. Stylo ſupernè glabro.

Radix præcedentis, radici lignoſæ *Centaureæ Scabioſæ* et *Trifolii pratenſis* imprimis adhærens. *Caulis* præcedentis, ſed procerior. *Flores* longè ſpicati, piloſi, pallidè rubeſcentes, venis ſaturatioribus notati; ſtigmatibus flavis; perſiſtentes, rigidi, ſubcompreſſi, ferruginei—centum et plures in eâdem ſpicâ interdum numeravi. *Bracteæ* præcedentis. *Calyx*, perianthium abbreviatum, piloſum, monophyllum, quadrifidum, ponè uſque ad baſin partitum, laciniis lanceolatis, acuminatis, duabus poſterioribus divaricatis, longiuſculis; levitèr ſtriatum, ſordidè album, lineis dilutè rubris notatum. *Corolla* tubuloſa, quadrifida, piloſa; tubo cylindraceo recurvo; dorſo carinato; faux aperta; limbus bilabiatus, inæqualis, fimbriato-criſpus; labium ſuperiùs rotundatum, reflexum, integrum; inferiùs trilobum; lobis æqualibus, rotundatis. *Nectarium*, glandulæ quatuor nectariferæ ad baſin filamentorum, tubo inſertæ. *Stamina*, filamenta quatuor ſubulata, anticè glabra, nuda, poſticè ad baſin piloſa, pilis non glanduliferis, duo breviora lateribus, duo longiora anteriori tubi parti inſerta. *Antheræ* didymæ, altero apice mucronatæ, levitèr adhærentes; defloratæ unà cum ſtylo exſertæ. *Piſtillum*, germen ovatum, glabrum, nudum; ſtylus glaber, nudus; ſtigma bilobum, obcordatum, flavum, medio tranſversè rimoſum. *Pericarpium*, capſula ut congenerum. *Semina* rugoſa, ſeu obſoletè reticulata.

Floret Julio, Auguſto 4.

Habitat in agris *Trifolii pratenſis*, non in ſementis anno; et in mar-

ginibus agrorum juxta *Centaureas scabiosam* et *nigram*, *Scabiosam arvensem*, &c.—Gunton, Kelling, Sheringham, Catton, Costesey, in glareosis.

This is no uncommon plant: it has hitherto been constantly confounded with the preceding; but though they are similar in general appearance, the difference between them is very discernible on a closer inspection; and they who acknowledge the force of that sentiment of Linnæus, that "minimis partibus per totum naturæ campum certitudo omnis innititur, quas qui fugit pariter naturam fugit*," will be ready to allow this to be a distinct species. There is reason to suppose it may have been noticed by Ray very early, though not particularly distinguished by him; for in his *Historia Plantarum circa Cantabrigiam nascentium*, printed in 1660, his first work in Botany, he speaks of having found the O. *flore majore* of J. B. "in a field of barley, on the right hand of the way between Cambridge and Grantchester, also in a corn-field at Cherryhinton," places in which this is very likely to be found, as it grows among herbaceous plants, and never on the roots of broom or furze:—He adds, "also at Gamlingay, growing at the roots of broom plentifully:" here he undoubtedly means our O. *major*, for that is still to be found there in abundance. In his *Catalogus Plantarum Angliæ*, published ten years afterwards, he notices them thus: "ad radices genistæ, interdum et inter segetes."

3. OROBANCHE *minor*.

Caule simplicissimo. Corollis quadrifidis. Staminibus infernè pilosis. Stigmate retuso. Stylo supernè glabro.

* *Philosophia Botanica*, p. 222. under the 280th aphorism: Fructificationis partes sæpius constantissimas differentias subministrant.

O. *major*, caule ſimplici, bracteis lanceolatis, flore majoribus. *Loeſl. Plantæ Hiſpanicæ rariores*, No. 35.

O. *major* β. minoribus floribus albidis, ſpicâ denſiore. *Haller Stirp. Helv.* 1 edit. p. 610.

O. flore minore, *R. Syn.* 3 edit. p. 288.*

O. *major* β *Hudſ. Flo. Angl.* 1 edit. p. 232 ?

O. *ramoſa* β *Hudſ. Flo. Angl.* 2 edit. p. 266 ?

O. *minor*. Stem ſimple. Corolla tubular; its upper lip undivided; lower in three curled ſegments, of which the middle one is lobed. Stamina ciliated. Style ſmooth.—*Smith in Engl. Bot.* tab. 422.

Radix priorum, ſquamis rarioribus; radici lignoſæ *Trifolii pratenſis* imprimìs adhærens. *Caulis* 6—12 pollicaris, ſimpliciſſimus, erectus, teretiuſculus, piloſus, craſſitie ferè pennæ anſerinæ, incarnatus, interdum luteus, ſquamoſus, ſquamis rarioribus—caules plurimi interdum aggregati. *Flores* ſpicati, luteo-albidi, venis purpureis notati, piloſi—variant colore luteo;—perſiſtentes, rigidi, ferruginei;—flos inferior ſæpè pedunculatus. *Bracteæ* ſimplices, lanceolatæ, piloſæ, ferè longitudine florum. *Calyx*, perianthium ſubæquale, cauli concolor, piloſum, diphyllum, laterale, foliolis nunc bifidis; laciniis anguſtiſſimis inæqualibus; nunc ſimplicibus lanceolatis, integris, vel uno latere inciſis. *Corolla* tubuloſa, quadrifida, piloſa; tubo cylindraceo, patente, incurvo; dorſo carinato; faux aperta; limbus bilabiatus, inæqualis; labium ſuperiùs rotundatum, crenulatum, integrum; inferiùs trifidum, laciniis æqualibus, rotundatis crenulatis—variat intermediâ interdum trilobatâ. *Nectarium*, glandulæ quatuor crocatæ nectariferæ ad baſin filamentorum. *Stamina*, filamenta quatuor ſubulata, anticè glabra, nuda, poſticè piloſa, pilis non glanduliferis, duo breviora lateribus, duo longiora anteriori tubi parti inſerta.

Antheræ

Antheræ didymæ, altero apice mucronatæ—defloratæ unà cum ſtylo exſertæ. *Piſtillum*, germen ovato-oblongum, nudum; ſtylus filiformis, ſubnudus; ſtigma retuſum, margine dilatatum, purpureum, medio tranſversè rimoſum, aliquando monſtroſum evadit triangulare vel quadratum. *Pericarpium*, capſula ut congenerum. *Semina* rugoſa, vel obſoletè reticulata.

Dignoſcitur prima facie—a præcedente, calyce diphyllo variabili;
—a majore, corollâ cylindraceâ;
—ab utrâque, corollâ minore.

Floret Julio, Auguſto, ♃ vel ♂.

Habitat in agris ad radices *Trifolii pratenſis*, non in ſementis anno; et in paſcuis inter *Hypochærin radicatam*, &c.—Sheringham, Weyborn, Eaton, Frettenham.

Having been favoured by the Preſident with a ſight of the plants in the Linnæan herbarium, it was with great pleaſure I found there one of this ſpecies: it was inſcribed by Linnæus, *Orobanche major*, and was given him by Loefling; moſt probably it was one of thoſe from the King of Spain's garden at Aranjuez, found at the roots of elms, which Loefling has deſcribed among his *Plantæ Hiſpanicæ rariores*. That it forms a diſtinct ſpecies there can now be very little doubt: the figure in *Engliſh Botany* is taken from one of my ſpecimens—it repreſents the calyx perfectly well, but not the ſtigmata. It is frequently to be found with a much longer ſpike; in which caſe the flowers are not only more numerous, but are much cloſer ſet than in the figure. From its growing ſo very copiouſly among clover, I am of opinion it is the ſame which Dr. Turner noticed as being ſo pernicious to it. None of the other old Herbaliſts have mentioned it, nor has it been introduced into any of our Britiſh Floras, if we except Hudſon, who is thought to have it in his

firſt

first edition of *Flo. Angl.*; but, from his uncertainty respecting it afterwards, it should seem he took it upon trust from Dillenius, rather than from any knowledge he himself had of it. Dillenius, in his edition of *Ray's Synopsis*, speaks of its being found in a field of oats near Rochester. It might possibly be not unknown to Ray. I am at least inclined to think so, from a passage in his *Historia Plantarum*, vol. ii. p. 1227, where having described the O. majore flore J. B. he adds, "O. flore minore J. B. adeo parùm differt a præcedente ut specie diversum esse mihi persuadere vix possum."

* * *Corollis quinquefidis.*

4. OROBANCHE *cærulea.*

Caule subsimplici. Corollis quinquefidis. Bracteis ternis. Calycibus tubulatis, semiquadrifidis.

O. *lævis*, caule simplicissimo, lævi, staminibus exsertis. *Syst. Plant. ed. Reichard. vol.* iii. *p.* 183.

O. *purpurascens*, caule simplicissimo pubescente staminibus inclusis. *Syst. Nat. ed. Gmelin*, p. 954.

O. *purpurea*, caule simplicissimo pubescente staminibus inclusis. *Jacquin Flo. Aust. tab.* 276.—Ibid. *enum. Vindob. Obs.* 50.

O. caule simplici, stipulis ternatis, calyce quinquefido. *Haller Stirp. Helv.* 2 *edit.* No. 294.

O. floribus cœruleis laxè spicatis. *Gmelin Flo. Sib. vol.* iii. *p.* 215. *tab.* 46. *fig.* 1.

O. *cærulea*, caule simplici, basi bulboso, floribus numerosis incurvis. *Villars Dauph. vol.* ii. *p.* 406.

O. *ramosa* β. *Withering Bot. Arr.* 3 *edit. p.* 558.

O. *cærulea.* Stem simple. Corolla tubular; its upper lip cloven and notched, lower in three equal entire segments. Stamina smooth. Bracteæ three. *Smith in Engl. Bot. tab.* 423.

Radix

Radix ut congenerum; radiculis diversarum herbarum radices complectentibus. *Caulis* 6—10 pollicaris, subsimplex, erectus, rigidus, pilosiusculus, parùm flexuosus, angulatus, sublignosus, ex luteo olivaceus, crassitie pennæ anserinæ vel cygneæ, squamosus, squamis ovato-lanceolatis. *Flores* laxè spicati (spicâ obtusiusculâ), violacei, venis saturatioribus notati, levitèr pilosi, floribus *ramosæ* affines sed majores; persistentes torti, compressi, cernui, fusci—flos inferior sæpè pedunculatus. *Bracteæ* ternæ calyci vix æquales, duæ laterales interiores lineari-lanceolatæ, intermedia exterior ovato-lanceolata, pilosæ, pilis brevibus. *Calyx*, perianthium monophyllum, cauli concolor, tubulatum, semiquadrifidum, laciniis æqualibus lanceolatis, acuminatis, pilosis, cum rudimento quintæ ad incisuram profundiorem posticam; interdum, sed rarò, adest quinquefidum cum rudimento sextæ posticæ. *Corolla* ringens quinquefida, pilosa, calyce duplo longior, tubo infernè tereti, supernè sensìm ampliato, compresso-triangulari; dorso acutè carinato, medio obtusiusculè incurvo; faux dehiscens; limbus bilabiatus subæqualis; labium superiùs bifidum, laciniis obtusiusculis, reflexis denticulatis, venis majoribus in dentes eductis; inferiùs trilobum, laciniis æqualibus acutiusculis; palatum sericeum, pilis scilicet albis, non glanduliferis, adpressis, tectum. *Nectarium* frustra quæsivi. *Stamina*, filamenta quatuor filiformia, nuda, glabra, vix recurva, duo breviora lateribus, duo longiora anteriori tubi parti inserta. *Antheræ* luteo-albidæ, conniventes intra faucem—defloratæ inclusæ. *Pistillum*, germen ovato-oblongum, nudum, læve; stylus filiformis, incurvus, pilosiusculus; stigma capitatum, album, bilobum, nec rimosum, faucem claudens. *Pericarpium*, capsula ovato-oblonga, medio sulcata, longitudinalitèr dehiscens. *Semina* minuta numerosa, subturbinata, reticulato-cellulosa.

Floret Julio ♃.

Habitat

Habitat inter gramina, in paſcuis, et ad margines agrorum—Sheringham juxta mare, Beeſton, et Northrepps.

We are entered now upon a diviſion of the genus in which the ſpecies, beſides having the upper lip of the corolla divided, differ in many reſpects from thoſe in the laſt: the ſhape of the flower is no longer cylindrical; the ſtamina are ſhort and filiform, the ſtigma with no apparent tranſverſe fiſſure, the calyx tubular, the bracteæ ternate, and the plants altogether leſs ſucculent and perhaps leſs paraſitic. The character therefore being in general ſo different, and more obvious marks of diſcrimination preſenting themſelves in this diviſion, I preſume a ſmall deviation from the form of the ſpecific definitions before laid down may be allowed.

The ſtem in this ſpecies, though generally, is not always unbranched; the Rev. R. B. Francis of Holt has remarked to me, that, if mutilated, it will throw out lateral ſhoots; and I have obſerved, that this is not the caſe with any of the three foregoing ſpecies; for if the entire ſpike of any of them is broken off, even at an early period, the ſtem decays; and if great part of it only is broken off, the work of nature is carried on in perfecting the few flowers that remain, on elongated footſtalks.—From this circumſtance, and from having alſo ſeen a perfect ſpecimen that was branched towards the bottom, I have been induced to define this ſpecies *Caule ſubſimplici*.

The little that was known of it in England, till lately, was from Mr. Pitchford's ſpecimen found in 1779, and Mr. Lightfoot's (ſee *With. Bot. Arr.* p. 558, and *Engl. Bot.* p. 184.) Being moſt allied to the *ramoſa*, it was taken at firſt for a variety of it, and deſcribed as ſuch in Withering, though with a very incorrect reference to its *habitat*. In 1796 Mr. Scrimpſhire found ſeveral at Sheringham, and I found a few

a few at the adjoining parish of Beeston, one of which I presented to the Society in February last. It seems to have been more generally found abroad, where it has usually passed for that unknown species of Linnæus, the O. *lævis;* a mistake arising, as I have been convinced by the President, from a wrong application of synonyms in the *Species Plantarum.*—See the preceding paper.

5. OROBANCHE *ramosa.*

Caule ramoso. Corollis quinquefidis. Bracteis ternis. Calycibus brevibus, profundè quadrifidis.

O. *ramosa*, caule ramoso, corollis quinquefidis.—*Syst. Plant. ed. Reichard, p.* 184.—*Pollich Flo. Pal. n.* 601.

O. caule ramoso, flore quinquepartito.—*Haller*, 2 *edit. n.* 296.

O. *ramosa*, caule subramoso, corollis quinquefidis.—*Hudson Flo. Ang.* 2 *edit. p.* 266.

O. *ramosa.* — *Raii Syn.* 3 *edit. p.* 288.* — *With. Bot. Arr.* 3 *edit. p.* 558.

O. *ramosa*, stem generally branched, corolla with five segments. —*Smith in Engl. Bot. tab.* 184.

Radix congenerum, annua, vix squamosa, *Cannabis sativæ* radicibus cauleque imprimis implicita. *Caulis* 6—10 pollicaris, erectus, subflexuosus, teres, pilosus, sublignosus, luteo-purpurascens, crassitie ferè pennæ anserinæ, basi ramosus, ramis caule brevioribus, squamosus, squamis raris ovato-lanceolatis, citò fuscescentibus; interdum simplex. *Flores* spicati (spica acuta) ex albido cœrulei, venis cœruleis notati, pilosi; persistentes declinati, tubo supernè compresso, infernè ventricosiore, fusci—flos inferior sæpe pedunculatus. *Bracteæ* ternæ breves, calyci vix æquales, membranaceæ, citò fuscescentes, duæ laterales interiores, lanceolatæ acuminatæ,

minatæ, exterior ovato-lanceolata. *Calyx*, perianthium monophyllum, hyalinum, dimidio corollæ brevior, ſcilicet ad corollæ longitudinem in ratione 2 ad 5; latius et profundius ad poſticam quam ad anticam partem, ibique quam ad latera, inciſum; laciniis æqualibus, lanceolatis, acutis. *Corolla* ringens, quinquefida, piloſa, tubo infernè terete, ſupernè ſenſim ampliato, compreſſo-triangulari; dorſo carinato incurvo; faux dehiſcens; limbus bilabiatus inæqualis; labium ſuperius rotundatum, breviuſculum, bifidum edentatum, reflexum; inferius trilobum, laciniis æqualibus, rotundatis, porrectis. Palatum ex albido luteum, pilis albidis non glanduliferis barbatum. *Nectarium* nullum. *Stamina*, filamenta præcedentis, piloſiuſcula, purpuraſcentia. *Antheræ* luteo-albidæ, intra faucem tectæ,—defloratæ incluſæ. *Piſtillum*, germen quadrato-ovatum nitidum, piloſiuſculum; Stylus filiformis, incurvus, piloſiuſculus, purpuraſcens; Stigma retuſum, margine dilatatum, albidum, non rimoſum. *Pericarpium*, capſula quadrato-ovata, longitudinalitèr dehiſcens. *Semina* minuta numeroſa, ſubturbinata, reticulato-celluloſa.

Floret Auguſto, Septembri ☉.

Dignoſcitur a præcedente — Spicis acutis; caule et ramis parùm ſquamoſis; calycibus bracteiſque dimidio corollæ brevioribus; tubo poſt floreſcentiam infernè globoſo.

This ſpecies was firſt found in Norfolk, by Mr. Woodward, in the year 1785, in a hemp field at Brome. He found it again, ſome time afterwards, in a ſimilar ſituation, on the oppoſite ſide of the river at Metingham, near Beccles, in Suffolk—the place where it is reported to have been found, in the time of Dillenius, by Dr. James Sherard. It grows alſo among the hemp at Outwell, in Norfolk. The ſeeds of both were probably introduced into England together.

In

Orobanche elatior.

In the *Botanical Arrangement* it is ſaid to be found "in corn-fields and dry paſtures;" and in the *Species Plantarum*, "in ſiccis." We have known it found in no other than a very rich, light, and moiſt ſoil. It may be doubted whether the O. *ramoſa* of Oſbeck, p. 58 of the original edition, and p. 78 of the Engliſh tranſlation, be the ſame ſpecies with ours, or not.

EXPLANATION OF TAB. XVII.

Fig. 1. Repreſents a root of the *Trifolium pratenſe* in the ſecond year of its growth.

2. An embryo plant of *Orobanche minor*, attached firmly by its centre, which is a yellow pellucid *gem*, covered with a few ſquamæ, to the root of the Trifolium, and throwing out fibres of a browniſh colour into the ſurrounding ſoil.

3. A young plant juſt riſen to a capitulum, covered above the ſurface of the earth with pellucid glanduliferous hairs.

4. *Orobanche elatior*, in its natural ſize.

a. The ſpike.

b. That part of the ſtem which is found below the ſurface of the earth. Note—*a* and *b* are not correſpondent parts. The intermediate part, which connects the bottom of *a* with the top of *b*, needs no figure for explanation; it is uſually about the length of *b*.

c. Part of the root of *Centaurea ſcabioſa*.

d. The corolla expanded.

e. One of the ſtamina.

f. The anthera magnified.
g. The piſtillum.
h. The ſame ſomewhat magnified.
i. A part of the corolla in the form of a ſquama frequently remaining attached to the germen.
j. The calyx.
k. The bractea.

XIV. *Ac-*

XIV. *Account, accompanied by a Figure, of a minute Ichneumon.* By *George Shaw, M.D. F.R.S. V.P.L.S.*

Read Nov. 7, 1797.

THIS accurate microſcopic drawing was made ſome years ago, of a ſpecies of *Ichneumon*, which may perhaps be the *Ichneumon atomos* of Linnæus, an inſect which in the *Syſtema Naturæ* is ſaid to be found at Upſal, and to be ſmaller than a common mite. Such was certainly the caſe with the inſect from which the figure was taken, and which, when living, was ſcarce to be perceived, except when in motion on the ſurface of the window on which it was diſcovered. It may be doubted, however, whether it be the *Ichneumon atomos* of the *Syſtema Naturæ*, ſince it did not appear to be varied with whitiſh, as there deſcribed, but to be rather of an uniform poliſhed black. The wings are beautifully irideſcent, and are edged with extremely long black hairs.

Its character (ſuppoſing it not to be the *Ichneumon atomos* of Linnæus) may be thus deſcribed:

ICHNEUMON *punctum.*

Ichneumon niger nitidus, alis iricoloribus, margine pilis longiſſimis nigris.

TAB. 18. *fig.* 1. repreſents the *Ichneumon punctum* highly magnified.

 XV. *De-*

XV. *Description of the Phasma dilatatum.* By Mr. *John Parkinson, F. L. S.*

Read Nov. 7, 1797.

THIS singular animal, which appears to be a species hitherto undescribed, is at present in the Leverian Museum. It is supposed to be a native of Asia; and belongs to that tribe of insects which Stoll has called by the title of Spectres, and which constitute a distinct genus from that of *Mantis*. The present species measures six inches and a quarter from the upper part or top of the head to the extremity of the abdomen. The whole animal is of a flattened form, more especially on the abdomen, which measures about an inch and a half across in its broadest part. The thorax is of an obtusely rhomboidal form, the sides sloping each way from the flattish upper part. The whole thorax is not only edged with spines, but has also several very sharp ones distantly scattered over its surface. The head rises up backwards into an obtusely conic shape, and has several very strong and large spines or processes. The abdomen is edged, almost throughout its whole length, with a continued series of small spines, to the number of five on the side of each individual segment: the extreme segments are without spines. The thighs, or first joints of the lower pair of legs, are in this insect remarkably strong, of a somewhat triangular shape, and beset with some

ſome ſtrong ſpines; but the tibiæ, or ſecond joints, are armed with far larger and ſtronger ones. The upper and middle pair of legs are of a nearly ſimilar ſtructure in proportion, but much leſs ſtrongly ſpined. The colour of all the legs is green, tinged with brown; the ſpines blackiſh. The general colour of the thorax, abdomen and head is now brown, but might probably have been of a greeniſh caſt in the living animal. The wings are ſcarcely larger than the elytra or wing-ſheaths, and ſeem originally to have been reddiſh, a tinge of that colour ſtill pervading ſome parts of the wings; the tips are green. Theſe wings are very ſtrongly veined with brown fibres. The wing-caſes are of a ſtrong opake green, and were doubtleſs more vivid in the living inſect. They have a great reſemblance to a pair of leaves. The mouth has four palpi, which are rather long; and under the mouth are ſituated two leaf-ſhaped organs, perhaps belonging to the action of that part. The antennæ are wanting, the firſt joints alone remaining. The abdomen is terminated by a kind of boat-ſhaped organ, the keel of which poſſeſſes a conſiderable ſpace beneath the abdomen, ſo that fewer ſegments appear on that part than above. The concavity of this organ is covered above by a terminal ſcale and bifid proceſs, conſtituting the tip of the abdomen on the upper part. On raiſing this valve, an *ovum*, nearly of the ſize of a pea, but of a more lengthened form, was diſcovered lying in the cavity beneath; and on inſpecting farther into the cavity of the abdomen, a great many more *ova*, exactly ſimilar, were found, to the number of five or ſix-and-twenty—ſome ſtill remaining in the upper part. Theſe eggs are of a ſlightly oblong ſhape, but flattened at one end: they are of a brown colour, and marked all over with numerous impreſſed points; and have on one ſide a mark or double-waved line, ſo diſpoſed as to repreſent a kind of croſs, as if curved on the ſurface: the flattened

end

end is surrounded by a small rim or ledge, and seems to be the part which opens at the exclusion of the larva, since it readily separates from the rest. On immersing some of these *ova* in warm water, and opening them, the included yolk, of a deep yellow colour, and of the appearance of a transparent gum, was discovered; and this, when burned, afforded the usual smell of animal substances, but in some it was accompanied by a slight degree of fragrance. It is perhaps needless to observe, that these mature *ova* clearly prove the insect to be in its complete or ultimate state, and not in that of a larva.

TAB. 18. *fig.* 2. is an accurate representation of the insect in its natural size and colours.

Fig. 3. shews the boat-shaped organ on the lower side of the abdomen.

Fig. 4. represents an *ovum* in its natural size.

Fig. 5. the same magnified.

Dr. Shaw, who assisted in the examination of the insect, has thus given its specific character, viz.

Phasma dilatatum, thorace dilatato rhombeato pedibusque spinosis, abdomine lanceolato, lateribus ciliato-spinosis.

XVI. *De-*


Linn. Trans. IV. tab. 18. p. 192
fig. 1.
2
3
4
5

XVI. *Description of the Blight of Wheat, Uredo Frumenti.* By *A. B. Lambert, Esq. F.R.S. V.P.L.S.*

Read December 5, 1797.

THE wheat in the West of England, especially in the counties of Wilts and Somerset, has of late years been very much injured, by what is called there the *Blight*, and generally supposed to be owing to an insect. In the year 1797 the wheat was very much hurt by it, and a few years before there were several fields near Warminster so much injured that the farmers were obliged to have it cut down long before it was ripe; for, as soon as a field is blasted, as they call it, which happens sometimes in a day and night, vegetation stops, and the only way to preserve the crop from being entirely lost is to reap it immediately.—I remember seeing a remarkably fine field of wheat, after one day's warm rain, look at a small distance as if it were covered with soot, which I was informed was owing to insects, but on examination I found to be a *Fungus*, which, no doubt, had been long sown in the stem of the wheat, but wanted that kind of weather to occasion its vegetation. The stem of the wheat where this *Fungus* appears is split; and when a whole stem is almost covered with it, which is generally the case, it hinders the plant's growth.

I find the genus to which this *Fungus* belongs well described by

Perſoon, under the name of *Uredo*, in a work publiſhed by him, intitled, *Tentamen Diſpoſitionis Methodicæ Fungorum*, 1797, p. 13. "Pulvere farinaceo, thecâ orbato, ſub foliorum cauliumque epidermide effuſo, hâc demùm margine lævi ruptâ." In page 57, he deſcribes different ſpecies; but does not mention that I have obſerved, which I ſuppoſe to be a new one, and which I ſhall call

UREDO *Frumenti*, lineari-oblonga fuſco-nigricans.

It is always found on the ſtem of the wheat. The *Uredo ſegetum* of Perſoon, var. α Hordei, β Tritici, γ Avenæ, affects only the parts of fructification.

It is in wet ſeaſons that the wheat is the moſt injured by this *Fungus*, particularly what grows in low ground, as the crops on the hilly country are ſeldom hurt. I am informed it is only within theſe laſt twelve or fourteen years that it has been noticed in the Weſt of England, or at leaſt that the wheat has been known to be injured by it; and may it not proceed from the land being too much worked, and not having that reſt given it that it requires? Whether this cauſe might have firſt brought the diſeaſe, or whether it might ariſe from a want of a change of crops, I leave to thoſe to determine who are more in the way of making obſervations upon Agriculture than myſelf.

See a figure of this *Uredo* in Sowerby's *Fungi*, *vol.* 2. *tab.* 140.

XVII. *Am-*

XVII. *Ammophila, a new Genus of Insects in the Class Hymenoptera, including the Sphex sabulosa of Linnæus. By the Rev. William Kirby, F. L. S.*

Read December 5, 1797.

IN no department of the animal kingdom is the Divine Wisdom more eminently conspicuous, than in the construction and œconomy of the insect tribes; and amongst these, none, perhaps, are more worthy of our attention, on both these accounts, than the individuals that compose the class *Hymenoptera*. Though they do not, like many of the *Coleoptera* and *Lepidoptera*, immediately attract our notice by the brilliancy or gaiety of their colouring (*a*), yet when we examine them closely, and observe the consummate skill manifested in their construction; when we attend to their history, replete, be they gregarious or solitary, with entertaining anecdotes, and furnishing instances of the most astonishing sagacity and most prudent precaution; we feel inclined to prefer the study of this order of insects to that of any other, not only as most prolific of materials to set forth the praises of Him who hath created them, which is the first duty of the Naturalist—but also as gratifying, in a

(*a*) Some of them, however, are singularly beautiful even in this respect. Take for examples the *Tenthredo nitens*, many of the *Ichneumons* of Linnæus's last family, and the whole genus *Chrysis*.

high degree, our natural taſte for the inſpection of things that are remarkable either for their beauty, their ſtructure, or their uſes.

Amongſt the parts which diſtinguiſh this claſs of inſects from others, there is none more ſingular, both for its utility and conſtruction, than the tongue and the valves which incloſe and defend it: for this inſtrument is not confined to one or two genera, as ſeems to have been the opinion of Linnæus and the majority of Entomologiſts; but belongs, as I have reaſon to believe in conſequence of repeated diſſections of this part, to a very large majority of the claſs; although in ſome, on account of their diminutive ſize, it may not be viſible, unleſs the eye of the examiner be aſſiſted by a very ſtrong magniſier.

By means of this inſtrument the *Hymenoptera*, I apprehend, contribute very conſiderably towards the depuration of the air; for the ſweets which the flowers would exhale, were it not for myriads of theſe inſects, which feaſt upon their nectar during the ſummer and autumnal months (*b*), would probably render that element impure and unfit for reſpiration (*c*). I have heard of perſons that have been nearly ſuffocated by the odour of flowers placed in their bedchamber.

This part, ſo important to theſe inſects, will furniſh, I feel perſuaded, a very appropriate character to diſtinguiſh many of the

(*b*) Hymenopterous inſects, eſpecially thoſe that are provided with a ſhort roſtrum, are moſt abundant upon umbelliferous plants. Upon theſe, particularly the *Daucus carota*, the Entomologiſt will find many of the rarer ſpecies of the ſplendid genus *Chryſis*.

(*c*) The wiſdom of Providence has not only been attentive to provide againſt the atmoſphere's being overloaded with ſweets; it has alſo uſed ſimilar precautions to prevent its being corrupted by exhalations of a contrary nature: and to effect this purpoſe, it employs an infinite number of inſects. (Which claſs of animals, in conjunction with the *Fungi*, may be called the depurators and ſcavengers of Nature). Witneſs the myriads to be found in their different ſtates in dung and all putreſcent ſubſtances.

genera

genera in the class, which are now very much confused. This persuasion is the result of an examination of what Fabricius terms the *instrumenta cibaria*, in order to fix upon an essential character, more determinate than the present, for the genus *Apis*. I found that the tongue was of one form in *Sphex*, of another in *Vespa*, and of another still in *Apis*. Amongst the insects which I dissected with this view, was the *Sphex sabulosa* of Linnæus; and I was not a little surprised to find that it was furnished with an inflexed *rostrum* (*d*), which concealed a long, retractile, tubular tongue, with a bifid *clava* at its end (*e*): whereas the tongue of true *Spheges*, such at least as I have examined, is very short, flat, dilated, and nearly entire at the apex (*f*). It agreed with the tongue of *Vespa*, in being divided at the end; but in this latter genus, that part is extremely short and broad, obcordate, very deeply bifid, having its lobes sometimes tipped with a small callous point (*g*). It had a still stronger affinity with that member in *Apis*, especially in those species that have an inflexed *rostrum* (*h*), but in these the tongue is entire, and usually acute. In many other circumstances this insect differs from all those genera, as will appear when I give its natural character.

The possession of three other British species, which agree with this in the peculiar form of the *rostrum* and *maxillæ*, as well as in habit and other circumstances, makes my hesitation the less to consider them as distinct from the genus *Sphex*, and more particularly as Linnæus has placed an insect exhibiting the same characters amongst his *Apes*, under the name of *Apis Ichneumonea*. This will appear, I

(*d*) Tab. XIX. No. I. fig. 4. a. (*e*) fig. 3. (*f*) Tab. XIX. No. II. fig. 2.
(*g*) Tab. XIX. No. III. fig. 2. See also *Reaumur*, Tom. V. Tab. 16. fig. 2. and *De Geer*, Tom. II. Partie II. Tab. 26. fig. 10, 11.
(*h*) Tab. XIX. No. IV. fig. 2.

think,

think, evident to every one who consults De Geer's figure of that insect (*i*). Indeed that author describes the rostrum as having a different direction from that which is mentioned above (*k*), and which is observable in all my species of *Ammophila:* yet since he could have no opportunity of examining a recent specimen, (this insect being a native of South America,) he might very easily have been misled in this point; for the rostrum readily assumes and retains a direction outwards, although its natural position when at rest is inwards.

It is singular that so attentive and accurate an observer should have entirely overlooked this conspicuous part in *Sphex sabulosa,* especially as it had not escaped the notice of Linnæus.

I have given this genus the name of *Ammophila,* because those species with which I am acquainted frequent sandy banks, particularly such as are exposed to the sun.

This is nearly allied to several genera. The *Sphex sabulosa* one would take at first sight for an *Ichneumon,* and Geoffroy (*l*) has ranked it under that genus. It has the antennæ, fierce port, and manners of *Sphex:* its bifid tongue connects it with *Vespa*; and the inflexed direction and form of the valves of its rostrum give it an alliance with a large number of *Apes.* On this account I would place it between the two latter genera.

Linnæus, in an admirable "*Methodus demonstrandi lapides, vegetabilia, aut animalia,*" which I have seen at the end of some editions of his *Systema Naturæ,* under the article *Genus,* lays down the *Character naturalis* as a necessary part of it; although he has only given *natural characters* in his *Genera Plantarum.* Fabricius is the first Entomo-

(*i*) Tom. II. Partie II. Tab. 32. fig. 13—16.
(*k*) Mem. XII. p. 761.
(*l*) Tom. II. p. 349. n. 63.

logist

logist who has drawn out natural characters for insects (*m*). To point out at first those circumstances in which all the individuals of a genus agree, is certainly extremely useful, and spares much unnecessary tautology when we come to describe them. I shall therefore follow his example upon the present occasion.

AMMOPHILA.

Sandwasp.

Character Naturalis.

Caput suborbiculatum, subdepressum. *Rostrum* corneum, inflexum, subulato-conicum (*n*), *vaginâ* trivalvi; *valvulis* duabus superioribus (*o*) semisagittatis medio palpigeris, *palpis* sexarticulatis; inferiori (*p*) apice biaristatâ (*q*), *aristis* membranaceis; *palpis* duobus quadriarticulatis instructâ (*r*); *linguam* submembranaceam, retractilem, tubulosam, subclavatam, *clavâ bifidâ*, exerens (*s*). *Labium* inflexum. *Maxillæ* forcipatæ minaces, apice tridentatæ, dente interiori minimo, intermedio magno truncato, exteriore maximo acuminato (*t*). *Antennæ* filiformes, thorace breviores, sæpiùs tredecim articulorum (*u*), medio frontis insertæ (*v*). *Oculi* ovales, distantes. *Stemmata* in triangulum disposita.

(*m*) Ego primus, in Entomologiâ, characteres naturales composui, introduxi, quibus omne systema niti debet. *Fabric. Philos. Entomol. Hamburg.* 1778, VI. § 28.

(*n*) Tab. XIX. No. I. fig. 4. a. (*o*) fig. 1. (*p*) fig. 2. c.

(*q*) fig. 2. dd. (*r*) fig. 2. e. (*s*) fig. 2. f. and fig. 3. (*t*) fig. 5.

(*u*) The three first joints of the antennæ differ in form from the rest—The first, or *bulb*, is scarcely visible without a magnifier, the second is very large, and the third very small. In one species they consist of fourteen joints.

(*v*) fig. 6.

Collum

Collum infundibuliforme (*w*).

Thorax ſubcompreſſus ponè alarum inſertionem elongatus (*x*). *Scutellum* obſoletum.

Alæ planæ, venoſæ, *anaſtomoſi* obſoletâ.

Abdomen petiolatum glabrum, *aculeo* in fœminis recondito.

Pedes longi, graciles, ſetoſi (*y*). *Femora* apophyſibus biarticulatis inſidentia (*z*). *Tibiarum* poſticarum ſpinulæ interiores uno latere pectinatæ (*a*). *Tarſi* quinque-articulati.

Color niger, abdominis *cingulo* ferrugineo.

Many of theſe characters are peculiar to this genus, particularly the form of the *roſtrum*, *maxillæ*, *collum*, and the pectinated *ſpinulæ* of the poſterior *tibiæ*. Even *colour*, ſo various in other genera, in this ſeems characteriſtic. To the above marks it might be added, that, in all the ſpecies I am going to deſcribe, the under ſides of the poſterior *tibiæ* are covered with a ſhort pale down.

CHARACTER ESSENTIALIS.

Roſtrum conicum inflexum, linguam bifidam exerens.

Antennæ filiformes *in omni ſexu*, articulis ſubquatuordecim.

(*w*) Tab. XIX. No. I. fig. 7.

(*x*) That part of the thorax which is behind the wings, I believe I ſhall name upon a future occaſion the *Metathorax*, as it is ſeparated in hymenopterous inſects both from the thorax and ſcutellum by a ſuture, and in deſcriptions often requires diſtinct notice.

(*y*) Fig. 8. (*z*) Fig. 8. a.

(*a*) Fig. 10. I conjecture that this pecten is ſerviceable to the inſects of this genus in the excavation of the little burrows, where they depoſit the animal to which they have committed an egg. When with their hind legs they diſſipate (ruſpando) the little heap of ſand from the mouth of the burrow, which they had ſcratched with their fore ones from its bottom, this pecten will prevent the grains from paſſing between this ſpine and the baſe of the tarſus, which is alſo pectinated, although leſs viſibly. Fig. 9. a.

Oculi

Oculi ovales.
Alæ planæ.
Aculeus reconditus.

These characters, I think, will sufficiently distinguish our *Ammophila* from those genera to which it is most nearly related. The direction of the rostrum in this genus, the form of the eyes, and the plane surface of the wings, clearly prove it to be distinct from *Vespa*. The bifid tongue, and the antennæ filiform in every sex (*b*), separate it from *Apis*. The direction and length of the rostrum, and the bifid tongue, divide it from *Sphex*. The same part in conjunction with the number of articulations, and form of the antennæ, prevent its being confounded with *Ichneumon*.

SYNOPSIS SPECIERUM.

1. *Vulgaris*. A. antennis tredecim-nodiis, frontis foveâ insertæ; abdominis petiolo elongato biarticulato, alis æquali.
2. *Affinis*. A. antennis tredecim-nodiis, frontis foveâ insertæ; abdominis petiolo uniarticulato; alis corpore brevioribus.
3. *Hirsuta*. A. antennis tredecim-nodiis; abdominis petiolo uniarticulato brevi; alis corpus æquantibus.
4. *Argentea*. A. antennis quatuordecim-nodiis; abdominis petiolo uniarticulato; alis corpore brevioribus (*c*).

(*b*) In *Apis* the antennæ of the males are filiform, while those of the other sex are subclavate.

(*c*) This genus, as far as I am acquainted with the species that compose it, offers to the Entomologist the singular felicity of forming a *Diagnosis Specierum*, from form, and the number and proportion of parts, without the necessity of having recourse either to pubescence, or colour, for that purpose.

1. AMMOPHILA *vulgaris.*

Common Sandwasp.

A. antennis tredecim-nodiis, frontis foveâ insertæ; abdominis petiolo elongato biarticulato, alis æquali.

Sphex sabulosa, nigra, hirta; abdominis petiolo biarticulato; segmento secundo tertioque ferrugineis.

Linn. Syst. Nat. ed. Gmel. i. p. v. n. 1.
Fn. Suec. 1648.
Fab. Ent. Syst. Em. ii. Sphex n. 1.
Villars Ent. Eur. iii. n. 1.
Scop. Carn. n. 770.
Schrank Enum. Ins. Aust. n. 768.
Müll. Linn. Nat. cl. v. p. 864.
Faun. Fridr. 627.

Ichneumon niger, abdomine fulvo, posticè nigro, petiolo longissimo.
Geoffr. Hist. ab. des Ins. ii. p. 349. n. 63.

Guespe Ichneumon noire, à antennes filiformes, et à filet fort long, dont le devant du ventre est roux, et les ailes fort courtes.

De Geer ii. p^tie ii. p. 822. n. 5. tab. 28. fig. 7.
Frisch. Ins. ii. tab. 1. fig. 6, 7.
Sulz. Ins. tab. 19. fig. 120.
Schæff. Icon. tab. 83. fig. 1.
Donovan iii. tab. 93. fig. 1.

Habitat in terrâ sabulosâ, "*aprica*;" ubi canis instar pedibus anterioribus cuniculum fodit, larvamque phalænæ, vel araneam semimortuam in eo sepelit, cui ovulum concredit: quo facto orificium terra claudit. *Linnæus.*

Caput punctulatum, subvillosum villis sordidi coloris.

Thorax sordido-subvillosus, linea intermedia longitudinali exaratus; *callis* (*d*), puncto sub alas, et uno utrinque apud abdominis insertionem, pilis decumbentibus sericeo-argenteis ornatis. *Squamæ* nigræ (*e*).

Alæ subhyalinæ, apice obscuriores, nervis nigricantibus, abdomine circitèr dimidio breviores, s. petiolum longitudine æquantes.

Abdomen clavatum; segmento primo filiformi nigro; secundo lineari, compresso, ferrugineo, puncto excavato utrinque notato; tertio campanulato ferrugineo; quarto nigro, basi et infernè ferrugineo; reliquis nigris.

Long. corp. lin. 10.

β Variat minor, thoracis callis, lateribus, et posticis pilis sericeis destitutis; alis unicoloribus. An sexus alter? forsan mas!

Long. corp. lin. 6.

This species, which is very common in Norfolk and Suffolk about sandy banks of a sunny exposure; though rare, according to the ingenious Mr. Donovan, in the neighbourhood of London; is easily distinguished from its congeners by the elongated *petiolus* of its abdomen, and its very short wings. It may readily be known, even when flying, by the singular manner in which it carries its abdomen with the anus pointing upwards, so that it stands nearly at right-angles with that part of the thorax to which it is attached. The history of this insect is very entertaining, as may be seen in De

(*d*) By the *Calli* I mean two little tubercles, one on each side of the anterior part of the thorax, to be met with in most hymenopterous insects.

(*e*) The *Squamæ* are the minute semi-circular scales which cover and defend the root of the superior wings, one over each.

Geer (*f*), whom I shall content myself with referring to; but I cannot resist the temptation of transcribing from our great Ray, the very curious account he has given of some proceedings, of this very insect, as I suspect, which passed under his own observation. These are his words (*g*): "Junii 22. an. 1667, è maximis hujus generi vespam, speciem jam non recordor, erucam viridem seipsâ triplo majorem trahentem vidi: quam postquàm, me præsente et spectante, ad unius circitèr perticæ nostræ mensuræ, i. e. 15½ pedes, deportâsset; propè orificium cuniculi, quem sibi prius in terrâ excavaverat, deposuit: deinde pilulâ terreâ, quâ prædictum orificium obturaverat, remotâ, ipsa prius in cavernulam descendit, et post parvam inibi moram ascendit iterùm, erucamque, quam juxta foramen deposuerat, apprehendens, secum in cuniculum devehit, eâque inibi relictâ, mox rediit sola, globulisque terreis assumptis, unam post alteram in cuniculum devolvit, et per intervalla pedibus anterioribus ruspando (ut cuniculi aut canes solent) pulverem retrorsùm in foramen conjecit; idemque opus repetit cum pulvere aut pilulis alternatìm, donec cuniculus penitus oppletus esset, ipsa aliquotiès descendente ad terram (ut mihi videbatur) deprimendam et densandam; semel etiam atque iterùm in pinum adstantem evolante, ad resinam fortè petendam terræ conglutinandæ, et operi consolidando. Repleto foramine, et cum terræ superficie coæquato, ut aditus amplius non possit discerni, duo pini folia adjacentia assumit, et juxta cuniculi orificium deposuit, ad locum (ut verisimile est) signandum. Quis hæc non mihi miretur et stupeat? Quis hujusmodi opera meræ machinæ possit attribuere?" (*h*)

Scopoli,

(*f*) De Geer, tom. ii. p^tie ii. Mem. xiv.

(*g*) Raii Hist. Inf. p. 254.

(*h*) I have been informed that the ingenious Mr. Curtis has written a history of this insect,

Scopoli, as well as the great Linnæus, describes the rostrum as bivalve. I am loth to dissent from such high authorities; but I am convinced, from repeated examination, that the rostrum in this and most hymenopterous insects consists of three valves besides the tongue; two which cover its upper surface, and one that protects it beneath, to which it adheres (*i*).

I never was so fortunate as to meet with the variety of this insect mentioned by Linnæus, *abdominis dorso nigro.* It is possibly a distinct species. Villars, the ingenious author of the *Entomologia Europæa*, mentions another, *pedibus quatuor anticis fulvis.* I should likewise think this more than a variety.

2. AMMOPHILA *affinis.*

Contiguous Sandwasp.

A. antennis tredecim-nodiis, frontis foveâ insertæ; abdominis petiolo uniarticulato; alis corpore brevioribus.

Habitat rarior in ericetorum sabulosis.

Caput punctatum, nigro subvillosum. *Maxillæ* nigræ fasciâ mediâ fuscâ.

Thorax nitidus, punctatus, lineolis quinque (quarum una intermedia) impressus. *Squamæ* fuscæ, posticè rufæ.

Alæ testaceæ, abdomine tertiâ parte breviores.

Abdomen (petiolo excluso) lanceolatum; segmento primo filiformi nigro, secundo campanulato nigro, apice ferrugineo; proximis duobus ferrugineis; reliquis nigris.

Long. corp. lin. 9.

insect, which was composed for a Society of which he was a member, before the Linnæan was established; what comes from the pen of so learned and accurate a Naturalist, must be extremely valuable, and therefore I cannot help indulging a wish that the public may be put in possession of this curious and interesting paper.

(*i*) Tab. xix. No. i. ii. iii. iv. v. fig. 1, 2.

I took

I took two ſpecimens of this inſect upon the ſunny bank of a ſand-pit in Martleſham Heath near Woodbridge, in the beginning of laſt September, which was the only time I ever met with it. It is ſufficiently diſtinguiſhed from the A. *vulgaris*, by the uniarticulate ſtalk of its abdomen, the black *villi* that are ſcattered over its head and trunk, the five impreſſed lines that are viſible upon the diſk of its thorax, and by its wings, which are proportionably longer, and of a different hue: the maxillæ alſo are ſhorter, and have an obſcure reddiſh brown *faſcia* acroſs their middle; and the whole inſect is thicker in proportion. I do not find this ſpecies deſcribed in any author that I have an opportunity of conſulting.

3. AMMOPHILA *hirſuta.*

Hairy Sandwaſp.

A. antennis tredecim-nodiis; abdominis petiolo uniarticulato brevi; alis corpus æquantibus.

Sphex arenaria hirta nigra, abdominis petiolo uniarticulato, ſegmento ſecundo tertioque rufis; alis longitudine corporis.
Fab. Ent. Syſt. Em. ii. n. 2.
Linn. Syſt. Nat. ed. Gmel. i. p. v. Sphex 22.
Villars Ent. Eur. iii. — — — 7.

Sphex hirſuta nigra, capite thoraceque pubeſcentibus, abdomine anticè fulvo.—*Scop. Ent. Car.* n. 772.

—— nigra hirta, abdominis petiolo uniarticulato; abdomine medio ferrugineo; tibiis omnibus ſpinoſis.
Schrank Enum. Inſ. Auſt. n. 769.
Linn. Syſt. Nat. ed. Gmel. i. p. v. n. 53.
Villars Ent. Eur. iii. n. 16.

Capta ſemèl in foſſæ ripâ ſabuloſâ.

Caput

Caput magnum, punctulatum, atro-villosum. *Maxillæ* longitudine capitis valdè minaces. *Frons* planiuscula.

Thorax et pectus atro-villosa. *Squamæ* nigræ.

Alæ longitudine corporis subhyalinæ, apice nigræ, venis ferrugineis, costâ fuscâ.

Abdomen nigrum, lanceolato-ovatum; petiolo brevi villoso; segmento secundo, tertio, quartique basi, rubello-ferrugineis.

Pedes postici, abdomine dimidio longiores. *Tarsi* setis valdè asperi.

Long. corp. lin. 8.—Alt. Sex ♀ lin. 6½.

The larger specimen of this insect I purchased, as English, at a shop in Piccadilly; but the small one (which I believe to be the male) I took upon the sunny bank of a sandy ditch near Martlesham Heath, at the same time with A. *affinis*. I think that I have likewise seen it in the rich cabinet of our Secretary, my tutor in Entomology, and to whose liberality mine is indebted for some of its most valuable contents.

This insect is beyond a doubt the *Sphex arenaria* of Fabricius, and likewise the S. *hirsuta* of Scopoli and Schrank; although Gmelin and Villars make them different. It is clearly distinct from the two preceding species. Its wings of the length of the body, tipped with a black *nebula*; its abdomen of a figure inclining to ovate; its large head very villose, as well as its trunk; its maxillæ threatening with an immense acumen, plainly prove this. It is larger also in all its parts; the band which surrounds its abdomen is of a brighter red; the legs are much more bristly, especially the tarsi; and the interior spine, which arms the apex of each of the posterior tibiæ, is more conspicuously pectinated.

4. Ammo-

4. AMMOPHILA *argentea.*

Silver-fronted Sandwasp.

A. antennis quatuordecim-nodiis; abdominis petiolo uniarticulato; alis corpore brevioribus.

Caput nigro-villosum. *Maxillæ* acumine fusco. *Antennæ* thoracis ferè longitudine. *Frons* planiuscula, infrà antennas pilis densis decumbentibus argenteo-nitidissimis, nisi à tergo vix conspicuis, tecta.

Thorax angustus; subvillosus uti pectus villis certo situ argenteis. *Squamæ* nigræ.

Alæ subhyalinæ, apice obscuriores, nervis ferrugineis; abdomine dimidio ferè breviores.

Abdomen clavatum, segmento primo filiformi nigro; secundo campanulato tertioque rufis; quarto rufo, apice nigro; reliquis nigris.

Pedes setulis brevibus asperi.

Long. corp. lin. $5\frac{2}{3}$.

Semèl capta, sed ubi et quando nescio.

At first sight one would take this species for A. *vulgaris* β, but upon a nearer inspection it will be found very distinct. The front has no *fovea*, and from the antennæ downwards is quite covered with a coat of silver pile, which, when the light falls upon it from above, gives it a very glittering appearance. From the midst of this pile other longer black hairs, thinly scattered, arise. The antennæ consist of fourteen joints, counting the minute one at their base. The *villi* of the trunk glitter in certain lights, but not so much as the pile on the front: the footstalk of the abdomen consists of a single

single joint, its belt is of a paler red, and the bristles of the legs are very short.

I have subjoined a sketch which exhibits a comparative view of the *rostra* and *maxillæ* in *Ammophila*, *Sphex*, *Vespa*, and *Apis*; which will, I hope, though rudely executed, (for I cannot say "*anch' io son pittore*,") afford a tolerable idea of the marks and characters that separate these genera.

I have no doubt of there being several foreign insects, besides A. *ichneumonea*, that belong to this genus (*k*): but as I have not at present an opportunity of examining the rich cabinets in the metropolis, I must defer saying any thing upon them till a future opportunity.

EXPLANATION OF TAB. XIX.

No. I.

The rostrum, maxilla, and other parts of an *Ammophila* magnified.

Fig. 1. The outside of one of the upper valves of the rostrum, which is semisagittate. (a) Its feeler of six joints.

Fig. 2. The under-side of the rostrum exhibiting (a) the inside of one of the upper valves. (b) Its feeler. (c) The under valve. (d d) Its aristæ. (e) One of its feelers of four joints. (f) The tongue.

Fig. 3. The under-side of the tongue viewed by itself, exhibiting (a) its bifid *clava*. (b) The orifice of its tube. (c) Its stalk.

Fig. 4. The under-side of the head, to shew the direction of the rostrum when at rest. (a) The apex of the rostrum. (b) The neck.

(*k*) The insect figured by De Geer, Tab. xxxii. fig. 17. belongs probably to this genus.

Fig. 5. A maxilla. (a) The inner tooth, generally acute. (b) The intermediate one, truncated. (c) The exterior one, acuminated. This acumen, crossing that of the other maxilla, forms the forceps.

Fig. 6. The antennæ, consisting of thirteen joints. (a) The first joint. (b) The second. (c) The third.

Fig. 7. (a) The neck. (b) The back part of the head. (c) The fore part of the thorax.

Fig. 8. A hind leg. (a) The apophysis, consisting of two joints. (b) The thigh. (c) The tibia. (d) The tarsus, consisting of five joints.

Fig. 9. The first joint of the tarsus. (a) The pecten at its base.

Fig. 10. The interior pectinated spine at the apex of the posterior tibia.

No. II.

The rostrum and maxilla of a *Sphex* magnified.

Fig. 1. The outside of one of the upper valves, short and rounded, and hairy at the top. (a) Its feeler of six joints, the intermediate ones the largest.

Fig. 2. The under-side of the rostrum. (a) The inside of the upper valve. (b) Its feeler. (c) The under valve. (d d) Its minute aristæ. (e) Its feeler, of four joints. (f) The tongue, short and dilated at the apex.

Fig. 3. The upper side of the tongue, on which it appears rather emarginate.

Fig. 4. A maxilla.

Fig. 5. The inside of a maxilla, to shew the two obsolete teeth at the apex (a).

No. III.

The rostrum and maxilla of a *Vespa* magnified.

Fig. 1. The outside of one of the upper valves, short, hairy above the feeler, rounded at the top; below the feeler swelling out externally into the segment of a circle. (a) The feeler of six joints of nearly equal size.

Fig. 2. The under-side of the rostrum. (a) The inside of the upper valve. (b) Its feeler. (c) The under valve. (d) A fovea in its disk. (e e) Two processes analogous to the aristæ in No. I. and No. II. but tipped on this side with a callous point. (f) One of its feelers, of four joints. (g) The tongue, obcordate and bifid. (h h) Callous points at the tip of each lobe, observable on the under side only.

Fig. 3. The upper side of the tongue, transversely striated.

Fig. 4. A maxilla. (a) Two small acute teeth. (b) One tooth large and truncated.

No. IV.

The rostrum and maxilla of an *Apis, rostro inflexo*, magnified.

Fig. 1. The outside of one of the upper valves, lanceolate with a subinvolute acumen, and laterally emarginate. (a) The feeler, consisting of a single joint.

Fig. 2. The under-side of the rostrum. (a) The inside of the upper valve. (b) The under valve. (c c) Its aristæ. (d d) The feelers, one at the apex of each arista, consisting of two joints. (e) Its linear tongue, subacute.

Fig. 3. The upper side of the tongue. (a) The top of it downy. (b) The lower part striated.

Fig. 4. The maxilla, armed with two obtuſe teeth at its apex. (a) The interior tooth ſmall. (b) The exterior very large. N. B. The black lines are deſigned to repreſent the *ſulci*, which are drawn upon its exterior ſurface.

No. V.

Roſtrum and maxilla of an *Apis*, *roſtro reflexo*, magnified.

Fig. 1. Outſide of one of the upper valves, cultriform and acute. (a) Feeler of ſix joints.

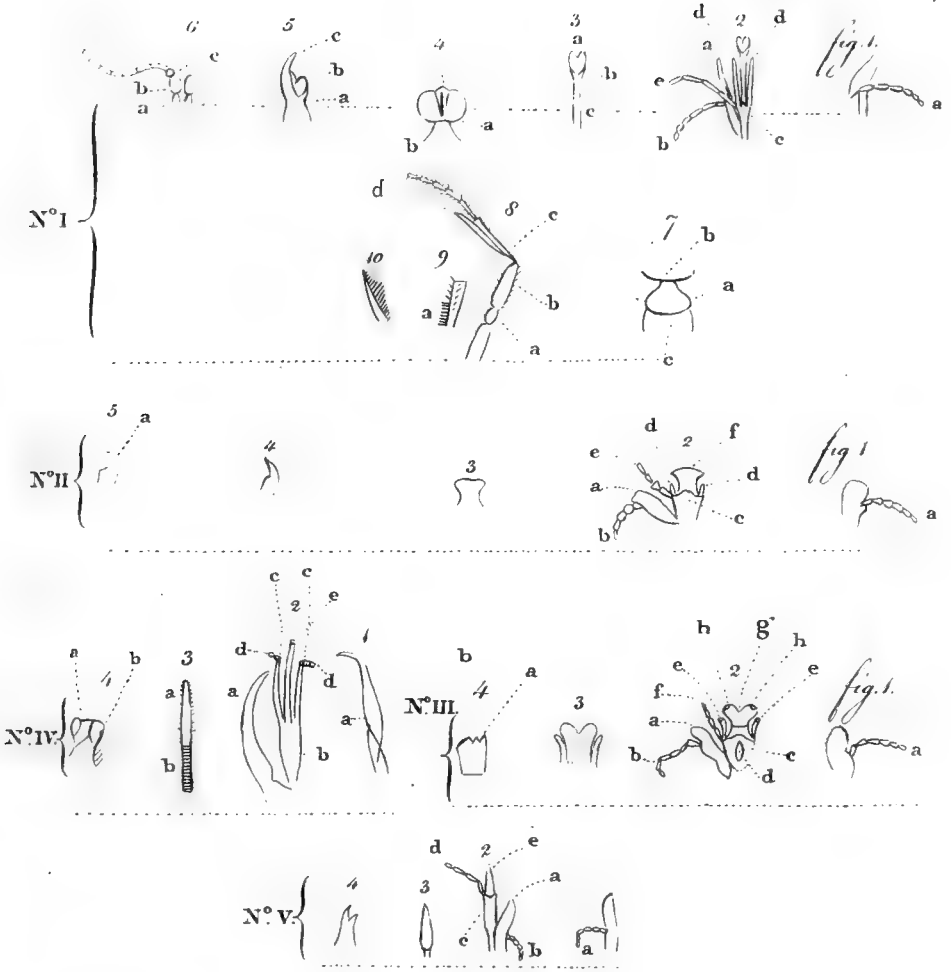
Fig. 2. Under-ſide of the roſtrum. (a) Inſide of the upper valve. (b) Its feeler. (c) The under valve. (d) One of its feelers of four joints, the three laſt forming an angle with the firſt (*l*). (e) The tongue.

Fig. 3. The tongue ſeparate, linear-lanceolate, and very acute.

Fig. 4. The maxilla, armed at its apex with two unequal teeth, of which the interior is the ſhorteſt.

(*l*) With my pocket lens I could diſcover no part analogous to the *ariſtæ*, upon the under valve of this roſtrum.

XVIII. *The*


N°I
N°II
N°III.
N°IV.
N°V.
fig. 1.
fig. 2.
N°VI.

XVIII. *The Characters of Twenty New Genera of Plants. By James Edward Smith, M. D. F. R. S. P. L. S.*

Read February 6, 1798.

1. HÆMODORUM.

TRIANDRIA *Monogynia*, propè Wachendorfiam.

Ord. Nat. Iridibus affine, *Juſſ. Gen.* 59.

CHAR. ESSENT. *Petala* 6, tria interiora ſupra medium ſtaminifera. *Stigma* obtuſum. *Capſula* infera, trilocularis.

Herba facie *Corymbii*, glabra, inflorescentiâ corymbosâ, totâ puniceâ, exſiccatione nigrâ. A *Wachendorfiâ* differt germine infero, petalis apicem verſus ſtaminiferis, ſtaminibus abortivis nullis.

LOCUS *Auſtralaſia*.

2. CONOSPERMUM.

TETRANDRIA *Monogynia*, poſt *Proteam*.

Ord. Nat. Proteæ, *Juſſ. Gen.* 78.

CHAR. ESSENT. *Calyx* nullus. *Corolla* monopetala, ringens, ſtaminifera;

minifera: *labium* ſuperius fornicatum; inferius trifidum. *Stigma* obtuſum. *Semen* unicum, nudum, pappo coronatum.

Frutices rigidi, *Proteis* anguſtifoliis habitu affines. *Folia* ſimplicia, ſparſa. *Flores* ſpicati. *Corolla* irregularis. *Stamina* fauci inſerta, ad labium ſuperius adſcendentia. *Antheræ* 4, uniloculares; ſuperiores dorſo connatæ; laterales dimidiatæ. *Semen* obconicum, pappo radiante.

LOCUS *Auſtralaſia.*

3. XYLOMELUM.

TETRANDRIA *Monogynia*, propè *Bankſiam.*

Ord. Nat. Proteæ, *Juſſ. Gen.* 79.

CHAR. ESSENT. *Amenti* ſquama ſimplex. *Petala* quatuor, ſtaminifera. *Stigma* clavatum, obtuſum. *Capſula* unilocularis, diſperma. *Semina* alata.

Habitus omnino *Brabeji*; gaudet verò capſulâ ligneâ, apice hinc dehiſcenti, ſeminibus binis, alatis, nec *drupâ* amygdalinâ monoſpermâ. *Florum* plures, ſtigmate minori, abortiunt.

LOCUS *Auſtralaſia.*

4. LAMBERTIA.

TETRANDRIA *Monogynia.*

Ord. Nat. Proteæ, *Juſſ. Gen.* 79.

CHAR. ESSENT. *Calyx* communis polyphyllus, imbricatus, ſeptemflorus. *Petala* quatuor, ſtaminifera. *Stigma* ſubulatum, ſulcatum. *Capſula* unilocularis, diſperma. *Semina* marginata.

Frutex ramis virgatis, foliis ternis, apice mucronato-pungentibus.

Flores

Flores Proteæ melliferæ quodammodo ſimiles, ſaturatè roſei, formoſi. *Capſulæ* criſtatæ, tricornes.

Locus *Auſtralaſia.*

In honorem amici optimi *Aylmer Bourke Lambert*, S. S. Reg. et Linn. Socii, libelli de *Cinchonâ* auctoris, hoc novum dicavi genus.

5. CONCHIUM.

Tetrandria *Monogynia.*

Ord. Nat. Proteæ, *Juſſ. Gen.* 79.

Char. Essent. *Calyx* nullus. *Petala* quatuor, ſtaminifera. *Stigma* turbinatum, mucronatum. *Capſula* unilocularis, diſperma. *Semina* alata.

Frutices rigidi, foliis mucronatis, pedunculis unifloris, confertis, floribus albis, capſulis obliquis. Genus a *Xylomelo* differt ſtigmate mucronato, a *Bankſia* fructu uniloculari, ab utrâque verò floribus calyce deſtitutis, nec amentaceis.

Locus *Auſtralaſia.*

6. PERSOONIA.

Tetrandria *Monogynia.*

Ord. Nat. *Lorantho* proximum genus.

Char. Essent. *Calyx* nullus. *Petala* quatuor, baſin verſus ſtaminifera. *Glandulæ* 4 ad baſin germinis. *Stigma* obtuſum. *Drupa* monoſperma.

Frutices ſubviminei. *Folia* exſtipulata, plerumque alterna. *Corolla* intus glabra. *Antheræ* lineares, demum reflexæ.

Stylus

Stylus persistens, glaber. *Drupa* in plerisque edulis. *Flores* flavescentes.

Genus a *Lorantho* discrepat numero partium, calyceque nullo. Vix *Caprifoliis* Jussieui associandum.

LOCUS *Australasia.*

In memoriam celeberrimi *C. H. Persoon*, opusculis variis de *Fungis* præclari.

7. ZIERIA.

TETRANDRIA *Monogynia*, propè *Fagaram.*

Ord. Nat. Rutaceæ, *Juss. Gen.* 297.

CHAR. ESSENT. *Calyx* quadripartitus. *Petala* 4. *Stamina* glabra, glandulis insidentia. *Stylus* simplex. *Stigma* quadrilobum. *Capsulæ* 4, coalitæ. *Semina* arillata.

Frutices foliis oppositis, ternatis, floribus albis. *Genus* dignoscitur staminibus singulis glandulæ magnæ insertis.

LOCUS *Australasia.*

In memoriam piè defuncti *Johannis Zier*, Soc. Linn. quondam Sodalis, botanici indefessi, nobis non oblivisendi, quamvis alio sub nomine labores ejus sæpiùs inclaruerint.

8. LASIOPETALUM.

PENTANDRIA *Monogynia*, propè *Iteam.*

Ord. Nat. Ericæ, *Juss. Gen.* 160.

CHAR. ESSENT. *Corolla* rotata, hispida, quinquefida. *Stamina* basi squamâ munita. *Antheræ* posticè bilobæ, apice poris duobus. *Capsula* supera, trilocularis, trivalvis; dissepimentis e medio valvularum.

Planta

Planta paludosa, viminea, tomento ferrugineo stellato, præter foliorum paginam superiorem denudatam, tecta. *Folia* alterna. *Flores* racemosi, fusci, inamœni. *Calyx* 3- vel 5-phyllus. *Stylus* simplex. *Stigma* acutum. *Capsula* trigona.

Locus *Australasia.*

9. CRYPTANDRA.

Pentandria *Monogynia*, post *Azaleam.*

Ord. Nat. Rhododendra? *Juss. Gen.* 158.

Char. Essent. *Calyx* pentaphyllus. *Corolla* tubulosa, limbo quinquefido, squamis quinque, cucullatis, inter segmenta. *Stamina* fauce inserta sub singulis squamis. *Stigma* trifidum. *Capsula* supera, trivalvis, trilocularis e valvulis inflexis. *Semina* solitaria, compressa.

Fruticulus ericoides, foliis fasciculatis, floribus capitatis extùs setosis. *Semina* elliptica.

Locus *Australasia.*

10. VELLEIA.

Pentandria *Monogynia*, propè *Scævolam.*

Ord. Nat. Campanulaceæ, *Juss. Gen.* 165.

Char. Essent. *Calyx* triphyllus, inferus. *Corolla* tubulosa, supra hians, limbo quinquefido. *Capsula* quadrivalvis, unilocularis, polysperma. *Semina* imbricata.

Genus *Goodeniæ* nostræ proximum, at differt *calyce* magno, *triphyllo*, infero! *capsulâ* quadrivalvi, *corolla* non usque ad basin fissâ. *Stigmate* gaudet *Goodeniæ*, habitu herbaceo, acauli.

Locus *Australasia.*

In honorem amiciſſimi D. *Thomæ Velley*, Soc. Linn. Sod. faſciculo de plantis ſubmarinis præclari.

11. STACKHOUSIA.

PENTANDRIA *Trigynia*, propè *Spatheliam*.

Ord. Nat. Terebintaceæ, *Juſſ. Gen.* 369.

CHAR. ESSENT. *Calyx* quinquepartitus. *Petala* quinque, unguibus coalita. *Capſula* tricocca, loculis monoſpermis.

Fruticulus vimineus, *Struthiolæ* facie, floribus flaveſcentibus, racemoſis, faſciculatis. *Folia* alterna, oblonga, integerrima, glauceſcentia. *Styli* breves. *Stigmata* obtuſa, ſimplicia. *Capſula* corrugata. Variat ſtylis binis, capſulâ dicoccâ.

LOCUS *Auſtralaſia*.

In honorem digniſſimi viri D. *J. Stackhouſe*, Soc. Linn. Sod. Nereidis Britannicæ auctoris.

12. SOWERBÆA.

HEXANDRIA *Monogynia*, antè *Allium*.

Ord. Nat. Aſphodeli, *Juſſ. Gen.* 53.

CHAR. ESSENT. *Corolla* infera, hexapetala. *Filamenta* tria, biantherifera, ſterilibus tribus interſtinctis.

Herba inodora, juncea, radice fibroſa. *Scapus* nudus. *Umbella* multiflora, bracteis ſcarioſis. *Petala* purpurea, perſiſtentia.

LOCUS *Auſtralaſia*.

In honorem viri amiciſſimi *Jacobi Sowerby*, Soc. Linn. Sod. botanici egregii, pictoris optimi, Fungorum Britannicorum ſcrutatoris acerrimi.

13. XAN-

13. XANTHORRHOEA.

HEXANDRIA *Monogynia*, propè *Anthericum*.

Ord. Nat. Asphodeli, *Juss. Gen.* 52.

CHAR. ESSENT. *Corolla* infera, hexapetala, persistens. *Filamenta* plana, linearia, nuda. *Capsula* triquetra. *Semina* bina, compressa, marginata.

Caudex lignosus, resinâ flavâ scatens. *Folia* triquetra. *Scapus* teres, longissimus, *amento* terminatus multifloro, floribus abortivis interstinctis squamoso.

LOCUS *Australasia*.

14. CORRÆA.

OCTANDRIA *Monogynia*, post *Ericam*.

Ord. Nat. Rhododendra, *Juss. Gen.* 159.

CHAR. ESSENT. *Calyx* monophyllus. *Petala* quatuor, conniventia. *Antheræ* incumbentes, biloculares, longitudinalitèr dehiscentes. *Capsula* supera, quadrivalvis, quadrilocularis e valvulis inflexis. *Stigma* simplex, acutum.

Frutices foliis oppositis, simplicibus, pubescentiâ stellari, calyce campanulato, integro, denticulato, petalis in aliquibus connatis, corollam monopetalam simulantibus. *Befaria* (meliùs *Bejaria*) Linnæi a *Corræâ* differt partium numero, at præcipuè antheris apice biporosis, stigmate incrassato septemfido.

LOCUS *Australasia*.

In honorem amici optimi, botanici doctissimi, *Josephi Correa*

de Serra, J U D, S S. Reg. et Linn. Sodalis, hoc novum et pulcherrimum dicavi genus, cùm *Correia* Vandellii *Ochnæ* ſpecies eſt.

15. GOMPHOLOBIUM.

DECANDRIA *Monogynia*, poſt *Sophoram*.

Ord. Nat. Leguminoſæ, *Juſſ. Gen.* 352.

CHAR. ESSENT. *Calyx* campanulatus, ſimplex, quinquepartitus. *Corolla* papilionacea. *Stigma* ſimplex, acutum. *Legumen* ventricoſum, uniloculare, polyſpermum.

Frutices foliis ternatis vel impari-pinnatis, floribus magnis, flavis.

LOCUS *Auſtralaſia*.

16. DAVIESIA.

DECANDRIA *Monogynia*, poſt *Gompholobium*.

Ord. Nat. Leguminoſæ, *Juſſ. Gen.* 352.

CHAR. ESSENT. *Calyx* angulatus, ſimplex, quinquefidus. *Corolla* papilionacea. *Stigma* ſimplex, acutum. *Legumen* compreſſum, monoſpermum.

Frutices rigidi, foliis ſimplicibus, pungentibus, floribus parvis, flaveſcentibus.

LOCUS *Auſtralaſia*.

In honorem clariſſimi *Hugonis Davies*, S. T. P. Soc. Linn. Sod. de plantarum Britannicarum ſtudioſis optimè meriti.

17. AFZELIA.

17. AFZELIA.

DECANDRIA *Monogynia*, propè *Hymenæam.*

Ord. Nat. Leguminosæ, *Juss. Gen.* 347.

CHAR. ESSENT. *Calyx* tubulosus, *limbo* quadrifido, deciduo. *Petala* quatuor, unguiculata; summo maximo. *Filamenta* duo suprema sterilia. *Legumen* multiloculare. *Semina* basi arillata.

Arbores foliis abruptè pinnatis, alternis, floribus racemosis, sanguineis, bracteolatis, leguminibus lignosis, ponderosis, seminibus nigris arillo coccineo speciosis.

LOCUS *Africa æquinoctialis.*

Nomen dedi in inventoris honorem, celeberrimi *Adami Afzelii*, Botanices in Academiâ Upsaliensi Demonstratoris doctissimi, qui hujus generis historiam absolutissimam nobis pollicitus est. *Afzelia* Gmelini nimis incerta est ut tanto nomine condecoretur.

18. ERIOSTEMON.

DECANDRIA *Monogynia*, propè *Rutam.*

Ord. Nat. Rutaceæ, *Juss. Gen.* 297.

CHAR. ESSENT. *Calyx* quinquepartitus. *Petala* quinque, sessilia. *Stamina* plana, ciliata; *antheris* pedicellatis, terminalibus. *Stylus* e basi germinis. *Capsulæ* quinque, coalitæ, nectario toruloso insidentes. *Semina* arillata.

Fruticuli foliis alternis, floribus solitariis. Hujus generis est *Diosma uniflora* Linnæi, cui stamina 5 abortiva sunt. Differt a *Diosmâ* defectu squamarum cum petalis alternantium; staminibus

minibus non exſertis; ciliatis, nec glabris; defectu nectarii germen coronantis; ſtaminumque numero.

LOCUS *Auſtralaſia.*

19. CROWEA.

DECANDRIA *Monogynia*, poſt *Erioſtemonem.*

Ord. Nat. Rutaceæ, *Juſſ. Gen.* 297.

CHAR. ESSENT. *Calyx* quinquepartitus. *Petala* quinque, ſeſſilia. *Stamina* plana, ſubulata, pilis intertextis connexa. *Antheræ* longitudinalitèr filamentis e parte interiori adnatæ. *Stylus* e baſi germinis. *Capſulæ* quinque, coalitæ. *Semina* arillata.

Habitus præcedentis, abundè verò diſcrepat antherarum formâ ac ſitu.

LOCUS *Auſtralaſia.*

In honorem amiciſſimi D. *Jacobi Crowe*, Soc. Linn. Sod. qui Floram Britannicam ad unguem inveſtigavit, atque obſervationibus numeroſis vario in modo communicatis illuſtravit.

20. DIURIS.

GYNANDRIA *Diandria*, propè *Arethuſam.*

Ord. Nat. Orchideæ, *Juſſ. Gen.* 65.

CHAR. ESSENT. *Nectarium* dependens. *Petala* novem; quinque exteriora maxima, biformia. *Columna genitalium* reſupinata, ſupernè operculata.

Formoſum genus, ſcapo baſi foliato, floribus racemoſis ſpathaceis. Dignoſcitur primâ facie petalorum exteriorum duobus

Lambertia formosa

duobus infimis elongatis, ferè calycinis, ſæpiùs linearibus. Columnâ gaudet reſupinatâ, orchideis omnibus huc uſque cognitis ſitu contrario, monente celeberrimo *Swartz*, quocum exemplaria communicavi.

Locus *Auſtralaſia.*

Tab. XX. exhibits the *Lambertia formoſa*, the only Species hitherto diſcovered of that Genus, (See page 214.) engraved from a Drawing made in New South Wales, and corrected from wild Specimens.

XIX. *Fur-*

XIX. *Further Obſervations on the Wheat Inſect, in a Letter to the Rev. Samuel Goodenough, LL.D. F.R.S. Tr.L.S. By Thomas Marſham, Eſq. Sec. L. S.*

Read February 6, 1798.

DEAR SIR,

THE very imperfect knowledge that we gained of the wheat inſect in the year 1795, which through you was communicated to the *Linnæan Society*, who have honoured it with a place in the Third Volume of their *Tranſactions*, has ſtimulated me to purſue the enquiry with greater earneſtneſs, though not with additional zeal; for it has always been my invariable opinion, that the enriching of a cabinet with the works of the creation is but a ſecondary conſideration at beſt, and of little utility, unleſs an endeavour to inveſtigate their nature, œconomy, and properties, be provoked by it. Indeed I often lament, that my ſituation in the metropolis, and the few opportunities I have of enjoying the country, prevent me from purſuing my favourite ſtudy as fervently as I could wiſh. In the preſent caſe I conſider myſelf only as the firſt inſtitutor of an enquiry that has become important by the perſevering aſſiduity and accurate examination of our mutual friends, to whom I was ſo much indebted in the former caſe. Early in June 1797, I wrote both to Mr. Kirby and Mr. Markwick, requeſting that they would again turn their attention to the wheat fields, and examine the ears of that grain as they advanced, from the firſt appearance of

of the flower, until the ſeed was ripe; and the reſult of their unremitted endeavours, with a few of my own obſervations, I now lay before you, requeſting, that if you think them worthy their attention, you will preſent them to our valuable Society; for ſuch I think it may be truly ſtyled, ſince the opinion of the Public has ſo fully ſtamped its conſequence.

Mr. Markwick, in a letter to me dated the 17th July 1797, ſtates as follows:—" On the 12th of this month I firſt diſcovered ſome of the little flies (which I ſend you incloſed) ſitting between the huſks or clefts of the ears of wheat: the next day they appeared to me more abundant; and then, for the firſt time, I found a few of the ſmall yellow larvæ, which infeſted the wheat in the year 1795, ſitting cloſe to the ſtamina, exactly as they are repreſented in the 3d vol. of the *Linnæan Tranſactions*, page 251. Tab. 22. fig. 10. a; ſince that time I have found the larvæ in much greater abundance, and the fly is alſo to be ſeen, though I think not in ſuch great numbers. The other inſects which I have diſcovered on the wheat, are the *Thrips phyſapus*, in its larva and perfect ſtate, as in the year 1795; and ſome of the ears were infeſted with the plant louſe *(Aphis)* called here the Dolphin." On the 25th of July, I received alſo a letter from Mr. Kirby, that contained ſome valuable hints, which induced me to ſend a copy of it to Mr. Markwick; and on the 17th of September I was favoured with the following letter from that gentleman:—

" I want words to expreſs the pleaſure I received from your laſt letter, as well as from your obliging communication of that of your very ingenious and learned friend Mr. Kirby, and ſhould have acknowledged the obligation ſooner, but waited until the end of harveſt, with the ill-founded hope of having ſomething to communicate relative to our little inſect worthy of your notice; for I am ſorry to ſay,

that I have not had any ſucceſs in diſcovering the perfect ſtate of this inſect: however, I will relate exactly what has happened.

" I incloſed ſeveral ears of wheat, containing a number of the ſmall yellow larvæ, in a flower-pot, cloſely ſtopped at the bottom, and covered with gauze at the top; and have at different times found dead, at the bottom of the pot, two different ſorts of very ſmall flies, one of which was a ſhort thick black fly, with very long tranſparent wings, and long ſlender ſmooth antennæ, of which I have ſent two rude figures ſomewhat magnified, ſee Tab. xix. No. vi. fig. 1. a and b. The other fly was as minute, if not leſs, with a yellow body, ſpotted and tranſparent wings, and long jointed antennæ, beſet with ſmall hairs or briſtles at each joint, at leaſt ſo they appeared to me through a magnifying glaſs; but that you may, if you pleaſe, examine them yourſelf, I have ſent two along with the others, being all that I found of that kind, though I fear they are not in a good ſtate; and I have alſo incloſed ſuch figures as I was able to make of them, ſee Tab. xix. No. vi. fig. 2, a and b. To your learned friend's queſtion as to the quantity of miſchief done by this unknown fly, I fear I cannot give a ſatisfactory anſwer: I certainly think his average of two grains in each ear deſtroyed by this inſect not too great, for I ſcarcely examined any ears in which there were not more than that injured. But, after all, are not our fears with reſpect to the injury that the wheat has received from this inſect greater than they ought to be? and does not the wheat ſuffer as much from inſects or ſome other cauſe every year, even in thoſe years that are moſt productive?

" By what I can learn from enquiries, and from my own obſervation, there is a good crop of wheat in this neighbourhood: one farmer, who has begun to threſh out his wheat, has found it yield well; and when in my own field I had the curioſity to rub out a few ears,

and

and to count the number of grains in each, in none I found fewer than forty, and in one ſixty-two; nay, my ſervant found one with ſeventy grains, moſt of which were perfect, there being only three or four ſhrivelled in each ear—a proof, I hope, that notwithſtanding the depredations of this and other inſects, the crop will not turn out deficient." In another part of his letter, Mr. Markwick, with great probability, conjectures, "that theſe larvæ may feed on the farina, or male duſt of the ſtamina, and poſſibly prevent the proper fertilization of the piſtil in ſuch a manner as to occaſion the future grain to be ſhrivelled and imperfect."

In addition to the foregoing remarks, I can only ſubjoin a few obſervations of my own on the ears of wheat ſent me by Mr. Markwick, and let Mr. Kirby's accurate and valuable experiments follow as a ſeparate paper. On cloſe examination of a number of ears, I found from two to ſix grains inhabited by the larvæ, as repreſented in Tab. 22. fig. 10. a. in the 3d vol. of the *Linnæan Tranſactions*, except that the number of the larvæ was greater in many of them, and in one or two I found what appeared to be a pupa. Having incloſed ſeveral of thoſe ears in large phials, with gauze over the mouth, I ſoon perceived that they became covered with mould, and the larvæ quitting them fell to the bottom of the phials and periſhed. I then procured one of the chimnies made uſe of for Argand's lamps, in which I incloſed ſome other ears, covering each end with gauze: by this means a free circulation of air being permitted to paſs through, the corn remained clean, and the little animals have not quitted their ſituation; which leads me to conclude that they will change into the pupa ſtate, as many appeared to have done that were left in the box in which they came, ſo that I have great hopes of breeding the fly at the proper ſeaſon of the year, which I preſume is now approaching. The figure from Mr. Markwick's drawing, repreſented in Tab. xix. No. vi. fig. 2. agrees in general with the deſcription of *Tipula*

Tritici of Mr. Kirby, and perhaps may prove to be the different ſex; or it is poſſible that Mr. Kirby might have taken his inſect immediately on its quitting the pupa ſtate, and before the wings were completely dry, ſo that the obſolete clouds with which they are marked had not become viſible. The manner in which both theſe Gentlemen met with this fly leaves very little doubt in my mind of its being the true parent of the larvæ we have deſcribed; and this opinion is very much ſtrengthened by the very great affinity there ſeems to be between our *Tipula* and the *Tipula Juniperina* of Linnæus, and *Tipula Pini* of the Baron De Geer, Tom. vi. p. 417. Tab. xxvi. fig. 8—19; it however differs in colour from the Latin deſcriptions of thoſe inſects, although it agrees in the other particulars. But the long French deſcription which De Geer gives of *Tipula Pini*, varies very little from that of our inſect; and the figure, being uncoloured, would paſs for it very well, as the antennæ and wings ſeem exactly to correſpond: even the account of the larva is nearly the ſame, except that he remarks a thin green line paſſing through the body of his, which he conjectures to proceed from the food, viz. the leaves of the pine; if this be the fact, ſuch a line would not be viſible in our larvæ, as they feed on the pollen of the wheat, which is nearly their own colour: another difference is, that the larvæ of *T. Pini* form little reſinous caſes to preſerve themſelves during the Winter; but both continue unchanged until Spring, as appears by Mr. Kirby's opening one of the caſes, which he ſuppoſed contained the pupa, and finding the larva unchanged, from which I conclude that we have not yet ſeen the pupa. The flies of *T. Juniperina* and *T. Pini* do not come forth until May, which time will exactly ſuit our little animal for depoſiting its eggs in readineſs for the bloſſom of the wheat; and from the appearance of ſome of the little caſes which I have by me, that are ſo tranſparent as to admit of a perfect view of the larva, I am of opinion that they are approach-

ing to the pupa ſtate, as the maggot becomes more white and opake, and is evidently ſhrunk in length. Another circumſtance mentioned by the accurate De Geer, that unites them ſtill more cloſely, and confirms my conjecture of the two ſexes, is the difference between male and female; for he ſays, *Fæminæ alæ nigricantes*, agreeing with the clouded wings in our figure, and at the ſame time confirming Mr. Kirby's deſcription of his. In ſhort, ſo nearly are theſe inſects allied, that I ſhould have little heſitation to pronounce them the ſame, had they not fed on plants ſo very different in their nature and properties. The *Ichneumon Tipulæ* of Mr. Kirby has been ſo fully obſerved by all parties, that it requires nothing to be added here. I can only now obſerve, that the difficulty of inveſtigating and fully exploring the ſecret works of the Creator muſt be my apology for ſtill offering imperfect hints inſtead of a complete hiſtory, but I have done ſo with a view to excite other labourers to favour us with their communications and experiments; for, to uſe the words of my valuable friend Kirby, "If we can advance one ſtep, it is ſomething; and who can entirely remove the awful veil that conceals from mortal eyes the full beauty of the face of Nature, that envelopes in darkneſs her ſecret operations? To get now and then a glimpſe of the footſteps of him who is 'wonderful in working' is all that we can expect. The united force of ſuch obſervations, like rays collected by a lens, which, although when ſeparate they operate but ſlightly either as light or fire, will in time illuminate a ſubject, and make us ſee clearly in what darkneſs we were before. To collect theſe ſeparate rays is the office of the *Linnæan Society*, by whoſe means the light which each conveys is caught ere it be diſſipated, and thus many myſteries of Nature are elucidated, which otherwiſe might for ever have remained in obſcurity."

XX. *Hiſ-*

XX. *History of Tipula Tritici, and Ichneumon Tipulæ, with some Observations upon other Insects that attend the Wheat, in a Letter to Thomas Marsham, Esq. Sec. L. S. By the Rev. William Kirby, F.L.S.*

Read February 6, 1798.

MY DEAR FRIEND. *Barham, Sept.* 29, 1797.

WHEN you left me in July last, you desired me to continue my observations upon those insects that infest the wheat; and particularly to endeavour to complete the history of the larva, of which you have given an account in the 3d vol. of the *Transactions* of the *Linnæan Society* *, and which, with great justice, you suppose to be the *principal* enemy of the grain. In compliance with this request, I have endeavoured to trace it through all its metamorphoses, and to ascertain, in some measure, the quantity of mischief which it is capable of doing—with what success you shall now hear; and I shall add such other circumstances relative to this and other insects which attend the wheat, as have occurred to my observation. What I have collected, although far from being a complete history of *all* the insect infesters of that grain, may afford some few hints which may possibly be of use to assist the investigations of abler

* *Trans. Linn. Soc.* vol. iii. p. 242. Tab. xxii. fig. 9. 10. 11. 12.

Naturalists,

Naturaliſts, and, in conjunction with your own obſervations, and the information you will procure from the ingenious and accurate Mr. Markwick and other friends, be not unworthy of the notice of the public.

In the year 1795, when you firſt began to inveſtigate this ſubject, I obſerved very few of the larvæ in queſtion; and conſidering the *Thrips phyſapus* as occaſioning the greateſt quantity of injury, my chief attention was directed to that inſect; but in the preſent ſeaſon I have more particularly attended to the former. Wherever I have taken my walks, I have made it my buſineſs to examine thoſe fields of wheat through which I have paſſed, and I have ſcarcely paſſed through any in which ſome florets, of every ear that I examined, were not inhabited by theſe larvæ; and this has often been at ſome diſtance from hence. But although I have found the larvæ ſo abundant, the pupa has very ſeldom occurred to me; ſo that for fifty of the former, I think I may ſay without exaggeration I have ſcarcely found one of the latter. As many as I collected, I put into a tumbler covered with gauze, in which they remained ſome time without any imago making its appearance. At length I obſerved the exuvia of one lie at the bottom of the glaſs; but the imago, I ſuppoſe, had made its eſcape through the gauze, as I could not find it. Upon this I put the remaining ones into a ſmall phial, the mouth of which I ſecured with gauze four times doubled, and tied cloſe. About three weeks ſince, examining this one day, I obſerved a ſmall fly walking up its ſides: I opened it carefully, and ſecured my little animal, which upon examination appeared to be a very minute *Tipula*, nearly of the colour of the pupa. It is not deſcribed in Gmelin's edition of the *Syſtema Naturæ*, nor by any author that I have acceſs to; therefore I ſhall deſcribe it, and the little *Ichneumon* which depoſits its egg in its larva.

TIPULA.

TIPULA. *Alis incumbentibus. Culiciformes.*

Tritici. T. ferrugineo-rufa, alis hyalinis margine pilosis, oculis nigris. Minima aurantiaca. *Antennæ* moniliformes thorace longiores. *Alæ* pilis ciliatæ. *Pedes* longiusculi.

Longitudo ferè linearis.

Larva saltatrix, apoda, citrea, marginata margine plicato-papilloso, capite acuto, caudâ truncatâ.

Habitat in *Tritici* spicis.

Pupa angusta, utrinque acuta, rufescens.

ICHNEUMON. *Minuti, abdomine ovato sessili.*

Tipulæ. I. niger, antennis basi pedibusque rufis; tibiis posticis clavatis apice nigris.

Minutissimus, niger, nitidus. *Antennæ* fractæ, vibratoriæ, articulo primo longo rufescenti. *Alæ* aveniæ immaculatæ corpore longiores. *Abdomen* obovatum, depressum, subsessile. *Tibiæ* clavatæ, præsertim posticæ.

Longitudo infra linearis.

Habitat in larvis *Tipulæ Tritici*, ovum unicum deponens in singulis.

After I had taken my little *Tipula*, I unfortunately lost it. I had fastened it upon a piece of paper with gum water, and left it for a time in an open box, that the gum might dry. I suppose some other insect took that opportunity to devour it; for when I returned to put it to a place of greater security, it was gone, and ever since I have watched in vain for the disclosure of another.

It

It is ſingular that this ſpecies of *Tipula*, which muſt neceſſarily be very common, ſhould never have been noticed. So often as I have been, and at all times, in the corn-fields, with my attention always awake to entomological ſubjects, I do not recollect ever ſeeing it before. Since I loſt it, I have ſearched for it in a field where I found the larvæ in the greateſt plenty; I have examined the barn where the corn from that field was laid up; and in both inſtances was equally unſucceſsful. From theſe circumſtances it ſeems probable, that although one or two might be diſcloſed with me, by being placed in a ſituation where the ſun ſhone upon them, ſooner than their natural ſeaſon, yet that in general the fly does not make its appearance until the Spring, ſo as to be in readineſs to depoſit its eggs in the wheat, when it has made ſo much progreſs in growth, that the larva may be hatched about the time of its going into bloſſom. And I am confirmed in this opinion by another circumſtance: A few days ſince, with a fine needle, I carefully took off the thin membrane from two of the pupæ which I had reſerved, that I might ſee how near they were to a change of ſtate; but inſtead of diſcovering the lineaments of the future fly, the inſect was ſtill in the form of the larva*: ſo that probably the pupa is not uſually complete until the Spring, and the inſect incloſes itſelf in a thin membrane to protect itſelf from the cold of the Winter.

I obſerved above, that the *pupæ* which I met with bore no proportion in number to the *larvæ*. I have ſeen more than once ſeven or eight florets in an ear inhabited by the latter, and ſometimes ſo many as thirty in a ſingle floret, ſeldom leſs than eight or nine, and

* It may be objected that this was probably the larva of the *Ichneumon*, which had devoured that of the *Tipula*. To this I reply, that it was in colour, form, and in every reſpect ſo exactly ſimilar to the latter that it could be no other.

yet I have ſcarcely ever found more than one pupa in an ear, and had to examine ſeveral to meet with that. What then becomes of the remainder of the larvæ? Are they deſtroyed by that of the *Ichneumon?* or do they become the prey of ſome other inſect? or do they fall to the ground when they aſſume the pupa, and remain there until the following Spring? To give a poſitive anſwer to any one of theſe queries I ſhall not pretend; I will only relate circumſtances, and point out what from them appears to me to be moſt probable. The pupæ that I have obſerved have generally been ſomewhat attached to the grain, and, what is worthy of notice, I never found them within thoſe florets where the larvæ had taken up their reſidence; they ſeem invariably to chooſe for their habitation, in their intermediate ſtate, one where the grain is uninjured, to which they may attach themſelves. A queſtion here ariſes, how they contrive to get from one floret to another, having no feet? but as I have never ſeen them do this, I will not attempt to conjecture how they do it. In the field above-mentioned, I took up many roots of ſtubble, with a large lump of earth round them, to ſee if I could diſcover any of the pupæ concealed in it; but if they were there, they eſcaped my eye, from their minuteneſs: yet it ſeems not probable, nor analogous to the general proceedings of nature, that it ſhould be indifferent to them whether they go under ground, or remain in the ear, when they aſſume the pupa. That they are deſtroyed by any other inſect than the *Ichneumon*, I have no reaſon to believe, having never ſeen them attacked by any other; therefore it ſeems to me moſt probable that this little friend to man is the deſtroyer of by far the greateſt part of them. If this be the caſe, what a benefactor to the human race is this diminutive animal! and how ought we to admire and adore the wiſdom and goodneſs of Divine Providence, in thus ſetting bounds to the ravages of an inſect, which, however inſignificant it

may

may ſeem at firſt ſight, might, if permitted to exceed its due limits, deprive us of the ſtaff of bread, and almoſt occaſion the deſtruction of our ſpecies! The ſuperſtition of the Ancients, had they been acquainted with the advantages which appear to be derived to man through the inſtrumentality of this important though minute link in the chain of creation, would have erected altars to it, as to a beneficent deity: Can we, who enjoy the clear light of revelation, do leſs than adore and extol that goodneſs, which thus preſerves a due balance in his works, and ſays to the deſtroyer, Thus far ſhalt thou come, and no further * ? Indeed the numerous ſpecies of the genus *Ichneumon* ſeem to have been created on purpoſe to keep within due bounds the other tribes of inſects. Any perſon who has obſerved the depredations committed in our gardens by the caterpillar of the cabbage butterfly, may conjecture to what extent they would be carried, were it not given in charge to the Ichneumon of that inſect to keep them within their aſſigned limits. In a word, were it not for this philanthropic genus, we ſhould not be able to ſtir, nor even breathe, without being annoyed, nay ſuffocated by myriads and myriads of troubleſome animals, which are now taught to know their proper bounds, and anſwer the ends for which they were created. But why do I thus moralize to you, to whom theſe reflections are perpetually recurring? I ſhall therefore return to my hiſtory.

It is ſingular, but moſt people who are acquainted with the larva of the *Tipula Tritici* miſtake this friendly *Ichneumon* for its parent, and thus impute all the miſchief to the very creature which

* Finis creationis telluris eſt gloria Dei, ex opere naturæ per hominem ſolum. *Linn.*

Omnes res creatæ ſunt divinæ ſapientiæ et potentiæ teſtes: divitiæ felicitates humanæ: Ex harum uſu bonitas creatoris; ex pulchredine ſapientia Domini; ex œconomia in conſervatione, *proportione*, renovatione, potentia majeſtatis elucet. *Id.*

is appointed to prevent it. It is ſome ſatisfaction to me to confirm your opinion* and do juſtice to our little benefactor, and to point out where the odium ought to fall.

To ſee our little *Ichneumon* depoſit its egg in the caterpillar of the wheat fly, is a very entertaining ſight. In order to enjoy this pleaſure, I placed a number of the latter upon a ſheet of white paper, at no great diſtance from each other, and then ſet an *Ichneumon* down in the midſt of them. She began immediately to march about, vibrating her antennæ very briſkly:—a larva was ſoon diſcovered, upon which ſhe fixed herſelf, the vibratory motion of her antennæ increaſing to an intenſe degree; then bending her body obliquely under her breaſt, ſhe applied her anus to the larva, and during the inſertion of her *aculeus*, and the depoſiting of the egg, her antennæ became perfectly ſtill and motionleſs. Whilſt this operation was performing, the larva appeared to feel a momentary ſenſation of pain, for it gave a violent wriggle. When all was finiſhed, the little *Ichneumon* marched off to ſeek for a ſecond, which was obliged to undergo the ſame operation, and ſo on to as many as it could find in which no egg had been before depoſited—for it commits only a ſingle egg to each larva. I have ſeen it frequently mount one which had been pricked before, but it ſoon diſcovered its miſtake and left it. The ſize of it is ſo near that of the *Tipula*, that I imagine the larva of the latter could not ſupport more than one of the former, and therefore inſtinct directs it to depoſit only a ſingle egg in each; beſides, by this means one *Ichneumon* will deſtroy an infinite number of larvæ.

The larva of the *Tipula Tritici* (as Mr. Markwick, in his letter to you, dated July 17, 1797, has well conjectured) appears to feed upon

* *Tranſ. Linn. Soc.* vol. iii. p. 243.

the

the pollen or duſt of the antheræ, for in thoſe florets in which it reſides the germen never ſwells, and the antheræ are perſiſting; from which it ſeems evident that the impregnation of the germen is prevented, either by the inſect's uſing ſome means, perhaps a kind of gluten, to prevent the pollen from burſting from the antheræ, or, *vice verſa*, by doing ſomething to the ſtigma to prevent the fertilization of the germen. The pollen of three antheræ is a ſtore which will maintain ſometimes thirty of theſe creatures, from the time that the wheat is in bloſſom, until it is nearly if not altogether ripe. I could never diſcover that the grain was injured in any other way by this inſect, but it invariably produces the inanition of it in the floret which it inhabits. It may always be detected by the diſcoloured appearance of the baſe of the corolla, which is its uſual ſtation.

Although Mr. Markwick could not diſcover any damage done to the wheat in the year 1795, yet, upon a cloſer examination in the preſent year, that gentleman ſeems convinced that the inanition of the grain takes place wherever the larva makes its attack, as appears by his letter above quoted. My own obſervations fully confirm this opinion; and the miſchief occaſioned by it will appear to you very conſiderable, at leaſt in this neighbourhood, when you weigh the following reſult of a particular examination of my own, which had this circumſtance for its object.

To aſcertain the quantity of miſchief produced by our *Tipula* within particular limits, I went to a field of fifteen acres, which was planted partly with white and partly with red wheat. In this field I took five ſtations, one on each ſide, and one in the centre. In each ſtation I examined a certain number of ears, grain by grain, without ſelection. The reſult was, that in thirty ears of white wheat, ſeventy-three grains were deſtroyed by the larva, which is at the

rate

rate of not quite two and a half grains to an ear; and in twenty ears of red wheat, twenty-nine grains were deſtroyed, which is nearly at the rate of one and a half grains to an ear. Take the whole together, and the proportion will be about two grains in an ear, which I ſuppoſe may be about a twentieth part of the produce, and would make a difference of at leaſt five coomb in the crop in this field. The white wheat in this inſtance was moſt expoſed to the attack of the inſect;—whether this be generally the caſe, muſt be determined by future experiments upon a more extenſive ſcale. Leaſt miſchief ſeemed to be done on the South ſide of the North hedge; but no part eſcaped wholly—not an ear I examined but what had ſuſtained ſome injury. From the field that I have been ſpeaking of I went to another, which was ſown later in the Autumn: in this I found ſcarcely any of the larvæ; but it was very much infeſted by the *Aphis*, called in Mr. Markwick's letter above-mentioned the Dolphin*. The ſame ſpecies of *Aphis* is ſufficiently common upon barley and oats, as well as wheat: I found very few of theſe in the firſt field. The red gum, which is undoubtedly a kind of *Fungus*, appears to me totally unconnected with the inſects that infeſt the wheat: in the field where I found an infinity of the larvæ of the *Tipula Tritici*, and *Thrips phyſapus*, I ſcarcely found any

* Poſſibly this may be the *Aphis Avenæ* of Fabricius: but as he has given no deſcription of it, I cannot be poſitive; I ſhall therefore deſcribe it under the name of

A. *granaria*, viridis, cauda biſeta, ſetis geniculiſque pedum nigris.

Aphis avenæ. *Fab. Sp. Inſ.* ii. p. 386. n. 17. *Gmel.* tom. 1. part. iv. p. 2206. n. 52. *Vill. Ent. Eur.* 1. p. 551. n. 50?

Caput flavidum uti antennarum articulus primus. *Oculi* nigri. *Abdomen* obovatum caudâ aculeatâ. *Pedes* lividi, tarſis geniculiſque nigris.

Habitat in *tritici* et *hordei* ſpicis, *avenæque* paniculis.

florets

florets which produced this little plant; but ſome ears of a kind of bearded wheat, which I cultivated in my garden, were quite diſcoloured by it, without any larva attending upon it. Of all the inſects that are found in wheat, the *Thrips phyſapus*, in all its ſtates, is by far the moſt numerous. I do not recollect examining a ſingle ear in which it was not to be found; and my opinion ſtill remains unaltered, that it derives its nouriſhment from the grain; nor can I look upon the ſpecies of this genus as carnivorous, any more than thoſe which belong to its neighbouring genera, *Aphis*, *Chermes*, and *Coccus*.

I have nothing further at this time to add upon this intereſting ſubject, and therefore believe me, &c.

XXI. *Account*

XXI. *Account of a New Species of Muſcicapa, from New South Wales. By Major-General Thomas Davies, F. R. S. and L. S.*

Read February 6, 1798.

HAVING had the good fortune to procure fine ſpecimens of the male and female of a ſingular bird from New South Wales, which the natives of that country call the *Merion Binnion*, or Caſſowary-Bird, and as it is a ſpecies at preſent very little known, I am induced to preſent to the Preſident and Members of the Linnæan Society an accurate drawing of both ſpecimens, in hopes that it may be found worthy of their acceptance. I am ſorry that I cannot at the ſame time furniſh the Society with an accurate account of its manners. Even its genus appears to be rather difficult to determine with the certainty I could wiſh, and I ſhall therefore leave that deciſion to others more capable than myſelf. I have, as yet, claſſed it in my own collection with the *Flycatchers*, as it appears to me to approach neareſt to that genus.

All the information which I have been able to procure reſpecting it, from Governor Philip, Colonel Nepean, and other Gentlemen, who reſided ſome years in New South Wales, is, that it is found about Sidney and Botany-Bay, in marſhy places, abounding with long graſs and fine ruſhes, in which it hides itſelf very dexterouſly; that,

that, when diſturbed, its flight is very ſhort, like that of a graſs-hopper; and that it no ſooner alights than it runs with ſuch great agility that many who have been confident of their having covered birds with their hats, have, to their great ſurpriſe, ſeen them again take wing at no great diſtance: ſo that they are always difficult to catch. I have, however, to obſerve, that the colour of the bird, and the length of its legs, muſt greatly contribute to its ſo eaſily eſcaping the vigilance of thoſe who purſue it. I am alſo induced, from the circumſtance of its bill being well ſurrounded with briſtles, to think that its food is ſmall flies, and other inſects which it catches amongſt the roots of the graſs and ruſhes.

The length of the bird, from the point of the bill to the end of the rump, is three inches; the bill is three-eighths of an inch long, of a browniſh black colour, conſiderably curved at the point, having the baſe furniſhed with ſtrong briſtles, and noſtrils large and low down; irides uncertain; head much flattened and narrow towards the baſe of the bill, with a pale azure bar from the baſe of the bill over the eye; throat, to the centre of the neck, on each ſide, azure; front part of the head, cheeks, breaſt, fore part of the ſhoulders, thighs, ſides and rump, ferruginous; centre part of the belly nearly white; hind part of the head, neck, ſhoulders, back and rump, greyiſh brown, elegantly ſtreaked with browniſh black; feathers of the back and rump, long, ſoft, and of a ſilky texture; wings very ſhort, ſcarcely reaching to the baſe of the tail, of a dark browniſh black colour, edged with rufous brown; legs ſlender, three-fourths of an inch long, of a pale dun or horn colour; feet ſlender and long; claws crooked and very ſharp, eſpecially the hind one, which is the largeſt, all of the ſame colour with the legs; the tail, independent of the body, is four inches and more in length, ſhafts black and very ſlender, armed on each ſide with minute

ſlender filaments, like hair, of a black colour. The female is like the male in every reſpect, excepting that it has no azure bar over the eye, and that it is entirely of a ferruginous colour from the baſe of the under-mandible to the vent.

The natives of New South Wales give the name of *Merion Binnion* to this bird, on account of the great reſemblance of its tail to the feathers of the Caſſowary.

Since the above account was written, Dr. Shaw has examined the bird therein deſcribed, and has named and characterized it as follows:

MUSCICAPA *malachura.*

Soft-tailed Flycatcher.

M. fuſca, ſubtus ferruginea; gula (maris?) cœrulea; cauda longa cuneata, rectricibus decompoſitis.

Brown Flycatcher, ferruginous beneath; the throat (of the male?) blue; the tail long and cuneated, with looſe-webbed feathers.

TAB. XXI. repreſents the *Muſcicapa malachura*, male and female.

XXII. *Obſer-*


Linn Trans. IV tab. 21 p. 232

XXII. *Obſervations on the Genus Pauſus, and Deſcription of a New Species. By Adam Aſzelius, M. D. Demonſtrator of Botany in the Univerſity of Upſala, F. R. S. and F. M. L. S.*

Read March 6, 1798.

IN a diſſertation publiſhed at Upſala in the year 1775, and called *Bigæ Inſectorum*, Linné deſcribed two new genera of inſects, to one of which he gave the name of *Pauſſus*. The etymology of this word, though he does not explain it himſelf, is probably the Greek παῦσις, ſignifying a *pauſe*, a *ceſſation*, a *reſt*. But then it ought to be ſpelt with only one *ſ*; and in either caſe it would be difficult to comprehend the reaſon of his applying it to the inſect in queſtion. The former, however, may eaſily be accounted for as a trifling error of the preſs; and the latter, I imagine, it may not be improper to explain in this way:—Linné, old, infirm, and ſinking under the weight of age and labour, ſaw no poſſibility of continuing any longer his glorious carreer: wiſhing therefore to put a ſtop to his uſual amuſements and uſeful exertions, he would ſay,

——————— hic meta laborum;

and ſo it was as to inſects, for *Pauſus* is the laſt he ever deſcribed, and afterwards he publiſhed only two ſmall botanical diſſertations.

 But

But whether this etymology and explanation be right or wrong, I cannot find any better; and thus I am induced to follow Thunberg, Gmelin, and Herbſt, in their mode of ſpelling *Pauſus* with one *ſ*, being as to my idea the moſt rational.

Linné knew but one ſpecies of this genus, from which he took the generic character, and which he called (from μικρὸς and κεφαλὴ) *micro-cephalus*, on account of its head being very ſmall in proportion to the other parts of the body. It is ſhortly deſcribed in the diſſertation above-mentioned, and five figures of it ſubjoined, repreſenting it in different views, two in its natural ſize, and three in a magnified one.

After this original account of Linné, there have been very few authors that have publiſhed any thing concerning *Pauſus*. Thoſe I have had an opportunity of ſeeing, and I think I have ſeen all, are the following; and whoſe writings I ſhall mention in the ſame chronological order as they have appeared.

Thunberg, during his travels in the country of the Hotentots, in the year 1772, having met with two unknown inſects, deſcribed them as conſtituting a new genus in the claſs of Coleoptera. But having returned to Sweden, and being then acquainted with the *Pauſus* of Linné, he thought his two ſpecies might be referred to this genus, eſtabliſhed during his abſence; and accordingly he wrote a paper on the ſubject, which he delivered to the Royal Academy of Science at Stockholm, and which is printed in its Tranſactions for the year 1781.—Here he deſcribes and ſpecifies his two inſects, calling the one *Pauſus ruber*, and the other *Pauſus lineatus*; annexing two figures of the laſt mentioned, one ſhewing it in its natural ſize, and the other repreſenting it magnified. He alſo makes ſome few additional remarks on the genus itſelf, and gives the ſpecific difference of P. *microcephalus*.

Fueſsly,

Fueſsly, without taking notice of what Thunberg had written on the ſubject, republiſhed Linné's original account in the 3d number of his *Archiv der Inſectengeſchichte*, printed at Zurich 1783. The whole deſcription, as well as all the figures, are expreſsly copied; but the other remarks are tranſlated into the German language.

Gmelin, in his *Linnæi Syſtema Naturæ* of 1788, ſeems to have confined himſelf only to the peruſal of the text of Fueſsly, tranſcribing even his error; which he ſurely could never have done, had he at the ſame time conſulted the original of Linné.

Herbſt, in his *Natur Syſtem der Inſecten*, the 4th part of the Coleoptera, publiſhed at Berlin 1792, has inſerted both Linné's and Thunberg's ſpecies, but tranſlated their deſcriptions of them into German, and given them new ſpecific characters in Latin, though not very recommendable for correctneſs either ſcientific or typographical. To this he has ſubjoined a plate, repreſenting, amongſt many other inſects, alſo two figures of P. *microcephalus*, and two of P. *lineatus*; the former copied from the diſſertation of Linné, and the latter from Thunberg's paper in the Tranſactions of the Swediſh Academy of Science.

Fabricius began in the ſame year, or 1792, to publiſh at Copenhagen his *Entomologia Syſtematica*. Not having before taken notice of *Pauſus* in any of his writings, he now introduced it in this work; not however as a diſtinct genus, but putting it under his *Cerocoma*, he calls Linné's inſect C. *microcephala*, and the figured one of Thunberg C. *lineata*. The other, or *Pauſus ruber*, he does not mention at all.

An anonymous author, or probably more than one, have laſtly publiſhed at Winterthour in the canton of Zurich, in the year 1794, a French tranſlation of Fueſsly, combining all his ſeparate numbers in one continued volume, and calling it *Archives de l'Hiſtoire des Inſectes*

Inſectes de Fueſsly. Here occurs nothing but what is found in the original edition, except a new blunder, and a remark in the notes to this purport: "that there are two other ſpecies of *Pauſus* mentioned in the memoirs of the Swediſh Academy, and that Fabricius, not having examined theſe inſects as minutely as he ought, has placed them amongſt his *Cerocomæ*, till there may occur an opportunity of determining their genus with more accuracy."

Theſe are all the writers I have ſeen who treat on the genus and ſpecies of *Pauſus.* And it is very remarkable, that almoſt every one of them has committed ſome miſtake. This may be excuſable, when there are ſeveral accounts of a natural production from ocular obſervations of different perſons; but not ſo when there exiſts only one, as is the caſe in regard to Linné's *Pauſus*; for though Thunberg and Fabricius may both have ſeen it, yet neither of them has added any thing to illuſtrate it but what might have been collected from Linné's deſcription and figures of it, the latter having only created greater confuſion than any before him, by putting it among the *Cerocomæ.* As to Fueſsly, Gmelin, Herbſt, and Fueſsly's tranſlators, I am almoſt certain they never ſaw a *Pauſus;* and therefore, whatever they have written, they ought to have taken from Linné, and are to be eſteemed in proportion as they have copied him faithfully.—But I ſhall ſtate their reſpective miſtakes more at large, when I come to the hiſtory of P. *microcephalus* in particular, and ſhall now in the firſt place ſettle the characteriſtics of the genus.

Beſides the Linnæan ſpecies, which I have examined here in London, I brought another nondeſcript with me from Africa, which, in imitation of Linné's deriving the ſpecific name of his from the Greek, I call (from σφαίρα and κέρας) P. *ſphærocerus*, on account of each of its antennæ bearing at its end a large and remarkable globe. Both

Both theſe ſpecies I have carefully compared, and found to agree in many circumſtances; but I ſhall here only mention the moſt ſtriking ones, as well as thoſe which ſtand in need of ſome explanation, or where, from want of proper *termini technici*, I ſhall be under the neceſſity of uſing circumlocution in order to be underſtood.

The *Body* is hairleſs, ſmooth, and poliſhed, above ſomewhat depreſſed, before narrower, and behind nearly cylindrical; the *ſize* ſmall, being from the top of the antennæ to the end of the abdomen only three lines long, and acroſs the elytra not quite one broad; the *colour* uniform, a darker or lighter brown; the *motion* ſteady and ſlow, at leaſt in the ſpecies I have ſeen alive. It is very unlike all other genera I know; but it ſeems to come neareſt to the *Clerus* of Fabricius, bearing to it, at leaſt upon the whole, ſo much natural reſemblance that its moſt proper place in the ſyſtematical arrangement will be next after that genus.

The *Head* is ſmaller and ſhorter than the thorax, almoſt round, and at the baſe ſurrounded as it were by an annular ſegment; in the living animal it is pointing ſtraight forward, but when dead it commonly bends a little downwards. The *clypeus* is minute, and more or leſs depreſſed in the middle. On the *throat* there is a convex ſpot, raiſed in form of a triangle, which is nearly equilateral, the baſe of which forms a croſs-bar between the eyes, its two upper angles being acute, but the lowermoſt cut off by the annular ſegment juſt mentioned.

The *Eyes* are rather large, tranſverſally oblong, prominent, and ſituated in a ſocket, the brim of which is elongated into one angle before lying horizontally, and another behind ſtanding upright; which ſtructure ſeems to prevent the inſect from being able to look in any other direction than forwards.

The

The *Antennæ* are very remarkable, and different from thoſe of all other inſects, not only by their conſiſting of no more than two joints, but alſo by their ſingular mechaniſm. The *under-joint* is a thick and almoſt round knob, truncated at both ends, and below on the outſide furniſhed with a little bright ball, moving in a cavity on the head, juſt before the eye, between the clypeus and the anterior angle of the eye-ſocket. This ball is the pivot on which the whole antenna rolls or performs its rotatory motion. It is very viſible at its root, and eaſily miſtaken for an eye, being quite globular, and, by continual rubbing, highly poliſhed. The *upper joint* is alſo a kind of knob, but of a very different nature, and curiouſly conſtructed. In the front it is outwardly marked with a raiſed line, or an edge, running from the baſe to the vertex, and behind elongated into a tube or a hook pointing inwards. Beneath it is furniſhed with a pedicle, which having a ball at the end, and being inſerted in the under-joint, towards the outſide of its top, as into a ſocket, makes the upper-joint qualified for a ſeparate motion, independent of that of the whole antenna. And as a proof that this is really the caſe, it is to be obſerved that there are ſcarcely two antennæ to be met with having the elongated hind part of the upper-joint pointing exactly the ſame way, though the under-joint remains in its uſual poſition; which makes it very difficult to determine the true and moſt natural direction of this hind part, which however, I ſhould think, muſt be either juſt above the under-joint, or a little on the outſide of it. Linné gives to this part the name of *hook;* and ſo it is in my ſpecies, but in his own it reſembles more a tube or a blunt ſpur, or rather it is nothing elſe than a ſhort contracted elongation of the upper-joint. But, having made this remark by way of explanation, I ſhall not ſcruple to retain the original term *uncinata*, as applied to the upper-joint, called by Linné

Linné *clava*, to which I alſo would add his other appellation of *ſolida*, if it could be done with any ſort of propriety. By this epithet he certainly meant nothing more than *integer*, adopting it in contradiſtinction to *lamellatus* and *perfoliatus*. And it anſwered the purpoſe very well, as long as no other inſects were known than thoſe having their clavæ entire and at the ſame time ſolid. But now it would imply a contradiction, ſince we have got a coleopterous inſect with an entire clava though not ſolid; which is undoubtedly the caſe as to P. *ſphærocerus*, being provided with clavæ, or head-balls, almoſt pellucid, and ſeemingly containing no ſubſtance whatſoever but perhaps ſome fine liquid. As to the clavæ of P. *microcephalus* I am not ſo certain, but they have alſo an appearance of being inflated; and beſides, as they are larger than the whole head, one would ſuppoſe them too heavy to be carried in the front, if quite ſolid. However this may be, the word is ſtill improper in regard to the other ſpecies, and I ſhall therefore avoid uſing it. The under-joints of both ſpecies are almoſt parallel, but the upper ones very diverging. On the vertex of theſe latter, at the end of the raiſed line above deſcribed, there are one or more ſmall protuberances, tipped with fleſhy ſubſtances, like hairs, which probably are organs for feeling.

The *Mouth*, and its different parts, as to their ſhape and ſtructure, I have not been able to aſcertain ſo accurately as I could wiſh, and as it ought to be done; for, independent of their ſmallneſs in ſo little an animal, it is quite impoſſible to deſcribe them rightly, without their being taken ſeparate from one another; and for this purpoſe I had not any of theſe rare inſects to ſacrifice, three of one ſpecies and ſix of the other being all which I have ſeen. Beſides, the former were not my own; the latter I could ſubject to a cloſer ſcrutiny, not minding much whether any of them became broken. The

 conſequence

conſequence of which is, that I am better acquainted with P. *ſphærocerus* than with the other. The mouth, however, of both ſpecies, and the various parts belonging to it, I have been obliged to examine in their unſeparated ſtate, and I have been therefore unable to avoid all miſtakes, as the innermoſt are more or leſs concealed by the exterior ones. But I muſt confeſs that even theſe latter, which I can plainly ſee through a compound microſcope, do not appear to me exactly ſuch as Fabricius will have them to be. I ſhall deſcribe them all as I have found them.

The *Palpi* are four in number, and ſeem all to ariſe from the croſs-line between the eyes, or the baſe of the jugular triangle before mentioned. The two placed in the middle and farther in, and perhaps alſo a little higher up, are three times as long as the others, at the bottom nearly approximate but afterwards diverging, flat within and convex without, moving on two ſmall tubercles at the baſe, above which they are firſt contracted, and ſo more or leſs widened. They may alſo, although my obſervations have not ſatisfied me on the ſubject, be in ſome way or other attached to the lowermoſt and external part of the labium. In thoſe of P. *microcephalus* I cannot find the leaſt veſtige of articulation except the baſe-hinges; but thoſe of P. *ſphærocerus* ſeem to be jointed all along, though I cannot aſcertain it as a fact, not being able to make out any number of joints, even with the greateſt magnifying power which I have uſed. Theſe palpi would probably be called *poſteriores* or *poſtici* by Fabricius, but the appellation of *interiores* appears to me much more ſuitable. The other two, which he perhaps would name *anteriores* or *antici*, anſwer every deſcription of being *exteriores*, for they are not only placed on the outſide of the interior ones, and cloſe to them, but alſo on the outer margin of the often mentioned guttural croſs-bar. They are, beſides, very ſmall, erect, compreſſed,

compreſſed, narrower towards the top and blunt, and ſeem to have neither joints nor motion, nor the ſame ſtructure as the others, being minutely punctated. Whether or not they internally adhere to the maxillæ, is impoſſible for me to decide; but certain it is, that if they do, it cannot be to any other part than their very baſes.

The *Mandibulæ*, alſo inſerted in the jugular croſs-line between the exterior palpi and the anterior angle of the eye-ſocket, extended to the middle of the under-joint of the antennæ, and, moving on two hinges below, are upon the whole arched, acuminated, and forcipated: but, to ſpeak more particularly, they conſiſt of three different parts, viz. two horny caſes or ſheaths, the inferior of which is the largeſt and almoſt ſtraight; the ſuperior narrower, ſhorter, and bending inwards; and from the top of this there comes out a ſtill narrower round and fleſhy hook, which meets that of the other mandibula, and ſeems to be a true inſtrument for feeling. The ſtructure of the lowermoſt ſheath being the broadeſt, and the other broader than the hook, makes the mandibulæ appear as drawn out below on the inſide, and as if furniſhed with two teeth, the inferior of which is covered with ſmall hairs.

The *Maxillæ* being hidden by the mandibulæ, the exterior palpi and the labium, I cannot ſee any thing of them but their very tops, which are extended above the lip, or between it and the mandibulæ, and appear to be arched, horny, cylindrical, toothleſs, ſharp-pointed and forcipated.

The *Labium* is rather large, thin and membranaceous, of equal length and breadth, longitudinally raiſed in the middle, entire at the top, and there furniſhed with hairs. It is beſides ſhorter than the interior palpi, and often covered by them, which then are placed one on each ſide of the longitudinal carina. That of P. *ſphærocerus*

 is

is nearly truncated, and downwards inflected; but that of P. *microcephalus* ſhews an appearance very different, its top being ſeemingly drawn out in the middle into a point, and its keel longitudinally ſulcated, as if the lip were bipartite. Whether theſe appearances are optic illuſions, or realities, or owing to the ſubjacent maxillæ, I do not pretend to determine. But ſo much is certain, that, by repeated obſervations, I have not been able to diſcover any fiſſure in the middle tip of the labium, viewed in front.

The *Thorax*, though very unlike in theſe ſpecies as to many particulars, is nevertheleſs upon the whole of the ſame ſhape. It is narrower than the elytra, and uneven, conſiſting of two diſtinct parts, the foremoſt a little raiſed all around, and the other not only lower, but alſo broader, and either depreſſed or excavated in the middle, being otherwiſe nearly cylindraceous; and therefore the term *attenuatus*, uſed by Thunberg, ſeems not to be very appoſite, though it may anſwer much better the deſcription of his own ſpecies. But even ſuppoſing that the thorax tapers towards the baſe, it would be the very reverſe of *attenuatus* as applied elſewhere.

The *Elytra* are linear, almoſt flat, ſmooth, thin and flexile; the baſe, containing the ſmall *ſcutellum*, is not only much contracted, but even narrower than the thorax; the exterior margins, bent down, cover a great deal of the abdomen; and the truncated ends are inflected behind; but to avoid a fold being neceſſary in the outer angle on each ſide, where the incurvated borders of the ſides and the ends meet, the elytra are there cut out into minute ſinuſes, the edges of which being a little raiſed form as it were ſmall oblong tubercles.

The *Abdomen* is of the ſame thickneſs throughout, and compoſed of five ſegments; *above*, it is nearly flat, and of a light changeable ferruginous

ferruginous colour, looking as if pellucid, and the poſterior margin of the laſt ſegment but one as if raiſed above the terminal, which is dark-coloured, very large and bent down, being behind circular and marginated; *underneath*, and on its fore-part, the abdomen is marked with a little convex plat ſituated between the ſecond and third pair of feet, and further towards the end it is gibbous, the firſt and the fourth of the ſegments being much broader than the others, and the cavity under the thighs of the hinder feet ſurrounded by a circle of very minute and approximated dots. In the ſpecimens of P. *microcephalus* which I have had to examine, this cavity being covered by the thighs, and the upper part of the abdomen by the elytra, I can ſee only very few of the dots; nor am I able to aſcertain whether the whole back of the abdomen is as light-coloured as that of P. *ſphærocerus*.

The *Feet* are all nearly of an equal length, the two firſt being inſerted in the fore-part of the thorax, or rather of the breaſt; the two ſecond in the baſe of the venter at the top or contracted end of the little plat above mentioned; and the two laſt in the middle of the venter. The *thighs* are thicker than the legs, particularly thoſe of the hinder feet; they are without hairs or ſpines, of an oblong ſhape, but more contracted at the baſe, and compreſſed, though at the ſame time gibbous on both ſides; they are moveable in a tranſverſe direction by aid of a light-coloured appendage, which being attached to their baſe within, rolls in a ſocket below, and which on the hinder feet is very large, oval, and compreſſed to an obtuſe edge, but on all the other feet it reſembles more a tubercle, being almoſt round; the thighs are laſtly cut out at the top, and their inner margins a little beyond the middle, for the inward motion and contraction of the *legs*, which alſo are compreſſed but not gibbous, and on the edges more or leſs furniſhed with ſhort hairs.

hairs. The *tarſi* are nearly cylindraceous and very ſlender, compoſed of four joints, three of which are of equal length, but the outermoſt longer, all marked at their tops with a hair on each ſide, and otherwiſe hardly diſtinguiſhable. At the end of the tarſi there are two longiſh claws, crooked inwards, and diverging.

From this generic deſcription it is very eaſy to be convinced that *Pauſus* never can be of the ſame genus as *Cerocoma.* And it is rather a matter of ſurprize that Fabricius, who always has been ready to divide the genera of Linné, and ſometimes has done it for reaſons, I fear, not very urgent, ſhould now unite two ſo ſtrikingly and eſſentially diſtinct. He ſays, it is true, "that he has only put it in here for future examination, that it ſeems to be a genus of itſelf, and that he does not know it rightly." But then it might perhaps have been as well not to have mentioned it at all. Be this however as it may, in order to prevent any farther miſconception on the ſubject, I will here ſtate all the principal circumſtances by which *Cerocoma* differs from *Pauſus.*

The *Body* is of an oblong ſhape, and almoſt of an equal breadth throughout, the head and the thorax being ſcarcely narrower than the elytra. It is found without the tropics in the South of Europe and the moſt Northern parts of Africa, on plants growing in open fields.

The *Head* is oval, and inflected downwards.

The *Antennæ* are ſmall, ſcarcely as long as the thorax, and compoſed of many joints of various ſize and ſhape, particularly thoſe of the male. And therefore I do not comprehend what could induce Fabricius to call the joints equal, and the antennæ moniliformes, eſpecially as he adds that the latter are *irregulares;* for this term, according to the ſignification he has attached to it himſelf, flatly contradicts the former aſſertions.

The

The *Palpi* are nearly of equal length, the anterior affixed to the back of the maxillæ, and the poſterior to the middle of the lip, the former conſiſting of four joints and the latter of three. Fabricius ſays, that the palpi are filiform, and all their joints cylindrical, and of the ſame ſize. This may be true as to the hinder palpi, but it is not equally ſo in regard to the foremoſt, as theſe latter have the middle joints veſicular and incraſſated in the male, and obconical with the terminal one much larger in the female.

The *Mandibulæ* are toothleſs and without ſheaths.

The *Lip* is cylindraceous, elongated, and contracted where the palpi are inſerted, and above them bifid.

The *Thorax* is flat, but marked with no inequalities, being neither depreſſed nor excavated.

The *Elytra* are rounded at the end, and neither bent down there, nor at the exterior margins.

The *Abdomen* is furniſhed on the ſides with papillary folds.

The *Tarſi* of the fore feet have five joints, but thoſe of the hinder feet only four.

Theſe few remarks may be ſufficient to ſhew that *Cerocoma* is as different a genus from *Pauſus* as can be ſuppoſed, and perhaps much more ſo than many which Fabricius has eſtabliſhed. Having thus far ſettled the generic character, I ſhall now proceed to the hiſtory and deſcription of the ſpecies in particular.

I. PAUSUS *microcephalus.*

This, Linné ſays, " was ſent to him by Dr. Fothergill of London, in a collection of inſects chiefly from North America and Guinea;" which in fact is nothing more than ſaying, that it may be a native

of

of either of thoſe countries, or of both, or of neither; in one word, that its *habitat* was not known to him; and therefore he very prudently avoided aſſigning to it any.—This being the caſe, it is quite unaccountable how Fueſsly, Gmelin, Herbſt and Fueſsly's tranſlators could do it, without ſuppoſing a miſrepreſentation of Linné's text, as I am certain they knew nothing of the inſect, but what they had learned from his diſſertation.

Fueſsly tells us, "it was found amongſt a number of other inſects which the celebrated Dr. Fothergill of London had gathered in North America." But neither was Dr. Fothergill ever in America, nor is this inſect a native of that country, as far at leaſt as we yet know. This double blunder has nevertheleſs been faithfully tranſcribed by Herbſt; but Gmelin has ſatisfied himſelf with only the wrong *habitat.* Fueſsly's tranſlators have made two alterations in his text; the one equally erroneous as the original, in ſaying that this ſpecies was found in a collection of inſects from South America and the other; a real amendment, in excluding the ſtatement of Dr. Fothergill's having collected it himſelf in America.

Thunberg has very properly not attempted to ſay from whence it came; but Fabricius mentions Africa, from the authority of the cabinet of the Right Hon. Sir Joſeph Banks, Bart. K. B. and I have no doubt but that this is its true native country; not however the whole continent of Africa, but its weſtern coaſt, within the Tropics, on this ſide of the Line; at leaſt it is certain that the two ſpecimens of it now in London, one belonging to Sir J. Banks, and the other to Mr. Drury, were both ſent from thence by Mr. Smeathman. And it is ſo much the more probable that the inſect Linné got, likewiſe came from him; for I underſtand he was particularly patronized by Dr. Fothergill, and amongſt other curioſities alſo ſent him many inſects from that part of Africa which he viſited.

Now I find from thoſe of his manuſcript papers which Mr. Drury obligingly has permitted me to peruſe, that though he often travelled to different places between Iſles de Loſs and Sherbro', ſtill he reſided chiefly at the Bananas;—and therefore I think we ſhall not be much miſtaken, if we conſider this iſland, or the adjacent part of Sierra Leone, as the only native country hitherto known of P. *microcephalus*, this rare inſect, of which there are no more to my knowledge now exiſting in Europe than the three ſpecimens before-mentioned, all of which I have ſeen, but in a very different manner; for, of the Linnæan one, now in the poſſeſſion of Dr. Smith at Norwich, I had only a curſory view, at a time when I entertained no idea of deſcribing it; but the other two I have been allowed to examine and compare carefully. And as the figures annexed to Linné's diſſertation, though upon the whole of merit, were found to be capable of conveying a wrong notion of the true ſtructure of the antennæ, and principally of their ſuperior joint; Sir J. Banks did me the favour of granting me leave to have his ſpecimen drawn in different ſizes and poſitions.

Linné deſcribes this inſect as *niger elytris piceis*, Thunberg and Gmelin as *totus niger*, and Fabricius as *fuſcus*. Herbſt calls it *ater*, but figures the elytra piceous, and the reſt of the body blackiſh-cinereous; and thus makes it very curiouſly reſemble an harlequin. As to Fueſsly, he has only copied Linné's words; but in the French edition both *niger* and *piceus* are tranſlated by *noire*.—Hence we find that this inſect has been deſcribed now with one colour and now with another, and ſometimes as having two colours, though it does not poſſeſs but one, and that almoſt uniform. This is a ſingular fact, and a ſtriking inſtance of authors not knowing the true ſignification of Linné's terms.

It is not very uncommon in our days to ſee *ater* and *niger*, *piceus* and *fuſcus*, uſed promiſcuouſly: but it was not ſo originally with Linné; for, by *ater* he meant a colour of the blackeſt kind; by *niger*, another of black and brown mixed together; and by *piceus*, ſtill another of a lighter caſt, or with a greater portion of brown. As to *fuſcus*, it was a dark colour, compoſed of a mixture of black, brown, and cinereous. Having once aſked him the difference between *ater* and *niger*, I received this explanation from himſelf. It muſt therefore be genuine; and if we apply it to the preſent caſe, we ſhall find it agree admirably well, for the colour of P. *microcephalus* is a dark brown, but underneath and on the forepart bordering on blackiſh; and of courſe Thunberg has approached very near the truth in calling it *niger*, though I would rather give it the name of *piceus*.

Fabricius, in pointing out the ſpecific difference of this inſect, and ſpeaking particularly of its antennæ, ſays that their clava is *irregularis*. This word not being otherwiſe defined, it muſt here be taken in the ſenſe in which it is commonly uſed, and then it conveys the idea of the clava being of a ſhape either not always uniform, or deviating from the ordinary rules of nature. But neither is the caſe, for all that I have ſeen have been quite alike, and an oblong ſpheroid is not a very uncommon form to be met with in nature; P. *ſphærocerus*, both the *Pauſi* of Thunberg, and *Cerocoma ruficollis* of Fabricius, having, beſides ſomething ſimilar to it, the upper joint of their antennæ differently ſhaped from thoſe of other inſects.

After theſe details of the hiſtory of P. *microcephalus*, I ſhall now ſtate the chief differences between it and P. *ſphærocerus*.

It is of the ſame length, but ſomewhat broader acroſs the elytra, and of a much darker colour, being alſo very little ſhining.

The

The *Head* is uncommonly ſmall and without a horn, its annular baſe-part higher than the foremoſt; the *clypeus* bipartite, and the jugular *triangle* minute.

The *Eyes*, being as dark as the ſurrounding parts, cannot be diſcovered but by a large magnifier, and then they appear to be of a water-colour. The angles of the brim of the ſocket are large, the hinder one being raiſed to the height of the eye.

The *Pivots* of the *antennæ* are black, very bright, and eaſily taken for eyes. The *under-joint* is furniſhed with a wart on the inner margin of the top, covered with papillary or cartilaginous hairs. The *upper-joint*, or the clava, is dotted, much greater than the head, and of the ſhape of an oblong ſpheroid, being in *front* rounded and compreſſed with the carina raiſed into a ſharp edge, provided on the *vertex* with four tubercles ſet in a row and tipped with hairs, and elongated *behind* into an obtuſe tube, laterally compreſſed, above depreſſed, and underneath having a knob, which, in moving, touches the bundle of hairs on the top of the under-joint. The *pedicle* is long and crooked, its upper part being broader, compreſſed, and keeled in front.

The *interior Palpi* are of a lanceolated-oblong ſhape, and furniſhed with very minute hinges.

The *Mandibulæ* have ſmall hinges, and the inferior ſheath much larger than the ſuperior.

The *Thorax* is broader than the head and very uneven, the two parts being entirely ſeparated by a tranſverſely ſurrounding furrow, the *foremoſt* above and on the ſides elevated to a ſharp edge like a collar, and the *hinder* one cut out in the middle into a cavity, which, obtuſe behind, and dilatated and deepened before, is encompaſſed on the ſides with diverging and outwardly declining lobes, being

at their top rounded, and provided with ſhining hairs of a fulvous colour, and incurved downwards.

The *Elytra* are without dots, and rather longer than the abdomen. The folds of the exterior borders, and the tubercles on the outer angles of the ends, are both larger than thoſe of P. *ſphærocerus.*

The *Under-wings* are quite ſooty, and without the leaſt gloſſineſs.

The *Abdomen* has the terminal ſegment very retuſe, and the margin of the next before it viſibly raiſed.

The *Hinder-feet* are a little ſhorter than the others. The *thighs* of theſe feet are larger than thoſe of P. *ſphærocerus.* The *legs* of the four foremoſt feet are linear, but thoſe of the two hindmoſt ones nearly lanceolated, being alſo ſomewhat broader. The joints of the *tarſi* are exceedingly difficult to be diſtinguiſhed.

2. PAUSUS *ſphærocerus.*

I had been in Africa almoſt three years before I happened to meet with this remarkable little inſect, and then it was quite accidentally. There was a houſe building for the Governor, on an eminence called Thornton-hill, at the South end of Freetown, in Sierra Leone; and in the beginning of the year 1796, ſeveral apartments having been got ready ſo as to be habitable, one of them was allotted to me, and I removed into it in the end of the month of January.

I had not reſided there many days, when one evening having juſt lighted my candle and begun to write, I obſerved ſomething dropping down from the ceiling before me upon the table; which, from its ſingular appearance, attracted my peculiar attention. It remained for a little while quite immoveable, as if ſtunned or frightened, but began ſoon to crawl very ſlowly and ſteadily. I then caught it, and, from the remembrance I had of the Linnæan ſpecies, I directly took it for a non-deſcript of this genus.

Some few days after, coming into my room from ſupper with a light in my hand, and having put it upon the table, there inſtantly fell another down from the ceiling. The third I was favoured with by the then Governor, Mr. Dawes, who informed me that it had dropt down before him on the table, juſt when he had entered his room and was going to write. The other three which I afterwards collected, were alſo got upon ſimilar occaſions; and from thence I thought I had ſome reaſon to conclude, that it is a nocturnal animal, that it becomes benumbed by candle light, that it lives in wood and prefers new built houſes, &c. After the end of February I never ſaw any more.

The laſt which I caught I put into a box, and left confined there for a day or two. One evening going to look at it, and happening by chance to ſtand between the light and the box, ſo that my ſhadow fell upon the inſect, I obſerved, to my great aſtoniſhment, the globes of the antennæ, like two lanthorns, ſpreading a dim phoſphoric light. This ſingular phenomenon rouſed my curioſity, and, after having examined it ſeveral times that night, I reſolved to repeat my reſearches the following day. But the animal, being exhauſted, died before the morning, and the light diſappeared. And afterwards, not being able to find any more ſpecimens, I was prevented from aſcertaining the fact by reiterated experiments at different times; which I therefore muſt recommend to other Naturaliſts, who may have an opportunity of viſiting Sierra Leone, requeſting that they would particularly inquire into this curious circumſtance.

I ſhall now only add ſome few remarks, ſhewing in what manner this new ſpecies moſt eſſentially differs from the old one.

Not being quite ſo broad, it looks as if it were longer, and more cylindrical.

cylindrical. It is alſo of a lighter or cheſnut colour, and all over very gloſſy.

The *Head* is larger, but its annular baſe part ſmaller and contracted. It is furniſhed with a little horn in the middle between the eyes, which is ſtraight, conic, and tipped with a tuft of cartilaginous hairs. The *clypeus* is only depreſſed, and the jugular *triangle* wider.

The *Eyes* are large and very evident, thoſe of the male black, though in a certain light appearing greeniſh; but thoſe of the female are like pearls, or as if they were covered with a cryſtalline membrane. The angles of the brim of the ſocket are ſmall and rounded at the top, and the hinder one lower than the eye.

The *Pivots* of the *antennæ* are not ſo diſcernible, being of the ſame colour as the ſurrounding parts. The *under-joint* is without any hairy papilla or wart. The *upper-joint*, or the clava, is of the ſize of the head, quite globular, and reſembles an inflated bladder, being almoſt pellucid, and of a light fleſh colour. The *keel* is nothing more than a raiſed line, finiſhing on the vertex in only one cheſnut brown tubercle covered with cartilaginous hairs. Behind there is a little conical ſhining *hook*, of the ſame colour and with the ſame ſort of hairs bending outwardly, being of equal length with the horn on the head, but narrower. The *pedicle* is ſhort, ſtraight and cylindraceous.

The *interior Palpi*, furniſhed with very viſible hinges, are a little thicker towards the top, but look in ſome directions as if they were filiform.

The *Mandibulæ* have large hinges, and the ſuperior ſheath almoſt as long as the inferior one, and nearly cylindrical.

The *Thorax* is of the ſame breadth as the head, and not very uneven, the two parts being ſeparated by a furrow only on the

ſides

ſides and underneath, the *foremoſt* above and on the ſides convex reſembling an annular ſegment, and the *hinder* one impreſſed in the middle with a mark ſomewhat like two ſmall diverging wings of a blackiſh ſilvery colour.

The *Elytra* are ſhorter than the abdomen, and minutely punctated.

The *Under-wings* are of a ſhining and changeable violaceous colour, and not very dark.

The *Abdomen* has the terminal ſegment a little convex, and in the female more ſo than in the male. Underneath, the third and laſt ſegments are darker than the others.

The *Feet* are all of equal length. The *thighs* have ſmaller appendages than thoſe of P. *microcephalus.* The *legs* are at the top broader, truncated and hairy, having the exterior margin drawn out into a ſharp lamina, on each ſide of which there is a row of ſmall diverging hairs, which make the leg appear as if it were canaliculated, at leaſt in a certain light, and with a ſmall magnifier. On the interior margin there is but one row of hairs, and on the hinder legs I do not obſerve any. The *tarſi* are longer than thoſe of P. *microcephalus*, and have alſo both the joints and the claws much more diſtinct.

Having thus given a ſufficiently detailed account of the genus *Pauſus*, and its two ſpecies, which I have ſeen myſelf, as to their hiſtory, their generic reſemblance, and ſpecific difference, I ſhall now endeavour to deſcribe them in a ſhorter and more ſcientific language.

In ſettling his genera of inſects, Linné attended chiefly to the *antennæ* and their ſtructure; but he took occaſionally into conſideration alſo other parts, as the *head*, the *thorax*, the *elytra*, &c. &c. Fabricius has adopted a different method, and made out the generic

deſcriptions only from the mouth and the organs for feeding, or what he calls *Inſtrumenta cibaria.* Theſe deſcriptions he has publiſhed in his *Genera Inſectorum*, under the name of *Characteres naturales*, in imitation of what Linné had done before in regard to plants.

But as a *Character naturalis*, in whatever manner it may be made out, does not contain the whole deſcription of a genus, or the whole account of the agreement between its ſpecies, I would call the remaining part *Habitus naturalis*, and from the leading points of this double ſtatement I would form a *Character artificialis*, to be put before the genus in the text of the book, leaving what is named *Character eſſentialis*, or the moſt diſtinguiſhing marks from other genera, out of *Character naturalis*, to be inſerted as uſual in the methodical arrangement at the head of the claſs.

But *Pauſus* is a genus ſo very unlike all others hitherto known, that I cannot find a place for it in this arrangement. Gmelin has put it in the diviſion, *Antennis clava ſolida*; and Fabricius with *Cerocoma* in another, *Antennis moniliformibus.* But, as I have proved above, it does not belong to either; nor can it be placed amongſt Fabricius's genera *Antennis extrorſum craſſioribus*, becauſe theſe expreſſions, without being otherwiſe defined, are ſo vague that they may be equally applied to all inſects with clavated antennæ, as it has been done not only by Linné, but alſo by Fabricius himſelf in his *Philoſophia Entomologica.* I am therefore under the neceſſity of making a new diviſion for *Pauſus.*

DESCRIPTIO

DESCRIPTIO GENERIS.

CHARACTER ESSENTIALIS.

***** *Antennis clava integra inflata.*

PAUSUS. Antennæ biarticulatæ, clava uncinata pedicellata mobili.

CHARACTER ARTIFICIALIS.

PAUSUS. *Antennæ* biarticulatæ, articulo ſuperiore maximo inflato uncinato pedicellato: pedicello in cavitate articuli inferioris mobili.

Caput porrectum: gula triangulo convexo inſtructa.

Thorax anguſtus inæqualis ſcutellatus.

Elytra flexilia deflexa truncata.

Pedes antici pectoris parti anticæ affixi: femoribus appendiculatis: tarſis quadriarticulatis.

CHARACTER NATURALIS.

Palpi quatuor inæquales obtuſi, baſi trianguli gularis affixi.

interiores medii, triplo longiores, divergentes, intus plani extra convexi, baſi biarticulati, interius paulòque altius collocati.

exteriores laterales, minuti, erecti, ſetacei, compreſſi, articulis deſtituti, margini exteriori baſeos trianguli gularis inſerti.

Mandibulæ porrectæ arcuatæ accuminatæ forcipatæ, baſi biarticulatæ, dein e vaginis duabus corneis introrsùm dilatatis truncatis, quarum infera latior, bidenticulatæ, et tandem hamulo vaginis anguſtiore cylindraceo carneo terminatæ.

Maxillæ apice teretes integerrimæ unguiculatæ forcipatæ.

Labium palpis interioribus brevius, ſubquadratum, membranaceum, carinatum, apice integrum ciliatum.

Antennæ biarticulatæ: articulo *inferiore* parvo ſubrotundo utrinque truncato; *ſuperiore* maximo inflato in *capitulum* integrum, ante et extraversùs carinatum: carina a baſi ad verticem tuberculatum ducta, ponè et introrsùm tubo vel hamulo inſtructum, et ſubtùs pedicellatum: pedicello baſi globoſo nitidiſſimo: globo cavitati articuli inferioris versùs marginem ejus apicis exteriorem inſerto, et ad ſuperiorem articulum rotandum accommodato.

Metamorphoſis et victus nondum innotuerunt.

HABITUS NATURALIS.

Animal parvum, ab apice antennarum ad finem abdominis tres circitèr lineas longum et tranſverſim per elytra vix unam latum, ſupra depreſſum, in parte antica anguſtius, qua poſteriora fermè cylindraceum, læve glabrum unicolor nitidulum tardigradum, Africam occidentalem inter Tropicos ſitam inhabitans.

Caput parvum, thorace multò minus breviuſque, ſubrotundum, porrectum, baſi quaſi annulo cinctum. *Clypeus* minutus. *Gula* triangulo elato convexo: baſi inter oculos ducta.

Oculi majuſculi laterales tranſversè oblongi prominuli: margine acetabulorum antico in angulum horizontalem, poſtico in perpendicularem producto; unde facultas videndi non niſi in partem anticam.

Antennæ: articulis inferioribus ferè parallelis, ſuperioribus valdè divergentibus, mobiles ope tuberculi oculum referentis globoſi

boſi nitidiſſimi, quod margini exteriori baſeos articuli inferioris affixum, in cavitate capitis ante oculos inter angulum eorum acetabuli anticum et clypeum rotatur.

Thorax partibus duabus diſtinctis inæqualibus: *antica* dorſo emarginata altiore et lateribus etiam paulò magìs dilatata, *poſtica* latiore, dorſo prorsùm depreſſa vel excavata, cæterùm cylindracea, conſtans anguſtus ſcutellatus: *ſcutello* minuto triangulari.

Elytra linearia planiuſcula tenuia flexilia: *baſi* ſcutellum continente valdè coarctata, etiam thorace paulò anguſtiora; *humeris* utrinque antrorsùm aliquantùm protuberantia; *margine* exteriore longitudinalitèr quaſi carinata et dein adeò deflexa ut latera abdominis tota tegant, plica in anticum latiore; *ſuturis* parùm marginata; *apice* truncata inflexa et angulo exteriore, ubi partes deflexæ laterales et terminales concurrunt, exciſa in ſinum minutum, cujus margines elevati veluti tubercula compreſſa apparent.

Abdomen lineare: ſegmentis quinque, *ſupra* planiuſculum, colore dilutè ferrugineo vario: ſegmento ultimo maximo deflexo obſcuro ponè rotundato marginato; *ſubtus* in antica parte inter pedes medios et ultimos lamina convexa notatum, poneversùs gibbum: ſegmentis primo et quarto majoribus, ponè femora pedum poſticorum depreſſum: foſſula circulo e punctis minutis approximatis confecto circumdata.

Pedes ſubæquales, antici pectoris parti anticæ, medii ad baſin ventris et poſtici illi medio inſerti. *Femora* inermia, lanceolato-oblonga, compreſſo-gibboſa, incraſſata præſertim pedum poſticorum, ut tibiæ extendi atque contrahi poſſint apice margineque interiore ultra medium canaliculata, et ut pedes toti introrsùm moveri queant baſi appendiculata: appendice

 pallidiore,

pallidiore, acetabulo ſubjacenti adaptata, pedum poſticorum maxima ovali in aciem obtuſam compreſſa, reliquorum parva ſubrotunda. *Tibiæ* compreſſæ, margine utroque pilis breviſſimis inſignitæ. *Tarſi* anguſti teretiuſculi 4-articulati unguiculati: articulis minutis, tribus æqualibus, ultimo longiore, apice utrinque pilo inſtructis, aliàs vix diſcernendis: unguibus duobus longiuſculis apice incurvatis divergentibus.

DIFFERT A CEROCOMA.

Habitatione æquinoctiali in domibus.
Corpore glabro, antico anguſtiore.
Capite porrecto, gula triangulo notata.
Antennis magnis biarticulatis: articulo ſuperiore maximo, uncinato, pedicellato, mobili.
Palpis baſi trianguli jugularis affixis, interioribus multò longioribus.
Mandibulis vaginatis denticulatis.
Labio ſubquadrato, carinato, integro.
Thorace anguſto inæquali: partibus duabus diſtinctis.
Elytris margine circumcirca deflexis, apice ſinuatis truncatis.
Abdomine plicis papilliſque lateralibus deſtituto.
Pedibus anticis anticæ pectoris parti affixis, femoribus appendiculatis, tarſis omnibus quadriarticulatis.

DESCRIPTIO SPECIERUM.

1. PAUSUS *microcephalus*, capite mutico, clava oblongo-ſphæroidea, elytris longitudine abdominis impunctatis, tibiis linearibus.

Pauſſus microcephalus, *Linn. Diſſ. Big. Inſect.* p. 6. *ſq.** Tab. ann. fig. 6—10. *Fueſsl. Arch. Inſect.* Plag. 3. p. 1. *ſq.** Tab. 13. *ed. Gall.* p. 42.* Tab. 13.

Pauſus

Pauſus microcephalus, totus niger, *Thunb. Act. Stockholm*, 1781. p. 170.
Pauſus microcephalus, *Gmel. Syſt. Nat.* Tom. 1. P. 4. p. 1737.*
Pauſus microcephalus, ater capite minutiſſimo, thorace anguſto depreſſo, elytra picea lævia inflexa teuia (tenuia): *Herbſt. Syſt. Inſect. Coleopt.* P. 4. p. 100. *sq.** Tab. 39. fig. 6. a. b.
Cerocoma microcephala, antennis biarticulatis: clava irregulari dentata maxima, corpore fuſco, *Fabr. Entom. Syſt.* Tom. 1. P. 2. p. 82.

Habitat in Inſula Bananas ejuſque vicinitate. Muſ. Banks, Smith, & Drury.

Piceus in parte antica et infera paullo obſcurior, ſupra parùm ſubtus magis nitidus.

Caput minutiſſimum muticum: *parte* poſtica annulari altiore, *clypeo* bipartito, *triangulo* jugulari minuto.

Oculi mediocres, ſed adeo obſcuri, ut diſtingui nequeant niſi lente valdè aucti, et tum ſaturatæ glauceſcentes apparent: *angulis* acetabulorum magnis, poſtico oculis ferè altiore.

Antennæ: tuberculo ad baſin *motatorio* nigro nitidiſſimo, ſpeciem oculi omninò præ ſe ferente; articulo *inferiore* obſoletè punctato, apiciſque margine ſuperiore introrsùm verruca piloſa inſtructo; *ſuperiore* caput magnitudine excedente, oblongo-ſphæroideo, punctato, *antè* compreſſiuſculo: carina in aciem acutam elevata, *vertice* denticulis quatuor piliferis in ſeriem carina paulò exteriorem adinſtàr criſtulæ diſpoſitis notato, *ponè* in tubum obtuſum ſupra depreſſum ſubter tuberculatum apice compreſſum ſuper articulum inferiorem producto, *ſubtùs* pedicello longo adſcendente ſupernè compreſſo et antè carinato, infernè anguſtiore tereti nigro.

Palpi interiores lanceolato-oblongi: articulis minutis.

Mandibulæ: articulis parvis; vagina inferiore ſuperiorem magnitudine multùm excedente.

Labium: carina ſulcata et apice medio quaſi mucronato.

Thorax capite multò latior et maximè inæqualis: *partibus* duabus ſulco tranſverſo circumcirca ambiente omninò diſtinctis; *antica* ſupernè et lateribus in aciem acutam elevata, collari vel rotulam referente; *poſtica apice* utrimque rotundata piliſque fulvis nitidiſſimis deorsùm inflexis inſignita, *medio* in foſſulam prorsùm excurrentem dilatatam profundiorem excavata, *lateribus* extrinſecùs declivi, *poneversùs* margine convexo terminata.

Scutellum acutiuſculum, reliquo corpore nitidius.

Elytra longitudine abdominis vel ferè longiora, punctis deſtituta: deflexu laterali latiore et marginibus ſuturarum ſinubuſque tuberculatis in angulo apicis exteriore multò majoribus atque evidentioribus quàm inſequentis ſpeciei.

Alæ inferiores fuliginoſæ et omni nitore expertes.

Abdomen retuſum: margine poſtico ſegmenti penultimi elato; ſubtùs ponè pedes colore in cupreum vergente.

Pedes obſoletè punctati, poſtici aliquantò breviores. *Femora* pedum poſticorum margine exteriore arcuata. *Tibiæ* apice muticæ lineares, pedum poſticorum paulò latiores ferè lanceolatæ. *Tarſi* graciles: articulis difficillimè diſtinguendis.

2. Pausus *ſphærocerus*, capite cornuto, clava globoſa, elytris abdomine brevioribus punctatis, tibiis apice dilatatis.

Habitat in Sierra Leone: Freetown. Muſ. Smith, Marſham et meum. Januario et Februario noctuabundus ambulat, luce admiſſa cæcutit, delabitur et aliquamdiu immobilis remanet. Globi antennarum phoſphori videntur, atque materia tenui liquida repleti.

Caſtaneus

Castaneus nitidissimus, præcedente paulò angustior, unde etiam longior apparet et magìs cylindraceus.

Caput majus cornutum: *parte* postica annulari minore coarctata; *cornu* medio parvo conico erecto pilis cartilagineis terminato; *clypeo* solum depresso; *triangulo* jugulari majusculo.

Oculi admodùm magni, valdè conspicui, atri, sed in certa quadam luce virescente tincti: *angulis* acetabulorum parvis apice rotundatis, postico oculis multò humiliore.

Antennæ: tuberculo ad basin *motatorio* concolore, et sic non adeo manifesto; articulo *inferiore* punctis atque verruca destituto; *superiore* magnitudine capitis, sphærico, vesicæ inflatæ simili, semipellucido, incarnato, *carina* minuta vertice tuberculo unico pilifero castaneo nitido terminata instructo, *ponè* in hamulum conicum, longitudine cornu capitis sed graciliorem, apice pilis in externum flexis notatum, castaneum nitidissimum paulùm extra articulum inferiorem producto, *subtùs* pedicello brevi cylindraceo atro.

Palpi interiores versùs apicem aliquantùm incrassati, sed certo adspectu cylindracei: articulis majusculis.

Mandibulæ: articulis magnis; vagina superiore parùm breviore, et fermè cylindracea.

Labium apice deflexum et ferè truncatum: carina sulco destituta.

Thorax latitudine capitis et parùm inæqualis: *partibus* duabus sulco non nisi lateribus et subtus exarato distinctis; *antica* supernè et lateribus convexa, annulum vel segmentum referente; *postica* margine *anteriore* signo medio depresso nigrescenti-glauco duabus alis minutis apice divergentibus non adeo dissimili impressa, *posteriore* parùm elevata sed spatio lato: stria transversa media, instructa.

Scutellum obtusiusculum ferè inconspicuum.

Elytra abdomine breviora, obſoletè punctata.

Alæ inferiores colore violaceo vario nitido.

Abdomen apice convexiuſculum nigrum; ſubtus ſegmentis tertio et ultimo nigreſcentibus obſoletiſſimè punctatis.

Pedes omnes æquales impunctati. *Femora* baſi atra: appendicibus minoribus quam P. *microcephali*. *Tibiæ* baſi nigricantes, versùs apicem latiores compreſſiores, ipſo apice pilum utrinque gerentes, truncatæ, margine exteriore ſerie pilorum duplici, interiore unica et pedum poſticorum nulla inſtructæ. *Tarſi* longiores quam præcedentis ſpeciei: articulis etiam multò evidentioribus unguibuſque majoribus.

Fæmina differt *oculis* cryſtallinis; *palpis* interioribus paulò anguſtioribus, exterioribus glauceſcentibus; *mandibulis* brevioribus: vagina infera anguſtiore; *ſcutello* minore; *abdomine* longiore, apice convexo piceo; *femoribus* pedum poſticorum aliquantò gracilioribus; cæterùm ſimillima.

To theſe inſects, now deſcribed, there are ſome others which ſeem to be nearly related; but whether they are exactly of the ſame genus I cannot determine, not knowing how far they agree in the particulars of the generic character as above ſtated. But that they may not be overlooked hereafter, I ſhall here inſert them. They are the three following:

1. *Pauſus ruber*: totus rufeſcens, *Thunb. Act. Stockh.* 1781. p. 170.*
   Pauſus ruber, totus rufeſcens, thorace anticè eroſo; elytra truncata, margine exteriori deflexa, *Herbſt. Syſt. Inſect. Coleopt.* P. 4. p. 101.*
   Habitat in Capite Bonæ Spei.

2. *Pauſus lineatus*: rufeſcens linea elytrorum fuſca, *Thunb. Act. Stockh.* 1781. p. 171.* Tab. 3. fig. 4. 5.

Pauſus

Pausus lineatus, capite collo cylindrico a capite (thorace) separato; elytra linearia, linea in medio lata fusca, *Herbst. Syst. Insect. Coleopt.* P. 4. p. 102.* Tab. 39. fig. 7. a. b.

Cerocoma lineata, antennis biarticulatis: clava elongata integra, fusca linea nigra, *Fabr. Ent. Syst.* Tom. i. P. 2. p. 82. *sq.*

Habitat in Capite Bonæ Spei.

3. *Cerocoma ruficollis*, antennis biarticulatis: clava elongata integra, nigra thorace elytrorumque striga ferrugineis, *Fabr. Ent. Syst.* Tom. i. P. 2. p. 83.*

Habitat - - - - - - Dom. Lund.

Before I conclude, I must recommend to Gentlemen who may have an opportunity of seeing P. *microcephalus* and P. *sphærocerus* alive, to investigate their nature and metamorphoses, to examine carefully their instruments for feeding, and to enquire into the interior structure of the upper-joints, or the clavæ of their antennæ, as well as into the peculiar quality of giving light, which the balls of P. *sphærocerus* seem to possess, &c. &c.

EXPLANATION OF TAB. XXII.

PAUSUS *microcephalus*.

Fig. 1. the natural size.

Fig. 2. magnified, seen from above.

a a. the four tubercles on the vertex of each of the clavæ or upper-joints of the antennæ.

b b. the hooks of the clavæ, with their interior knob.

c. the pedicles of the same, with their balls at the base.

d. the lower joints of the antennæ.

e e. the eyes.
f. the raiſed hinder part of the head.
g. the elevated fore-part of the thorax.

Fig. 3. one of the tubercles of the clava, tipped with hairs, greatly magnified.

Fig. 4. the head, ſeen below, alſo much magnified.
a. the raiſed edge of the clava.
b. the hairy warts on the top of the lower joints of the antennæ.
c. the tops of the maxillæ.
d. the labium.
e e. the eyes.
f f. the jugular triangle.

Fig. 5. greatly magnified.
a. the mandibulæ, with their teeth and hinges.
b. the exterior palpi.
c. the interior ones, with their hinges.

PAUSUS *ſphærocerus.*

Fig. 1. the natural ſize.
a. the horn on the head.

Fig. 2. magnified, ſeen from above.
a a. the tubercles on the vertex of the clava or upper-joint of the antennæ.
b b. the eyes.
c c. the contracted hinder-part of the head.
d d. the elevated fore-part of the thorax.
e e. the raiſed poſterior margin of the ſegment next to the terminal one.

Fig.

Fig. 1.

Fig. 2.

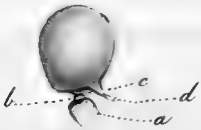


Fig. 3.

Fig. 4.

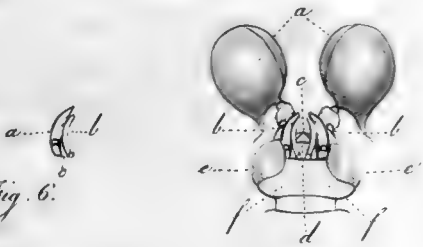


Fig. 5.

Fig. 6.

Pausus sperocerus.

Fig. 1.

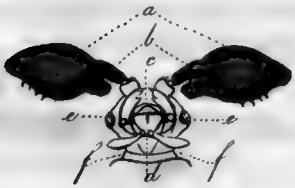


Fig. 4.

Fig. 5.

Fig. 3.

Pausus microcephalus

Fig. 2.

Fig. 3. one of the antennæ, greatly magnified.
a. the lower-joint.
b. the hook of the upper one, or of the clava.
c. its pedicle.
d. the ball of this pedicle.
Fig. 4. the hairy tubercle of the clava, very much magnified.
Fig. 5. the head, ſeen below, alſo greatly magnified.
a. the raiſed line of the clava.
b b. the balls or pivots of the whole antenna.
c. the tops of the maxillæ.
d. the labium.
e e. the eyes.
f f. the jugular triangle.
Fig. 6. greatly magnified.
a. the mandibulæ, with their hinges.
b. the exterior palpi.
c. the interior ones, with their hinges.

XXIII. *Observations on the British Species of Bromus, with Introductory Remarks on the Composition of a Flora Britannica. By James Edward Smith, M.D. F.R.S. P.L.S.*

Read April 3, 1798.

WHEN I first found myself in possession of the herbarium, manuscripts, and library of Linnæus, several great objects presented themselves to my view, all tending to the advancement of that study to which I then, in my own mind at least, entirely devoted myself. The establishment of a Linnæan Society, and the elucidation of the plants of Great Britain, were among these objects. The success of the former, from the concurrence of talents and zeal with which it has been supported, has exceeded my most sanguine hopes: happy will it be if the other object, the attainment of which must necessarily depend more on time and personal application, should ever be as completely accomplished.

Considering the attention that has already been given to British plants, it would appear that the subject must be nearly exhausted, and that nothing could be more easy than to compile a perfect catalogue of them; such slight errors in nomenclature as already exist, being at once to be removed by turning to the Linnæan herbarium. Perhaps this might be the case if we had fewer publications

tions upon the ſubject already. It is in many inſtances eaſier to detect truth itſelf, than to trace the cauſes of error.

Dr. Merrett, in his *Pinax*, muſt be conſidered as the father of our indigenous botany, notwithſtanding the errors of that work are ſuch that Ray has called it "Dr. Merrett's bungling *Pinax*." It may be queſtioned, however, whether any of us, who preſume upon a higher degree of eſtimation as Naturaliſts, if landed on an unexplored country, with only ſuch helps as he had, would fall into fewer miſtakes, or be guilty of fewer omiſſions. However this may be, the work of Merrett was ſo completely ſuperſeded by the labours of the immortal Ray, that we need in no inſtance recur to it as authority. The *Synopſis* of Ray, traced through its various editions, having been written from real obſervation, and from abſolute original ſcrutiny of almoſt every Britiſh plant, is the foundation of our preſent knowledge of the ſubject. He examined every plant recorded in his work, and even gathered moſt of them himſelf. He inveſtigated their ſynonyms with conſummate accuracy; and if the clearneſs and preciſion of other authors had equalled his, he would ſcarcely have committed an error. It is difficult to find him in a miſtake or miſconception reſpecting Nature herſelf, though he ſometimes miſapprehends the bad figures or lame deſcriptions he was obliged to conſult.

In tracing the botanical hiſtory of Britiſh plants, I therefore conſider Ray as the fountain-head of authority, but it is only Ray himſelf. Dillenius, the highly reſpectable editor of the laſt edition of the *Synopſis*, has, with commendable modeſty and diffidence, diſtinguiſhed from the original work all his own additions, being well aware of the danger of miſtakes. If he had not done ſo, the preceding edition of the work in queſtion, publiſhed in 1696, would have been our only reſource; for it cannot be concealed that Dillenius

has added ſeveral plants upon inſufficient grounds, either as ſpecies or natives, and has inſerted others, ſuppoſed to be new, that exiſt under other denominations in the original work. Indeed the changes he has made among the ſynonyms, not being always marked, and proving often erroneous, oblige us on that head ſtill to conſult the edition of 1696.

The *Synopſis* of Ray, as publiſhed by Dillenius in 1724, was the ſtandard book of Engliſh Botaniſts, till the works of Linnæus, more ſimple, compendious and perſpicuous, if not more free from error, than any that had before appeared, came into general uſe throughout Europe. England, long accuſtomed to take the lead in ſcience, would have ſeemed ſo far in a ſtate of barbariſm, if her vegetable productions had remained unarranged according to the new ſyſtem; and ſhe would have been of as little importance in Natural Science as France, partly from the ſame cauſe, and partly from her dancing after the bubbles of glittering theory, has till lately been.

Dr. Hill, a ready and experienced writer, and Mr. Hudſon, a more accurate and practical obſerver, each undertook, about the ſame time, to make the pupils of Ray, already become veterans in his ſervice, ſubmit to Linnæan diſcipline. Many of them found the advantage of it; ſome proved refractory, and are forgotten; while a multitude of new diſciples, allured by the attractiveneſs of the new ſyſtem, and the doctrines by which it was ſupported, have been daily advancing its utility and celebrity. The *Flora Anglica* of Hudſon has, almoſt from its firſt publication, to this hour, been the claſſical book of Engliſh Botaniſts. It has been the guide and ground-work of local Floras, as the *Flora Cantabrigienſis* of Mr. Relhan, *Flora Oxonienſis* of Dr. Sibthorp, and even the *Flora Scotica* of Mr. Lightfoot; for I by no means intend to detract from the practical merit of the authors of any of thoſe works, when I aſſert, that

that they have in general adopted the ſynonyms of Linnæus and of Ray from the *Flora Anglica.* The work of Mr. Hudſon has alſo been the baſis of all publications beſides Mr. Lightfoot's, intended to make the Botany of Great Britain acceſſible to thoſe who could not read the Latin tongue, as Dr. Withering's *Botannical Arrangement*, and the vegetable part of Dr. Berkenhout's *Outlines.*

The authors juſt enumerated have followed the plan of Mr. Hudſon himſelf, in applying the names, and even deſcriptions, in foreign authors, to the plants of Ray; an unexceptionable method if thoſe authors were always correct, if we were certain they all ſpoke of the ſame plants under the ſame names, or quoted other writers without any miſapprehenſion. This however being by no means the caſe, a great maſs of error has been from time to time accumulating, which it requires more care and patience to remove than would be neceſſary to work out the whole ſubject afreſh. Mr. Hudſon commonly applies a Linnæan name to a plant, becauſe Linnæus has quoted Ray for it, or becauſe Haller, or Scopoli perhaps, has referred to Ray and Linnæus, while all three may chance to have intended a different ſpecies. He even copies ſynonyms of other authors from any of the above-mentioned, without looking at the books quoted; as may in many inſtances be proved by the errors of the preſs, and awkwardneſſes of citation, which he has retained. He is however entitled to great praiſe for new-modelling the ſpecific characters, when he found ſuch as Linnæus had given did not well ſuit our plants, and on this ground he may rank as an original author. His deſcriptions alſo, which are original, are characteriſtic and valuable. Dr. Withering and Mr. Relhan, in copying deſcriptions from other writers, have always faithfully cited the ſource from which every article was derived; ſo that when thoſe deſcriptions do not well accord, even with each

other, as it often happens, a Student may chooſe between them; preferring a deſcription of Curtis, Lyons, or Hudſon, to one of Haller or Scopoli, becauſe of the probability of the ſpecies theſe laſt writers deſcribed not agreeing with our Britiſh ones, or with thoſe of Linnæus. Haller indeed is far from correct in his Linnæan ſynonyms, ſo that I find it dangerous to quote him without very particular reaſons. But if there be ſo much uncertainty in compiled ſynonyms and deſcriptions, even when we are informed from whence they are derived, what ſhall we ſay to Mr. Lightfoot's plan of copying from all quarters without any acknowledgment at all? His book is made up of paſſages from Linnæus, Haller, Scopoli, Dillenius and Gmelin; and he is not by any means attentive to the agreement of thoſe paſſages with the native plants to which he applies them. If the writer of every *Flora* would give original deſcriptions or characters, from real wild ſpecimens, his work muſt be valuable; and on this account Dr. Withering's third edition becomes a book of firſt-rate authority, no deſcriptions being more juſt than his, as far as they go. For the ſame reaſon Mr. Curtis's *Flora Londinenſis*, though incomplete, ought to be ranked, independent of its excellent figures, next to Ray's *Synopſis* in original merit and authority upon Engliſh plants.

With theſe examples before me, to ſhun or to imitate, I have long laboured at the *Flora Britannica*; and it is evident that, on ſuch a plan as I have propoſed to myſelf, it cannot very ſpeedily be completed. By ſtudying original ſpecimens in the great collections at the Britiſh Muſeum and at Oxford, I hope to bring the ſynonyms nearer to perfection than they are at preſent, and have already cleared up many difficulties. Many of my diſcoveries are daily given to the world in the *Engliſh Botany*; and I appeal to their number, not from oſtentation, but as an apology for not having more

more ſpeedily completed my whole taſk, in which ſo many points more remain to be inveſtigated.

By the above remarks, protracted perhaps to too great a length, I wiſh to introduce a botanical hiſtory of the Britiſh ſpecies of *Bromus*, a tribe of graſſes which, when examined, fully juſtifies all I have ſaid, and which could ſcarcely have been underſtood without a careful inveſtigation of the old herbariums, the errors in authors being ſo great and unaccountable as could not be believed without ſuch an inveſtigation.

GENERIC CHARACTER.

BROMUS. *Linn. Gen. Pl.* 36. *Juſſ. Gen.* 32.

Calyx bivalvis. *Spicula* oblonga, diſticha: *ariſta* infra apicem: *gluma* interior pectinato-ciliata.

All authors have found a difficulty in diſtinguiſhing this genus from *Feſtuca*, and ſome have united them. The ariſta being terminal in *Feſtuca*, and not ſo in *Bromus*, proves in moſt inſtances a ſufficient character, to which I beg leave to add, that the inner glume of the corolla in *Bromus* is fringed with ſtrong diſtant briſtly hairs, whereas that part in *Feſtuca* is either ſmooth or finely downy. There are nevertheleſs difficulties attending theſe marks, which I ſhall point out hereafter.

1. BROMUS *ſecalinus.*

Smooth Rye Brome-graſs.

B. paniculâ patente; pedunculis ſubſimplicibus, ſpiculis ovatis compreſſis decemfloris, floſculis diſtinctis teretiuſculis.

Bromus secalinus. *Linn. Sp. Pl.* 112.
B. polymorphus γ. *Hudſ.* 49. var. 2. *With.* 159.
B. vitioſus. *Weigel Obſ.* 4. *t.* 1. *f.* 2.
Feſtuca avenacea, ſpicis habitioribus, glumis glabris. *Raii Syn. ed.* 2. 261. *ed.* 3. 414.
F. graminea, glumis glabris. *Scheuchz. Agroſt.* 251. *t.* 5. *f.* 10.
Gramen avenaceum ſegetale majus, glumâ turgidiore. *Moriſ. Sect.* 8. *t.* 7. *f.* 16.

In arvis minùs frequentèr. Fl. Julio.

Near Edwinsford, Caermarthenſhire, among the winter corn. *Sir J. Banks, Bart.* Fields in Suſſex. *Sir. T. Frankland, Bart.*

Radix fibroſa, annua. *Culmus* tripedalis, folioſus, erectus, ſimplex, teres, glaber. *Folia* linearia; ſupra, margineque præcipuè, piloſa; ſubtus ſcabra. *Vagina* læviuſcula. *Stipula* brevis, eroſa, piloſa. *Panicula* vix ſemipedalis, patens; ramis ſemi-verticillatis, rectiuſculis, angulatis, ſcabris, longitudine inæqualibus, plerumque ſimplicibus unifloris. *Spiculæ* ovatæ, ferè ellipticæ, compreſſo-planæ, floſculis 9 ad 12, baſi remotis, unde rachis flexuoſa, glabra, tota in conſpectum venit. *Calyx* inæqualis, muticus, glumis ellipticis, glabris, trinerviis, margine membranaceis. *Floſculi* teretiuſculi, glabri (rariùs pubeſcentes), albido-vireſcentes, nitidi; *gluma exterior* elliptica, turgida, nec depreſſa, obſoletè ſeptemnervia, margine apicem versùs parùm membranacea, ſub apice ariſtata; *ariſta* rectiuſcula, ſcabra, glumâ brevior: *gluma interior* longè anguſtior et tenuior, concava, mutica, margine pectinato-ciliata. *Semen* cylindricum, ſupra ſulco exaratum.

This

This ſpecies is not very common. It may eaſily be known by its broad oval compreſſed ſpikes, each conſiſting of not more than 10 or 12 cylindrical rather remote florets, almoſt always ſmooth, and drooping as they ripen from the length of their foot-ſtalks, which are for the moſt part quite ſimple.

2. BROMUS *multiflorus.*

Downy Rye Brome-graſs.

B. paniculâ patente; pedunculis ſubſimplicibus, ſpiculis ovato-lanceolatis compreſſis quindecimfloris, floſculis ſubimbricatis teretiuſculis.

Bromus multiflorus. *Weigel Obſ.* 2. *t.* 1. *f.* 1. *Gmel. Syſt. Nat. Linn.* 188.

B. ſecalinus. *Leers* 36. *t.* 11. *f.* 2. *Lightf.* 1086. *Linn. Fl. Suec. ed.* 2. 96. var. 2.

Feſtuca graminea, glumis hirſutis. *Bauh. Theatr.* 148. *Scheuchz. Agr.* 250. *t.* 5. *f.* 9.

In arvis rariùs. *Dill. in R. Syn.* 414. Fl. Julio.

Near Norwich. *Miſs Hancock.* Between Edinburgh and Newhaven.

Habitus præcedentis. *Culmus* glaber. *Folia* inferiora ſubtus nuda, ſupra ad margines ſubpiloſa; ſuperiora ſubtus brevi lanugine pubeſcentia, ſupra piloſa; omnia margine ſcabra. *Vagina* glabra. *Stipula* breviſſima, lacera, vix piloſa. *Panicula* ut in priore. *Spiculæ* unciales, ovato-lanceolatæ, compreſſo-planæ, floſculis 12 ad 16, imbricatis, demùm ſubremotis. *Glumæ* omnes plerumque molliſſimè pubeſcentes, rariùs glabræ.

There is certainly great affinity between this ſpecies and the preceding, and they have been accordingly confounded, not only by Scopoli and Hudſon, who have united ſeveral more diſtinct ſpecies into one, under the name of *polymorphus*, but alſo by moſt other authors. Scheuchzer and the accurate Weigel have however diſtinguiſhed them, and the characters above given ſeem ſufficient. The B. *multiflorus* has more numerous florets, more cloſely ſet, and more frequently downy, though not invariably ſo. Both kinds, with ſmooth glumes, are confounded in the collections of Buddle and Sherard, under the ſynonym of Ray which belongs to the former; as they are in the herbarium of Bobart under *Moriſ. Sect.* 8. *t.* 7. *f.* 16; but in the laſt-mentioned the glumes of B. *multiflorus*, though not downy all over, are rough on the keel.

3. BROMUS *mollis.*

Soft Brome-graſs.

B. paniculâ erectâ coarctatâ; pedunculis ramoſis, ſpiculis ovatis, floſculis imbricatis depreſſis nervoſis pubeſcentibus.

Bromus mollis. *Linn. Sp. Pl.* 112. *Curt. Lond. faſc.* 1. *t.* 8. *Mart. Fl. Ruſt. t.* 99. *Relh.* 44. *Sibth.* 47. *Leers* 37, *t.* 11. *f.* 1. *Weigel Obſ.* 7. *t.* 1. *f.* 4. *Schreb. Gram.* 60. *t.* 6. *f.* 1, 2.

B. *Linn. Hort. Cliff.* 25, ex *Herb. Cliff.*

B. polymorphus α. *Hudſ.* 48. var. 1. *With.* 159.

B. hordeaceus. *Linn. Sp. Pl. ed.* 1. 77.

B. n. 1504. *Hall. Hiſt. V.* 2. 236.

Feſtuca avenacea hirſuta, paniculis minùs ſparſis. *Raii Syn.* 413.

Gramen avenaceum pratenſe, glumâ breviore ſquamosâ et villosâ. *Moriſ. Sect.* 8. *t.* 7. *f.* 18.

β. Bromus

β. Bromus nanus. *Weigel Obs.* 8. *t.* 1. *f.* 9. *Herb. Linn.*

In muris, aggeribus et pascuis vulgaris. Fl. Junio.

Radix fibrosa, parùm ramosa, albida, biennis. *Culmus* erectus, bipedalis, simplex, teres, striatus, sæpiùs glaber, subindè pubescens, geniculis tumidis, quandoque hirsutis. *Folia* (ut et vaginæ) striata, pilis mollibus canescentibus villosa, margine vix scabra. *Stipula* acutiuscula, lacera. *Panicula* bi- vel tri-uncialis, erecta, coarctata, demùm patentiuscula, decomposita; ramis semiverticillatis, simplicibus racemosisque, longitudine variis, angulatis, pubescentibus. *Spiculæ* erectiusculæ, ovatæ, acutæ, parùm compressæ, flosculis 5 ad 10, arctè imbricatis. *Calyx* e glumis duabus, inæqualibus, ellipticis, mucronatis, margine scariosis, carinatis, villosis, 7-9 nerviis, nervis viridibus, validis, extantibus. *Flosculi* calyci conformes, depresso-concavi, aristis scabris longitudine valvularum; *glumæ interiores* tenuissimæ, longèque angustiores, enerviæ, margine incrassato, viridi, ciliato. *Semen* ellipticum, depresso-planum.

Nothing can be more distinct than this common *Bromus* from the two already mentioned. Its compound dense panicle, and its strongly-ribbed, depressed, closely imbricated glumes, at once distinguish it. Few plants vary more as to luxuriance. The B. *nanus* of Weigel, sent by himself to Linnæus, is a starved dwarf variety, with few spikes in the panicle, as it often grows on walls. The same is in Buddle's herbarium.

We are certain from the Cliffortian herbarium, now fortunately in Sir Joseph Banks's hands, that this is the only *Bromus* mentioned in the *Hortus Cliffortianus*, though the synonyms there imply several

other ſpecies, and Linnæus afterwards quoted that work for B. *arvenſis.* So neceſſary is the compariſon of original ſpecimens!

I think there can be no doubt of Scheuchzer's Gr. avenaceum, locuſtis villoſis, anguſtis, candicantibus et ariſtatis, *Agr.* 254. *t.* 5. *f.* 12, being our B. *mollis*, though I have ſeen no ſpecimen under his own hand, and therefore would not quote him.

4. BROMUS *racemoſus.*

Smooth Brome-graſs.

B. panicula erectiuſcula diffuſa; pedunculis ſimplicibus, ſpiculis ovatis ſexfloris, floſculis imbricatis depreſſis nervoſis glabris.

Bromus racemoſus. *Linn. Sp. Pl.* 114.

B. polymorphus β et δ *Hudſ.* 49. var. 3 & 4. *With.* 160.

Feſtuca avenacea, ſpicis ſtrigoſioribus, è glumis glabris compactis. *Raii Syn. ed.* 2. 261. *ed.* 3. 414.

Gramen avenaceum pratenſe, gluma tenuiore glabra. *Dill. in Raii Syn. ed.* 3. 414.

G. avenaceum pratenſe, gluma ſquamoſa longiore glabra. *Moriſ. Sect.* 8. *t.* 7. *f.* 19. *Herb. Bobart.*

G. avenaceum hirſutum annuum, paniculâ ampliore magìſque ſparſâ locuſtis craſſioribus glabris et ariſtatis. *Till. Piſ.* 74. *Herb. Sherard.*

G. loliaceum alpinum, ſpicâ exili, rarioribus locuſtis. *Ponted. Comp.* 46. *Herb. Sherard.*

In pratis et paſcuis. Fl. Junio.

At Holkham, Norfolk. *Mr. Crowe.* Northamptonſhire. *Mr. Dickſon.*

Præcedente

Præcedente toto habitu gracilior. *Radix* annua. *Culmus* ferè tripedalis, glabriuſculus. *Folia* utrinque piloſa, margine parùm ſcabra. *Vaginæ* pilis plerumque deflexis hirſutæ. *Panicula* rara, diffuſa (nec coarctata), ſimplex, pedunculis ſemiverticillatis, ſcabris, elongatis, indiviſis, vix unquam bifloris. *Spiculæ* præcedentis, at glaberrimæ, vix ſeptemfloræ, nitidæ, viridi alboque vittatæ, nervis minùs prominentibus, ariſtis ſcabris longitudine valvularum.

Linnæus deſcribed this ſpecies from an Engliſh ſpecimen, leſs luxuriant than uſual, and therefore more ſtrictly racemoſe. The name however may be retained in alluſion to the ſimple ſtructure of the panicle. Even in the very luxuriant ſpecimen, ſent by Tilli to Sherard, the foot-ſtalks are moſtly ſimple and ſingle-flowered, by which, and the conſtant ſmoothneſs of its glumes, it may certainly be diſtinguiſhed from B. *mollis*.

We have under this graſs an inſtance of Dillenius's having inſerted, as a new ſpecies, into his edition of the *Synopſis*, what exiſted there well defined already, for his is not even a variety of Ray's plant.

Dr. Withering, by an error totally unaccountable to me, quotes Mr. Afzelius as ſaying that "the B. *ſecalinus*, *hordeaceus* and *racemoſus* are the *ſame plant* in the Linnæan herbarium, and that they are all varieties of B. *mollis*." This excellent Botaniſt muſt have ſpoken from recollection, and his memory deceived him, as any one may eaſily be convinced by looking at the ſpecimens. Nor is this the only error of the ſame kind, which, without my participation or knowledge, has glided into the work of my intelligent and liberal friend, to whom I ſhould have been happy at all times to have directly communicated all the information that might be conſiſtent with my own undertakings, which I know to be all he would ever deſire.

5. BROMUS *ſquarroſus.*

Corn Brome-graſs.

B. paniculâ nutante; pedunculis ſimplicibus, ſpiculis ovatis duodecim floris, floſculis imbricatis depreſſis, ariſtis divaricatis.

Bromus ſquarroſus. *Linn. Sp. Pl.* 112. *Hudſ.* 49. *With.* 160. *Villars Dauph. V.* 2. 115.

Feſtuca graminea, glumis vacuis. *Scheuchz. Agr.* 251. *t.* 5. *f.* 11.

Gramen phalaroides majus aceroſum, nutante ſpicâ. *Barrel. Ic. t.* 24. *f.* 1.

In arvis Angliæ auſtraliores. *Hudſ.* Fl. Julio.

Radix fibroſa, parva, annua. *Culmus* pedalis, ſimplex, glaber, ſtriatus, folioſus. *Folia* et *vaginæ* pubeſcunt, villis breviſſimis deflexis. *Panicula* pauciflora, pedunculis ſecundis, ſimplicibus, compreſſis, apice incraſſatis. *Spiculæ* omnium maximæ, ovatæ, tumidæ, nitidæ, floſculis 12 ad 16, arctè imbricatis, depreſſo-concavis, glabris, ſubinde ſcabriuſculis. *Calyx* inæqualis, nervoſus, muticus. *Glumæ corollinæ exteriores* calyce parùm majores, multinerviæ, apice bipartitæ, ariſtis ſubulatis, ſcabris, recurvato-divaricatis, longitudine glumarum; *valvulæ interiores* longè minores, ciliis raris pectinatæ. *Semen* ellipticum, depreſſo-concavum, corollæ adnatum, apice villoſum.

This deſcription is taken from ſeveral very excellent ſpecimens in the Linnæan collection, for I have never ſeen any of Britiſh growth. It owes its place, therefore, in the liſt of Engliſh plants, entirely to Mr. Hudſon, as Dr. Withering alſo remarks, and I am not without a ſuſpicion of his having miſtaken the true B. *ſecalinus* for this ſpecies.

6. BROMUS

6. BROMUS *arvenſis.*

Field Brome-graſs.

B. paniculâ patente; pedunculis ramoſis, ſpiculis lanceolatis octofloris, floſculis ellipticis imbricatis depreſſis glabriuſculis.

Bromus arvenſis. *Linn. Sp. Pl.* 113. *Fl. Suec. n.* 97. *With.* 162. *Leers* 38. *t.* 11. *f.* 3. *Villars Dauph. V.* 2. 116.

B. erectus β *Hudſ.* 50?

Feſtuca elatior, paniculis minùs ſparſis, locuſtis oblongis ſtrigoſis ariſtatis purpureis ſplendentibus. *Raii Syn. ed.* 2. 261. *ed.* 3. 414. *Herb. Sherard.*

F. graminea, effuſâ jubâ. *Scheuchz. Agr.* 262. *t.* 5. *f.* 15.

F. avenacea ſterilis elatior. *Rel. Rudb.* 15. *f.* 2.

Aegilops major, caule et foliis arundinaceis, locuſtis glabrioribus et anguſtioribus e fuſco xerampelinis. *Dill. Giſſ.* 130. *App.* 60. *Herb. Sherard.*

Gramen bromoides ſerotinum annuum, paniculâ rariore magiſque ſparſâ, locuſtis anguſtioribus, purpuraſcentibus, glabris et ariſtatis. *Till. Piſ.* 76. *Herb. Sherard.*

Inter ſegetes rariùs. Fl. Julio.

Near Southampton. *Sherard.* At Earſham, Norfolk. *Mr. Woodward.*

Radix fibroſa, parva, annua. *Culmus* tripedalis, erectus, ſimplex (baſi quandoque ramoſo-luxurians), teres, ſtriatus, glaber, folioſus, geniculis quatuor vel quinque. *Folia* patentia, acuta, ſtriata, utrinque pubeſcentia, margine parùm ſcabra, longiùs vaginata. *Vaginæ* cylindricæ, nervoſæ, moliſſimè pubeſcentes, pilis deflexis. *Stipula* breviſſima, lacera. *Panicula* erectiuſcula, multiflora, ramis paten-

patentibus, numerosis, simplicibus et ramosis, scabris. *Spiculæ* ovato-lanceolatæ, erectiusculæ, demùm nutantes, nitidæ, purpureo variæ, plerumque glabræ, subinde oculo armato pubescentes. *Glumæ calycinæ* valdè inæquales, lanceolatæ, acutæ, carinatæ, nervosæ, margine membranaceæ. *Flosculi* 7 ad 10, arctè imbricati, elliptici, depresso-concavi, carinâ scabri, margine membranacei, nervis duobus approximatis longitudinalibus lateralibus; aristis glumâ plerumque longioribus, parùm infra apicem membranaceum e carinâ elongatâ exortis, rectis, subulatis, scabris: *glumæ interiores* minores, enerviæ, obtusæ, muticæ, margine pectinatæ. *Semen* apice villosum.

There is some doubt whether Mr. Hudson really knew this grass, or whether what he took for B. *arvensis* of Linnæus is merely a variety, as he made it, of his B. *erectus*; and this point can never be determined. The two species have less resemblance or affinity than most other *Bromi*, and could surely never be confounded.

7. BROMUS *erectus.*

Upright Perennial Brome-grass.

B. paniculâ erectâ; pedunculis subsimplicibus, flosculis lanceolatis teretiusculis, foliis radicalibus angustissimis ciliato-pilosis.

Bromus erectus. *Hudſ.* 49. *ed.* 1. 39. *With.* 160. *Sibth.* 47. *Relh. Suppl.* 2. 8. *Eng. Bot. t.* 471.

B. agrestis. *Allion. Ped. V.* 2. 249.

B. perennis. *Villars Dauph. V.* 2. 122.

B. n. 1507. *Hall. Hist. V.* 2. 237. *Davall.*

Festuca avenacea sterilis spicis erectis. *Raii Syn. ed.* 1. 237. *ed.* 2. 261. *ed.* 3. (exclusis synonymis) 413.

Gramen

Gramen bromoides pratenſe, foliis præter culmum anguſtiſſimis, rarâ lanugine villoſus. *Scheuchz. Agr.* 255. *t.* 5. *f.* 13. From a ſpecimen named by Scheuchzer himſelf in the Sherardian collection.

G. bromoides paniculatum, foliis et culmo villoſis. *Scheuchz. Agr.* 257. according to the opinion of Sherard.

G. quod Feſtuca pratenſis lanuginoſa C. B. *Vaill. Paris.* 93. *t.* 18. *f.* 2. The ſynonyms very much confuſed.

G. avenaceum glabrum, paniculâ purpuro-argenteâ ſplendente. *Mor. V.* 3. 213. *n.* 20. *Herb. Bobart.*

G. loliaceum, locuſtis longis ariſtatis. *Mont. Prod.* 35. *f.* 2. *Herb. Sherard.* But the ſynonyms of Ray and Moriſon quoted by Monti are wrong.

G. ſparteum, longâ et ſpicatâ paniculâ, Lolii utriculis, Feſtucæ potius, majus. *Barrel. Ic. t.* 13. *f.* 1.

In paſcuis arenoſis, cretâ ſubſtratis. Fl. Julio.

In the hedges beyond Botley near Oxford. *Bobart.* Ditchley Park. *Mr. Woodward.* Holkham, Norfolk. *Mr. Crowe.*

Radix perennis, fibroſa, cæſpitoſa, fibris villoſis, fuſcis. *Culmus* ferè tripedalis, erectus, ſtrictus, ſimplex, teres, glaber (rariùs pubeſcens), ultra medium folioſus, geniculis circiter quatuor. *Folia* lineari-lanceolata, acutiuſcula, ſtriata, lætè viridia, ſcabra; radicalia anguſtiſſima, pilis longis albis ſparſis adſcendentibus ciliata, ſubinde involuta. *Vaginæ* ſtriatæ, glabræ. *Stipula* breviſſima, eroſa. *Panicula* erecta, ramis erectis, ſcabris, numero et longitudine variis, ſimplicibus, rariùs bifloris. *Spiculæ* lineari-oblongæ, compreſſæ, erectæ, purpuraſcentes, vel glabræ vel tomentoſæ. *Glumæ calycinæ* lanceolatæ, acutæ, carinatæ; interiore majore, trinervi. *Floſculi* 5 ad 9, imbricati, lanceolati, compreſſo-teretiuſ-

culi, ſubangulati, carinati, obſoletè nervoſi, carinâ ſcabri; ariſtis longitudine vix glumarum, parùm infra apicem membranaceum exortis, rectis, ſcabris. *Glumæ interiores* apicem versùs minutè pectinato-ciliatæ ciliis adſcendentibus, minùs quam in maximâ parte Bromorum conſpicuis. *Antheræ* croceæ. *Semen* lineari-oblongum, ſupra ſulcatum, apice villoſum.

The ſpecimen of this *Bromus*, that ranks firſt in authority, exiſts in the Sherardian herbarium, and is thus inſcribed in Sherard's hand:

"Feſtuca avenacea ſterilis, ſpicis erectis, D. Bobart. Synopſ. App. This was firſt found by me, and given to Mr. Bobart. Folia inferiora pilis longis obſita."

Under theſe very words it appears in the ſecond edition of Ray's *Synopſis;* but, in the third, Dillenius has added ſynonyms of Plukenet and Moriſon, which belong to a widely different plant B. *muralis* of Hudſon, *madritenſis* of Linnæus, *diandrus* of Curtis, under which laſt name I ſhall preſently deſcribe it. Mr. Hudſon however copies thoſe ſynonyms under his B. *erectus*, adding, with a query indeed, B. *racemoſus* of Linnæus; ſo that he includes under *erectus* three ſpecies, and, if his variety β be the real *arvenſis*, even four. Other Botaniſts in the time of Dillenius ſeem to have confounded B. *erectus* and *diandrus;* and that circumſtance perhaps led him into the ſame error. The latter ſpecies in Buddle's herbarium has the denomination *Feſtuca avenacea ſterilis ſpicis erectis, D. Bobart*, which we have juſt proved to belong to the former, while there are three moſt diſtinct graſſes, one of them B. *erectus* with downy glumes, in the ſame herbarium under the true ſynonym of B. *diandrus*, as will be ſhewn preſently, not one of which is the real *diandrus*. Buddle has alſo the *erectus* in another place, with ſmooth glumes, with the ſynonym in Ray's *Synopſis*, which belongs

belongs to B. *arvenſis*, as above quoted. So in the Sherardian herbarium, along with authentic ſpecimens from Scheuchzer and Monti of B. *erectus*, with their own names for it, are various others, ſome with downy glumes, others with ſmooth ones, to which Sherard has applied ſuch a maſs of confuſed ſynonyms from the Bauhins, Ray and Tournefort, that they only ſerve to ſhew he had really no clear ideas upon the ſubject, and that his authority, like that of too many other Botaniſts, is not to be implicitly relied on in matters of opinion or criticiſm, however valuable in the caſe of original ſpecimens of plants found or deſcribed by himſelf.

With reſpect to Vaillant, his figure leaves no doubt of B. *erectus* being the plant he intended, though it may or may not be the *Feſtuca pratenſis lanuginoſa* of Bauhin; and his other citations are obſcure, thoſe of Ray certainly wrong.

Bromus erectus is eaſily known by its black perennial downy root, erect panicle and ſpikes, and eſpecially by the radical leaves being much narrower than thoſe on the ſtem, perfectly linear, and remarkably ciliated with diſtant long white hairs, pointing upwards. The accurate Mr. Swayne, as well as Mr. Woodward, has noticed its affinity to *Feſtuca*, to which genus I might have been tempted to remove it, on account of the perennial root, and the inner glume of the corolla being downy rather than pectinated. The *ariſta* however being, although a direct continuation of the *carina*, not ſtrictly terminal, as the glume ſeparates from it on each ſide, but more eſpecially the great affinity between this graſs and *Bromus aſper*, an indubitable *Bromus*, make me retain it in that genus.

8. BROMUS *aſper*.

Hairy Wood Brome-graſs.

B. paniculâ nutante ramoſâ, floſculis lanceolatis teretiuſculis ſubenerviis, foliis uniformibus: inferioribus hirſutis.

Bromus

Bromus aſper. *Linn. Suppl.* 111. *With.* 161. *Mart. Fl. Ruſt. t.* 126. *Retz. Prod. ed.* 2. 25.

B. ramoſus. *Linn. Syſt. Veg. ed.* 13. 102. (nec *Mant.* 34). *Hudſ. ed.* 1. 40.

B. nemoralis. *Hudſ.* 51.

B. nemoroſus. *Villars Dauph. V.* 2. 117.

B. hirſutus. *Curt. Lond. faſc.* 2. *t.* 8. *Relh.* 48. *Sibth.* 48.

B. montanus. *Pollich. V.* 1. 116. *Retz. Obſ. faſc.* 2. 7.

Poa paniculâ nutante, laxâ, ſpicis oblongis, multifloris, ſæpe ariſtatis. *Gmel. Sib. V.* 1. 110. *t.* 21. *Herb. Linn.*

Gramen avenaceum dumetorum, paniculâ ſparsâ. *Raii Syn.* 415.

G. avenaceum dumetorum, jubâ longiore, ſpicâ divisâ. *Moriſ. Sect.* 8. *t.* 7. *f.* 27.

In nemoroſis et ſepibus, humidiuſculis. Fl. Julio.

Radix annua vel biennis, fibroſa, fibris craſſiuſculis, horizontalitèr patentibus, lævibus. *Culmus* 4- vel 5-pedalis, erectus, teres, ſtriatus, folioſus, ſupernè glaber, ſub trigeniculatus. *Folia* patentia, plana, acuta, nervoſa, aſpera atque piloſa, latitudine omnia ferè æqualia. *Vaginæ* teretes, vix carinatæ, nervoſæ; inferiores pilis deflexis hirſutiſſimæ. *Stipula* brevis, lacera. *Panicula* pedalis, nutans, multiflora; ramis ramuliſque plerumque binatis, elongatis, nutantibus, aſperis. *Spiculæ* lineari-oblongæ, pendulæ, fuſco-virides, ſubpubeſcentes. *Glumæ calycinæ* valdè inæquales, lanceolatæ, carinatæ, ſcabræ; majori trinerviâ. *Floſculi* circitèr novem, imbricati, demùm laxè patentes, lanceolati, teretiuſculi, carinati, obſoletè trinervii, carinâ præcipuè aſperi, margine ſcarioſi, ſub apicem ariſtati, ariſtâ glumis breviore; *glumæ interiores* crebriùs ciliatæ, margine ſcarioſo, inflexo. *Semen* ſulco exaratum.

No

No difficulty attends this ſpecies, except what ariſes from the number of names that have been given it, owing to Linnæus having by accident called another B. *ramoſus;* ſo that this requiring a new name, every perſon gave one according to his fancy. It is eaſily diſtinguiſhed from the preceding, to which, though no one has yet compared them, it is moſt nearly a-kin; but its annual, or at moſt biennial, pale ſmooth root, broad uniform hairy leaves, and branched drooping panicle, characterize it ſufficiently. Authors have laboured to diſtinguiſh it from B. *giganteus* of Linnæus, ſome having moſt careleſsly conſidered them as the ſame ſpecies. In that however the root is perennial, the ſpikes ſmall, florets fewer, nearly ovate, ſcarcely carinated, their inner valve though rough not ciliated, and their *ariſtæ*, as Villars well obſerves, terminal, for which two laſt reaſons particularly I have ventured to remove it to the *Feſtucæ.*

9. BROMUS *ſterilis.*

Barren Brome-graſs.

B. paniculâ nutante ſubſimplici, floſculis lanceolatis nervoſis ſulcatis, foliis pubeſcentibus.

Bromus ſterilis. *Linn. Sp. Pl.* 113. *Hudſ.* 50. *With.* 162. *Relh.* 46. *Sibth.* 47. *Curt. Lond. faſc.* 1. *t.* 9. *Mart. Fl. Ruſt. t.* 125. *Leers* 37. *t.* 11. *f.* 4. *Ger. em.* 76.

Feſtuca avenacea ſterilis elatior, ſeu Bromos Dioſcoridis. *Raii Syn.* 412.

F. graminea annua ſterilis, ſpicis dependentibus. *Moriſ. Sect.* 8. *t.* 7. *f.* 11.

In arvis, ruderatis et ſepibus vulgaris. Fl. Junio, Julio.

Radix

Radix annua, fibroſa, parva, fibris capillaribus. *Culmus* ſeſquipedalis, erectus, gracilis, teres, ſtriatus, ad apicem uſque folioſus, geniculis 5 vel 6. *Folia* patentia, plana, ſubflaccida, anguſta, acutiuſcula, nervoſa, utrinque molliſſimè pubeſcentia, margine ſcabriuſcula. *Vaginæ* cylindricæ, nervoſæ, molliſſimè villoſæ, pilis parùm deflexis. *Stipula* oblonga, lacera. *Panicula* ſpithamæa, nutans; ramis ſæpiùs ternis, elongatis, nutantibus, aſperis, ſimplicibus, vix unquam bifloris. *Spiculæ* lanceolatæ, pendulæ, fuſco-virentes, ſcabræ. *Glumæ calycinæ* maximè inæquales, lanceolatæ, ſcabræ; majori angulatâ, nervosâ. *Floſculi* 6 ad 8, imbricati, demùm patentiuſculi, lanceolati, compreſſi, carinati, aſperi, 7- vel 9-nervii, nervis duobus ſubmarginalibus maximis, inter nervos ſulcati atque ſubpubeſcentes, apice ipſo ferè ariſtati, ariſtis glumâ longioribus, ſcabris; *glumæ interiores* ſetis raris pectinatæ, margine ſcarioſo inflexo. *Stamina* tria. *Semen* ſulco exaratum.

This common *Bromus* is readily known by its drooping, almoſt ſimple, flower-ſtalks, and narrow downy leaves. The ſtrong nerves of the glumes, a part hitherto generally much neglected in graſſes, are remarkable in this and the next ſpecies.

10. BROMUS *diandrus.*

Upright Annual Brome-graſs.

B. paniculâ erecto-patente ſubramosâ, floſculis lanceolatis nervoſis ſulcatis diandris.

Bromus diandrus. *Curt. Lond. faſc.* 6. *t.*

B. madritenſis. *Linn. Sp. Pl.* 114. *With.* 161.

B. muralis. *Hudſ.* 50. *Sibth.* 48.

B. ciliatus. *Hudſ. ed.* 1. 40.

B. ſterilis,

B. ſterilis, erectâ paniculâ, major. *Barrel. Ic. t.* 76. *f.* 1.

Feſtuca avenacea ſterilis, paniculis confertis erectioribus, ariſtis brevioribus. *Raii Syn. ed.* 2. 261. *Pluk. Phyt. t.* 299. *f.* 2. *Herb. Sherard.*

F. avenacea ſterilis, pediculis brevioribus et ſpicis erectis. *Moriſ. V.* 3. 212. *n.* 13.—et F. graminea annua, ſpicis erectis. *Ejuſd. Sect.* 8. *t.* 7. *f.* 13. *Herb. Bobart.*

Gramen bromoides pumilum, locuſtis erectis, majoribus ariſtatis. *Scheuchz. Agr.* 260. Sent by Scheuchzer himſelf to Sherard.

In arenoſis et ad muros paſſim. Fl. Junio.

Common on the ſandy grounds in Jerſey. *Sherard.* At the foot of St. Vincent's rock, Briſtol, on the farther part near the meadows. *Sir J. Banks, Bart.* Near Batterſea. *Curtis.*

Radix annua, fibroſa, parva. *Culmi* pedales vel ſeſquipedales, erecti, ſtricti, graciles, teretes, ſtriati, glabri, folioſi, geniculis plerùmque tribus. *Folia* præcedentis, at minùs pubeſcentia, ſæpè omninò glabra. *Vaginæ* nervoſæ, ſubcarinatæ, ſæpiùs glabræ, quandòque piloſæ, pilis deflexis. *Stipula* brevis, eroſa. *Panicula* vix triuncialis, erecta, faſtigiata; ramis ternis, quaternis, quiniſve, ſcabriuſculis, plerùmque ſimplicibus, brevibus, unifloris, ſolo fertiliore tantùm elongatis et ramoſis, ſemper tamen erectis vel erectiuſculis, nunquam pendulis. *Spiculæ* lineari-lanceolatæ, erectæ, ſæpiùs fuſceſcentes, ſcabræ. *Floſculi* præcedentis, ſed diandri, minùſque argutè nervoſi, nervis duobus lateralibus approximatis præcipuè conſpicuis.

The eſſential character of this ſpecies conſiſts in its flower-ſtalks being ſhort and erect, leaves almoſt ſmooth, glumes much leſs

 ſtrongly

ſtrongly nerved than in the laſt, and eſpecially in its florets having but two ſtamina, which has been obſerved by Mr. Curtis, as well as by Dr. Withering who found the ſame graſs in Portugal. I have by compariſon proved it the B. *madritenſis* of Linnæus; but it being far from peculiar to Madrid, I make no ſcruple to prefer the expreſſive name *diandrus*. It is very diſtinct from the B. *rubens*. Like moſt plants that live in a ſandy ſoil, it varies greatly as to ſize.

Great obſcurity involves the early ſynonyms of this graſs, inſomuch that nothing but the inveſtigation of original ſpecimens could clear it up. The moſt important of theſe is one in the Sherardian herbarium, with a ticket inſcribed by Sherard, thus: "This I found common on the ſandy grounds in Jerſey. 'Tis ſhorter awned than the *Bromus ſterilis*, lower and more upright." Hence we learn with certainty that the plant intended by Ray, in the ſecond edition of his *Synopſis*, *p.* 261. *n.* 4. is our *B. diandrus*. We learn with equal certainty from the collection of graſſes made by Bobart, and referring all through to that part of Moriſon's *Hiſtoria*, of which he was the editor, that he knew it to be the plant of Ray, and that he intended it himſelf under the name and figure in Moriſon, to which I have referred above. Dillenius however, ſtrange to tell, in his edition of the *Synopſis*, applies theſe ſynonyms to the B. *erectus*; and under the definition which belongs to the *diandrus*, he quotes a paſſage in Petiver's *Concordia Graminum*, and gives a figure and deſcription of his own, all which apply to *Feſtuca uniglumis* of Solander, *Lolium bromoides* of Hudſon, which is the plant Dillenius found on the coaſt of Suſſex, and, as it appears from Buddle's herbarium, what Mr. Dale gathered in Merſey Iſland. This error of Dillenius is noticed on a ticket, which accompanies the genuine ſpecimen of B. *diandrus* in the Sherardian collection, on which is written, in a ſcrawling hand unknown to me,

me, but certainly neither Dillenius's, Sherard's, nor Buddle's, the proper reference to Ray's ſecond edition, and Plukenet, *t.* 299. *f.* 2. with a remark in Latin, that " another graſs is exhibited for this in the *Synopſis*," that is in the third edition. Yet with this are two poor ſpecimens of the ſame graſs, marked with the original definition of Bobart, and the reference to the Appendix to Ray's firſt edition, p. 237, which belongs to B. *erectus*, as I have already mentioned. This is written in a handſome hand, to which I am likewiſe a ſtranger. A more complicated blunder exiſts in Buddle's herbarium. Under the inſcription " Feſtuca avenacea ſterilis, paniculis confertis erectioribus, ariſtis brevioribus, D. Sherard, *Raii Syn.* 261," are three moſt diſtinct and diſſimilar plants. In the firſt place *Bromus ſcoparius* of Linnæus, next B. *erectus* with downy glumes, and laſtly *Feſtuca uniglumis*, under which laſt is written (by Buddle as well as the reſt) " collectum in inſ. Merſea propè Colceſtr. a D. Dale, R. H. 1287." So that there is only wanting the real graſs to which the ſaid inſcription properly belongs. I was once inclined, on this authority, to add B. *ſcoparius* to the Britiſh Flora; but as there is no proof in Sherard's own collection of his having found it in Jerſey, we muſt ſuppoſe Buddle had it from ſome other quarter, and, merely from his own judgment, referred it to the plant of Sherard and Ray.

From the above tedious but neceſſary detail, I truſt the confuſion of ſynonyms between B. *erectus* and B. *diandrus*, which exiſts in Hudſon and all other writers who have touched upon them, will be accounted for, and in ſome meaſure excuſed, though it muſt be confeſſed the author of the *Flora Anglica* had the means in his power of clearing it up, had he been ſufficiently attentive. It will alſo appear from the hiſtory of ſuch miſtakes, which are abundant throughout every Britiſh *Flora* we have yet ſeen, that the comple-

tion of a more perfect one is not the work of a day. Indeed the contemplation of them, and the certainty that in ſo intricate an undertaking ſimilar errors are ſcarcely to be wholly avoided, are ſometimes ſufficient to daunt the moſt ardent inveſtigator, and make him ſenſible how much he himſelf may need the correction and indulgence of future critics.

11. BROMUS *ſylvaticus.*

Slender Wood Brome-graſs.

B. ſpicâ ſimplici nutante ſecunda, ſpiculis ſeſſilibus teretiuſculis, ariſtis glumâ longioribus, foliis piloſis.

Bromus ſylvaticus. *Pollich. V.* 1. 118. *Pourret Act. Toloſ. V.* 3. 308.

B. pinnatus. *Fl. Dan. t.* 164.

B. gracilis. *Weigel Obſ.* 15. *t.* 1. *f.* 11.

Feſtuca ſylvatica. *Hudſ. ed.* 1. 38. *With.* 158. *Relh.* 44. *Sibth.* 46. *Lightf.* 103. *Mart. Fl. Ruſt. t.* 114. *Dickſ. H. Sicc. faſc.* 13. 9.

F. pinnata β. *Hudſ.* 48.

Triticum n. 1432. *Hall. Hiſt. V.* 2. 213.

Gramen avenaceum dumetorum ſpicatum. *Raii Syn.* 394.

In dumetis, nemoroſis, et ſepibus frequens. Fl. Julio.

Radix perennis, fibroſa, cæſpitoſa, fuſca. *Culmi* bipedales, erecti, ſimplices, teretes, folioſi, glabri, apice attenuati et inclinati. *Folia* patentia, latiuſcula, acuminata, rigidiuſcula, lætè viridia, ſcabra, nervoſa, ſubtùs præcipuè ſtriata, magìs vel minùs piloſa. *Vaginæ* ſtrictæ, ſtriatæ, piloſæ. *Stipula* brevis, obtuſa, lacera. *Spica* ſimplex, nutans, ferè triuncialis, rachi ſubflexuosâ, ſtriatâ, ſcabrâ,

ſcabrâ, hinc canaliculato-compreſsâ. *Spiculæ* 6 vel 7, alternæ, ſeſſiles, ſecundæ, non divaricatæ, lineari-lanceolatæ, luteolo-virides plerùmque pubeſcentes. *Glumæ calycinæ* inæquales, lanceolatæ, breviùs ariſtatæ, nervoſæ, apicem versùs hirtæ. *Floſculi* 6 ad 9, imbricati, demùm patentiuſculi, ſubcylindrici, apicem versùs præcipuè nervoſi atque hirti. *Ariſta* terminalis, glumis plerùmque longior, ſubulata, ſcabra. *Gluma interior* linearis, retuſa, ſetis erectis rigidis ciliata.

The inner glume being ſtrongly pectinated in this graſs and the following one, ſeems to me a ſure indication of their being *Bromi*, and that any thing to the contrary in the inſertion of the *ariſta*, being in many ſpecies very difficult to determine, and in ſome variable, is of leſs real moment. In habit alſo theſe plants agree with other *Bromi* rather than with *Feſtucæ*, except indeed their perennial roots.

12. BROMUS *pinnatus.*

Spiked Heath Brome-graſs.

B. ſpicâ ſimplici erectâ diſtichâ, ſpiculis ſeſſilibus teretiuſculis, ariſtis glumâ brevioribus, foliis nudiuſculis.

Bromus pinnatus. *Linn. Sp. Pl.* 115. *Hudſ. ed.* 1. 41. *Pollich. V.* 1. 117. *Weigel Obſ.* 14. *t.* 1. *f.* 10.

Feſtuca pinnata. *Hudſ.* 48. *Relh.* 44. *Sibth.* 46. *Dickſ. H. Sicc. faſc.* 13. 8.

Triticum n. 1431. *Hall. Hiſt. V.* 2. 212.

Avena læta. *Saliſb. Prod.* 22.

Gramen ſpicâ Brizæ majus. *Raii Syn.* 392. *Rel. Rudb.* 11. *f.* 2.

G. ſparteum, ſpicatâ Brizæ paniculâ et corniculatà. *Barrel. Ic. t.* 25.

In campis et ericetis, ſolo calcareo. Fl. Julio.

Not uncommon in Yorkſhire, Oxfordſhire and Kent.

Radix

Radix perennis, fibroſa, ſubrepens. *Culmus* ſeſquipedalis vel bipedalis, erectus, ſimplex, teres, folioſus, glaberrimus, apice rectus et rigens, parùmque attenuatus. *Folia* erectiuſcula, lanceolata, acuminata, rigidula, ſtriata, nervoſa, ſcabra, ſæpiùs nuda, rariùs ſuprà piloſa. *Vaginæ* ſtrictæ, ſtriatæ, glaberrimæ. *Stipula* brevis, obtuſa, ciliata. *Spica* ſimplex, erecta, longitudine varia, rachi ſubflexuosâ, ſtriatâ, angulis ſcabrâ, hinc complanatâ. *Spiculæ* 6 ad 10, alternæ, ſeſſiles, diſtichæ nec ſecundæ, erectæ, linearilanceolatæ, pubeſcentes. *Glumæ calycinæ* parùm inæquales, lanceolatæ vel ſubovatæ, ſubariſtatæ, multinervoſæ, margineque præcipuè hirtæ. *Floſculi* 6 ad 12, vel etiam plures, arctè imbricati, ſubcylindrici, apicem versùs præcipuè nervoſi atque hirti. *Ariſta* terminalis, glumis plerùmque brevior, quandòque etiam breviſſima, ſubulata, ſcabra. *Gluma interior* retuſa, ſetis erectis ciliata ut in præcedente.

This has been united, by many Botaniſts, with the laſt, to which it is certainly nearly allied; but there are ſeveral points of difference which ſeem to keep them diſtinct. Theſe are the erect diſtichous ſpike, the firmer habit, leſs hairy leaves, and ſhort awns of B. *pinnatus.*

XXIV. *Some*

XXIV. *Some Corrections of the general Description of Polytrichum rubellum, p. 79, with an Account of another new Species of the same Genus. By Mr. Archibald Menzies, F.L.S.*

Read March 6, 1798.

IN the general description of *Polytrichum rubellum*, at page 79, line 8 from the bottom, *for* "an inch to two inches," *read* "half an inch to about an inch." At page 80, line 1, *for* "from an inch to an inch and half," *read* "about an inch;" and in line 6, *for* "long and subulate," *read* "flat, but in the centre slightly pointed."

These mistakes happened in consequence of my having considered the following from New Zeeland, on a slight comparison, to be the same: but in examining more perfect specimens, since the paper on the genus *Polytrichum* went to the press, I have been induced to make it a distinct species, which ought to have come in between P. *rubellum* and P. *dentatum*; but which I now beg leave to add:

14—15. POLYTRICHUM *subulatum*, fol. lanceolatis carinatis cartilagineo-serratis dorso denticulatis, capsulis cylindricis erectiusculis, operculo subulato. TAB. 6. FIG. 5.

Hab. in Nova Zeelandia. Nelson.

This

This ſpecies was found amongſt the duplicates of Mr. Nelſon's collection of plants from New Zeeland, in Sir Joſeph Banks's Herbarium; and as it agrees ſo nearly with P. *rubellum*, perhaps the beſt manner of deſcribing it is to point out the difference.

The *ſtalk* of this is ſlightly branched, and in general taller than P. *rubellum*. The *leaves* are larger and more acutely lanceolate, with whitiſh edges finely ſerrated, and middle nerves ſtrongly dentated; their texture is more tender and fragile; their colour in the dried ſtate is the ſame, but whether they are reddiſh, like the others, in their recent ſtate, is uncertain; they are more crowded at the tops and about the diviſions of the branches. The *peduncles* in general are at leaſt half an inch longer, and terminate both the upper and lower branches; but the moſt remarkable difference is in the *operculum* being long and ſubulate, whilſt in the other it is flat, with a ſmall point iſſuing from its centre. The *capſule*, in this, is longer and more ſlender, and the exterior *calyptra* is of a ſubulate ſhape, whilſt in the other it is of a conical figure.

END OF THE FOURTH VOLUME.

DIRECTIONS

FOR PLACING THE PLATES OF THE FOURTH VOLUME.