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TRANSACTIONS

OF THE

WISCONSIN ACADEMY

OF

Sciences, Arts, and Letters.

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VOL. VII. 1883-87.

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PUBLISHED BY AUTHORITY OF LAW.



MADISON, WISCONSIN:  
DEMOCRAT PRINTING COMPANY, STATE PRINTERS.  
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OF THE

WISCONSIN ACADEMY OF SCIENCES, ARTS AND LETTERS.

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ATTIDÆ OF NORTH AMERICA.

BY

GEORGE W. AND ELIZABETH G. PECKHAM.

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## INTRODUCTION.

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On account of the habits of the Attidæ they are, in comparison with other families, poorly represented in collections. The most important contribution to the knowledge of North American species is the work of N. M. Hentz, his studies having been largely carried on in the southern states. The papers of Hentz were originally published in the Journal of the Boston Society of Natural History, from 1842-45, but are found in more convenient form in the collection made by Burgess in 1875. The works of Baron Walckenaer, 1837-47, and that part of Die Arachniden, by C. Koch, published in 1846, contain descriptions of many American Attidæ, but owing to the vagueness of the descriptions comparatively few can be identified with certainty. So far as Koch is concerned this is of slight importance, as his work was preceded by that of Hentz. But with Walckenaer the question of priority comes up, as doubtless many of the species commonly ascribed to Hentz were first published by him, and he should be credited with all such species as can be identified from his descriptions. The important question is, what species can be identified by Walckenaer's descriptions?

We have made a very careful study of the descriptions of Walckenaer's sixty-four species, comparing them with nearly all Hentz's species and with many others from different sources and we have been able to identify only four.

On the subject of priority we agree with Dr. Thorell that "to reject a name, as some have proposed to do, on account of *defectiveness* in the definition, would seem not to be right, as leaving room for much arbitrariness. What seems to one good enough may to another appear insufficient or faulty. *When one only knows with certainty what is to be understood by such a name*, every one can either alter or improve the characterization for himself."<sup>1</sup> We wish it to be understood that we reject none of Walckenaer's species on account of defectiveness of definition. We accept them whenever we are able to identify them.

Walckenaer's work on North American species was largely based on the manuscript plates of Abbot. He does not, so far as we know, state expressly that he has seen any of the specimens, but that he has examined most of them must be understood from the following statement which he makes before enumerating thirteen species. "Les espèces suivantes n'ont pas été observées par nous, et ne sont placées dans cette section que sur les indications fournies par les figures de l'ouvrage MSS. d'Abbot, intitulé: Georgian Spiders."

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<sup>1</sup> On European Spiders, I., p. 5. The italics in the concluding sentence are ours.

Had Walckenaer published Abbot's plates in connection with his descriptions it would doubtless have been easy to identify many of his species, but as the law of priority deals only with published matter, his claim to species must rest upon his descriptions alone, although Abbot's manuscript plates may be seen in the British Museum. In the event of their publication at some future time, such species as are identifiable, for the first time, through the figures, must be ascribed to Abbot at that date, and not to Walckenaer.

A good example of the difficulties of dealing with Walckenaer may be found in a species which he published in his first volume as *Attus protervus*, a black spider with black legs and palpi. In his fourth volume he refers to this species, saying: "Add to the synonymy *Plexippus undatus* Koch." Now there is no doubt that this last mentioned spider is identical with *Attus vittatus* ( $\delta$ ) Hentz, one of our most common species. The description and figure of Koch represent it fairly well as a dark spider with chevrons of white hair, and *yellow legs and palpi*. As a matter of fact the general appearance is very seldom so dark as would appear from Koch, who seems to have described from a single specimen. If, indeed, Walckenaer's *A. protervus* and Koch's *Pl. undatus* are identical, Walckenaer's description is absolutely false and bears no resemblance to the species. We can only suppose that Walckenaer was mistaken in thinking them identical.

We have collections from various parts of North America. Those of Count Keyserling (containing a number of type-specimens) and of Mr. Nicolas G. Pike have been of especial use to us. We are also indebted for specimens to the following persons. The locality in which each collection was made is indicated after the name of the sender.

Miss Edith Gifford, Mexico; Mr. Chas. Mann, Louisiana, Florida; Mr. Fr. Rauterberg, Texas; Miss Augusta Tovell, Texas; Mr. Thos. Gentry, North Carolina, South Carolina, Georgia; Mr. F. S. Risley, Florida; Col. J. J. Young, Pennsylvania; Mr. Philip Nell (for many specimens), Pennsylvania; Mrs. Mary B. Putnam, Iowa, Utah; Mr. Aurelius Todd, Oregon; Miss Murray, California; Mr. L. E. Ricksecker, California; Prof. J. J. Rivers, California; Mr. W. G. Harford, California, Washington Territory; Mr. W. G. Wright, California; Prof. O. B. Johnson, Washington Territory; Dr. F. Brendel, Illinois; Mr. Philip Abbot, Massachusetts; Mr. H. Van Rensselaer, Connecticut; J. B. Tyrrell, Esq. (Geol. Survey of Canada), Canada, Rocky Mountains; Rev. H. C. McCook, various parts of United States; M. E. Simon, Mexico; Dr. Ferdinand Karsch, collection of Attidæ of Royal Museum of Berlin (containing many North American specimens.)

North American Attidæ have been described by the following writers:

WALCKENAER: Hist. Nat. des Insectes Aptères, 1837?-47.

N. M. HENTZ: Occasional Papers, 1842-45.

C. KOCH: Die Arachniden, 1846.

GIEBEL: Illinois Spiders, Zeitschrift für Gesammten Naturwissenschaften, 1869.

J. BLACKWALL: Spiders from Canada, Ann. & Mag. of Nat. Hist.

T. THORELL: Spiders of Colorado, Bull. of Hayden's U. S. Survey of the Territories.

E. KEYSERLING: Neue Spinnen aus Amerika, VI.

H. C. MCCOOK: Proc. Acad. Nat. Sci. of Philadelphia, 1883.

PECKHAM: Descr. new or little known Attidæ, 1883.

The Attidæ have usually a high cephalothorax with almost vertical sides, and short and thick extremities, although there are many exceptions. Perhaps the position and relative size of the eyes—in which they most nearly approach the Lycosidæ—is of most value in defining the family. The eyes are arranged in three or four transverse rows, three in the sub-family Attinæ and four in the sub-family Lyssomanæ. In the former the first row is composed of four eyes, the middle ones being the largest; the second row is composed of two very small eyes, and the third of two of medium size. In the Lyssomanæ, the two outer eyes of the first row are placed so far back as to divide it into two transverse rows; otherwise the eyes are alike. The spiders are, many of them, very brilliantly colored—as much so as are the humming birds or beetles. As the markings are commonly formed of colored hairs or scales, they change considerably when the spider is wet, and are moreover, very easily rubbed off. The entire appearance of a spider may thus be changed, and its identification rendered difficult, if not impossible. The Attidæ, like the birds, moult frequently, and at each moult the markings may change, so that some of the older writers have formed several species for the different moults of one. These difficulties are increased by the fact that the adult males and females of a species usually differ considerably in appearance.

Although a great many species have been described, we have been able to identify but a limited number. The Attidæ live on the ground, on plants, and on trees, jumping on their prey. They form no web, but generally attach a line when they jump, to save themselves in case they miss their aim. The females place the cocoon under leaves or bark and spin some cross lines, under which they stand until the eggs are hatched.

Of the fifty-five species described by Hentz, we have identified forty-five. Of the ten remaining, probably five or six are varieties of those that we have described, but this being uncertain, we have not included them.

The key which follows is useful only in determining the species described in this paper:

KEY TO GENERA OF NORTH AMERICAN ATTIDÆ.

- |   |             |
|---|-------------|
| 1. Eyes in four rows .....  | LYSSOMANES. |
| 2. Eyes in three rows.....  | 3           |
| 3. Body slender, ant-like, legs weak.....                           | 5           |
| 4. Body not slender nor ant-like.....                               | 9           |
| 5. Cephalic part higher than thoracic; lip much longer than wide    |             |
|   | SALTICUS.   |
| 6. Cephalic part not higher than thoracic; lip as wide as long..... | 7           |

7. Thoracic part divided by a marked constriction into a shorter anterior and a longer posterior portion; quadrangle of eyes wider than long.....SYNEMOSYNA.
8. Thoracic part not divided; quadrangle of eyes much longer than wide.....SYNAGELES.
9. Cephalic part at least as long as thoracic<sup>1</sup>..... 11
10. Cephalic part shorter than thoracic..... 21
11. Cephalic part occupying  $\frac{2}{3}$  of the cephalothorax.....<sup>2</sup>HOMALATTUS.
12. Cephalic part occupying plainly less than  $\frac{2}{3}$  of cephalothorax..... 13
13. Spiders very small — not so much as 3 mm. long..... 15
14. Spiders<sup>3</sup> not very small ..... 17
15. Quadrangle of eyes equally wide in front and behind, legs 4, 3, 1, 2<sup>4</sup>NEON.
16. Quadrangle of eyes wider behind, legs 4, 1,  $\overline{2, 3}$ .....BALLUS.
17. Quadrangle of eyes equally wide in front and behind; first row strongly curved; cephalothorax very convex, with cephalic part strongly inclined forward, and falling steeply behind...AGOBARDUS.
18. Quadrangle of eyes wider behind; first row straight or very slightly curved; shape of cephalothorax unlike the above..... 19
19. Cephalothorax high, nearly as wide as long; dorsal eyes at widest point of cephalothorax, opposite a corner, and projecting; quadrangle of eyes, looked at from above, seeming to occupy  $\frac{2}{3}$  of cephalothorax.....ZYGOBALLUS.
20. Unlike the above.....ERIS.
21. Quadrangle of eyes wider in front..... 23
22. Quadrangle of eyes wider behind, or equally wide in front and behind..... 27
23. First row of eyes straight; patella + tibia III shorter than patella + tibia IV.....ASTIA.
24. First row of eyes curved; patella + tibia III equal to patella + tibia IV..... 25
25. Dorsal eyes nearer to each other than to lateral borders; legs ( $\delta$ ) 1, 3, 4, 2; ( $\rho$ ) 4, 3, 1, 2.....PROSTHECLINA.
26. Dorsal eyes further from each other than from lateral borders; legs ( $\delta$   $\rho$ )  $\overline{4, 3, 1, 2}$ .....<sup>5</sup>SAITIS.

<sup>1</sup> The cephalic part extends from the anterior margin of the lateral eyes of the first row to the posterior margin of the eyes of the third row.

<sup>2</sup> The only North American species of this genus yet known has metallic reflections, and when the spider is looked at from above the cephalic part seems to occupy nearly the whole cephalothorax.

<sup>3</sup> *Zygoballus sexpunctatus* H. is only 3 mm. long, but is distinguished from *Neon* and *Ballus* by its peculiar falces, as well as by the shape, and greater height of its cephalothorax.

<sup>4</sup> In *Neon* the dorsal eye is plainly larger than the anterior lateral.

<sup>5</sup> In *Saitis* legs III and IV are much longer than I and II, while in *Prostheclina* the difference is not so marked.

27. <sup>1</sup>Cephalothorax high, massive; quadrangle of eyes plainly wider (often much wider) behind; first row of eyes usually curved; legs 1, 4, 3, 2, 1, 4, 2, 3, 4, 1, 3, 2, or 4, 3, 1, 2..... 29
28. Unlike the above..... 33
29. Legs 1, 4, 3, 2, 1, 4, 2, 3 or 4, 1, 3, 2..... 31
30. Legs 4, 3, 1, 2..... PLEXIPPUS.
31. Eyes of second row twice as far from dorsal as from lateral eyes.  
PHIDIPPUS.
32. Eyes of second row halfway or about halfway between lateral and dorsal eyes..... PHILÆUS.
33. Third leg longest, fourth next..... HABROCESTUM.
34. Unlike above..... 35
35. Cephalothorax convex, and high, or moderately high..... 51
36. Cephalothorax low and flat..... 37
37. Abdomen at least four times as long as wide; cephalothorax low and flat, not wider than third row of eyes; legs of first pair very long..... HYCTIA.
38. Unlike the above..... 39
38. Spines only on metatarsi of first pair.....<sup>2</sup> ADMESTINA.
40. Legs all spined..... 41
41. Cephalothorax plainly wider than third row of eyes, quadrangle equally wide in front and behind..... 43
42. Unlike the above..... 45
43. Quadrangle of eyes  $\frac{1}{4}$  wider than long, occupying  $\frac{2}{3}$  of cephalothorax; lateral eyes of first row separated by not more than  $\frac{1}{3}$  their own diameter from middle eyes..... MENEMERUS.
44. Quadrangle of eyes  $\frac{1}{3}$  wider than long, occupying  $\frac{1}{3}$  of cephalothorax; lateral eyes of first row separated by at least  $\frac{1}{3}$  their own diameter from middle eyes..... MARPTUSA.
45. Middle eyes of first row three times as large as lateral eyes; quadrangle of eyes nearly twice as wide as long.....<sup>3</sup> SADALA.
46. Middle eyes of first row about twice as large as lateral eyes; quadrangle of eyes not more than  $\frac{1}{3}$  wider than long..... 47
47. Metatarsi III and IV with spines only in terminal circles; legs never ( $\delta$ ) 4, 1, 2, 3, nor 1, 3, 2, 4; ( $\varphi$ ) 4, 1, 3, 2, nor 4, 3, 1, 2..... ICIOUS.
48. Metatarsi III and IV with spines throughout their length; legs ( $\delta$ ) 4, 1, 2, 3 or 1, 3, 2, 4; ( $\varphi$ ) 4, 1, 3, 2 or 4, 3, 1, 2..... 49
49. Coxae I nearly touching; legs ( $\delta$ ) 4, 1, 2, 3; ( $\varphi$ ) 4, 1, 3, 2; quadran-

<sup>1</sup> Spiders in this group except *Phidippus rufus*, *Philæus militaris*, and *Plexippus puerperus* are large, from 8 to 16 mm (commonly about 10 mm) in length. The sides of the cephalic part are usually much swollen.

<sup>2</sup> Our only species of *Admestina* is small, not more than 4 mm long.

<sup>3</sup> *Sadala* is distinguished from *Icius* by having spines throughout the length of the metatarsi of the third and fourth legs, and by having the leg formula 1, 4, 2, 3. Our only species of *Sadala* is from Mexico.



gle of eyes  $\frac{1}{3}$  wider than long; middle anterior eyes touching; eyes of second row a little nearer the lateral than the dorsal eyes,

CYRBA.

50. Coxae I separated by width of labium; legs ( $\delta$ ) 1, 3, 2, 4; ( $\varphi$ ) 4, 3, 1, 2; quadrangle of eyes less than one third wider than long; middle anterior eyes subtouching; eyes of second row halfway between lateral and dorsal eyes.....CYTÆA.
51. First row of eyes straight<sup>1</sup> ..... 35
52. First row of eyes curved ..... 59
53. Middle eyes of first row touching..... 55
54. Middle eyes of first row not quite touching ..... 57
55. Metatarsi III and IV with spines only in terminal circles; quadrangle of eyes equally wide in front and behind; eyes of second row half way between lateral and dorsal eyes.....EPIBLEMUM.
56. Metatarsi III and IV spined throughout their length; quadrangle of eyes wider behind; eyes of second row nearer the lateral than the dorsal eyes.....ATTUS E. S.
57. Lateral eyes of first row nearly touching middle eyes; eyes of second row nearer lateral than dorsal eyes; legs ( $\delta$ ) 1, 4, 2, 3; ( $\varphi$ ) 4, 1, 3, 2.....PSEUDICIUS.<sup>2</sup>
58. Lateral eyes of first row separated by  $\frac{1}{3}$  their own diameter from middle eyes; eyes of second row not nearer lateral than dorsal eyes; legs ( $\delta$ ) 1, 3, 4, 2; ( $\varphi$ ) 4, 3, 1, 2.....HASARIUS.
59. Dorsal eyes nearer to each other than to lateral borders.....MÆVIA.
60. Dorsal eyes further from each other than from lateral borders.... 61
61. Quadrangle equally wide in front and behind; legs 4, 3, 2, 1..... ATTUS W.<sup>3</sup>
62. Quadrangle wider behind; legs not 4, 3, 2, 1.....DENDRYPHANTES.

The following tables are useful only for spiders described in this paper. They are designed to furnish an easy method for determining species. To use them, determine the relative length of the legs of the spider in question and find the corresponding formula in the tables. This will usually place the spider in a group of four or five genera, rendering it a comparatively easy matter to determine the genus. When the difference between two legs is extremely slight they are placed together with a dash above. The tables do not include the genera *Synemosyna*, *Synageles*, *Salticus* and *Lyssomanes*; *Dendryphantes multicolor* also does not appear since our only specimen has but three legs.

<sup>1</sup> It requires practice to distinguish a straight from a slightly curved row of eyes, but since these genera are only represented by three species the difficulty will be inconsiderable. *E. scenicum* is a dark spider with two oblique white bands on each side of the abdomen; *A. palustris* has two white spots near the center of the dorsum of the abdomen; *A. imperialis* has four snowy white oblique bands on the face and palces and a ring of white on the distal end of the femur of the palpus.

<sup>2</sup> Our only species of this genus is from west of the Rocky Mountains.

<sup>3</sup> The species which we leave in *Attus Walck*. It being only represented by an immature specimen we do not determine its genus.

TABLE OF LEG FORMULÆ FOR MALES.

	$\overline{1\ 2\ 3\ 4}$		$1\ 3\ 4\ 2$
PLEXIPPUS puerperus.		HASARIUS hoyi.	
	$1\ 3\ \overline{2\ 4}$	PROSTHECLINA cambridgii.	
CYTÆA minuta.			
	$1\ 4\ 2\ 3$		$1\ 4\ \overline{2\ 3}$
PHIDIPPUS mexicanus.		PHIDIPPUS rufus.	
PHIDIPPUS arizonensis.		PHIDIPPUS morsitans.	
PHIDIPPUS insolens.		PHIDIPPUS cardinalis.	
PHIDIPPUS johnsonii.		PHILÆUS militaris.	
PHIDIPPUS octopunctatus.		DENDRYPHANTES elegans.	
PHILÆUS chrysis.		MÆVIA californica.	
DENDRYPHANTES capitatus.		EPIBLEMUM scenicum.	
DENDRYPHANTES flavipedes.			
ATTUS palustris.			$\overline{1\ 4\ 2\ 3}$
ATTUS imperialis.		PSEUDICIUS harfordii.	
ICIUS albovittatus.			
ICIUS palmarum.			$\overline{1\ 4\ 3\ 2}$
HYCTIA pikei.		ASTIA morosa.	
MARPTUSA familiaris.			
MARPTUSA californica.			$3\ 4\ 1\ 2$
MENEMERUS melanagnathus.		HABROCESTUM coronatum.	
HOMALATTUS cyaneus.		HABROCESTUM viridipes.	
ZYGOBALLUS sexpunctatus.		HABROCESTUM peregrinum.	
ZYGOBALLUS bettini.		HABROCESTUM auratum.	
SADALA distincta.		HABROCESTUM hirsutum.	
		HABROCESTUM splendens.	
	$1\ 4\ 3\ 2$	HABROCESTUM oregonense.	
ICIUS piraticus.			
ICIUS mitratus.			$4\ 1\ 3\ 2$
MENEMERUS paykullii.		ASTIA vittata.	
AGOBARDUS anormalis.		ADMESTINA wheelerii.	
	$4\ 1\ \overline{2\ 3}$		$4\ 3\ 1\ 2$
CYRBA tæniola.		PLEXIPPUS putnamii.	
BALLUS youngii.		NEON nellii.	
	$\overline{4\ 3\ 1\ 2}$		$4\ 3\ \overline{2\ 1}$
SAITIS pulex.		ATTUS cautus.	

TABLE OF LEG FORMULÆ FOR FEMALES.

	1 4 2 3		1 4 3 2
ERIS octavus.		PHILÆUS mexicanus.	
ERIS nervosus.		ICIUS palmarum.	
HYCTIA pikei.			
	1 4 3 2		1 4 2 3
DENDRYPHANTES flavus.		PSEUDICIUS harfordii.	
	3 4 1 2		4 1 2 3
HABROCESTUM cœcatum.		PHIDIPPUS morsitans.	
HABROCESTUM viridipes.		PHIDIPPUS galathea.	
HABROCESTUM cristatum.		PHIDIPPUS m'cookii.	
HABROCESTUM auratum.		PHIDIPPUS opifex.	
HABROCESTUM splendens.		DENDRYPHANTES alboimmaculatus.	
	4 1 2 3	ATTUS palustris.	
ZYGOBALLUS bettini.		ICIUS lineatus.	
	4 1 2 3		4 1 3 2
PHIDIPPUS rauterbergii.		ICIUS mitratus.	
PHIDIPPUS miniatus.			
PHILÆUS fartilis.			4 1 3 2
PHILÆUS militaris.		PHIDIPPUS rufus.	
DENDRYPHANTES capitatus.		PHIDIPPUS obscurus.	
CYRBA tæniola.		PHIDIPPUS insolens.	
MARPTUSA familiaris.		PHIDIPPUS albomaculatus.	
MARPTUSA californica.		PHIDIPPUS johnsonii.	
BALLUS youngii.		PHIDIPPUS otiosus.	
	4 3 1 2	PHILÆUS farneus.	
HASARIUS hoyi.		PHILÆUS chrysis.	
PROSTHECLINA cambridgii.		PHILÆUS princeps.	
ASTIA vittata.		PHILÆUS rimator.	
CYTÆA minuta.		DENDRYPHANTES elegans.	
MENEMERUS melanognathus.		ERIS barbipes.	
AGOBARDUS anormalis.		EPILBEMUM scenicum.	
	4 3 1 2		4 3 1 2
ASTIA morosa.		SAITIS pulex.	
	4 3 1 2		
PLEXIPPUS puerperus.			

## PHIDIPPUS (C. KOCH.)

Cephalothorax high and convex, contracted in front and behind, sides usually widely rounded, especially in  $\delta$ , cephalic part inclined forward, and separated from the thoracic by a depression; thoracic part slanting, at first gradually and then more steeply from the dorsal eyes. Quadrangle of eyes  $\frac{1}{2}$  wider than long (excepting *arizonensis*, which is  $\frac{1}{2}$  wider than long, and *opifeæ* which is  $\frac{2}{3}$  wider than long), wider behind than in front; anterior eyes small, in a curved row, the middle not more than twice as large as the lateral, and but little separated; the lateral separated from them by from  $\frac{1}{2}$  to  $\frac{2}{3}$  their own diameter; eyes of second row twice as far from dorsal as from lateral eyes; eyes of third row about as large as lateral eyes, at least as far from each other as from the lateral borders. Third row of eyes narrower than the cephalothorax at that place. Clypeus from  $\frac{1}{4}$  to  $\frac{1}{2}$  as high as large middle eyes, vertical. Falces usually stout and nearly twice as long as face. Labium longer than wide, about  $\frac{1}{2}$  as long as maxillæ. Sternum deep set, projecting between the anterior coxæ which are separated by width of labium or a little less. Legs ( $\delta$ ) 1, 4, 2, 3; ( $\varphi$ ) 4, 1, 2, 3, or 4, 1, 3, 2; first leg stoutest, with femur and tibia enlarged and compressed, stouter than patella, and much stouter than metatarsus and tarsus. Tibia and patella of the first usually a little shorter than cephalothorax; tibia and patella of the third shorter than tibia and patella of the fourth; tibia and patella of the fourth at least as long as metatarsus and tarsus of the fourth. Femoral, tibial, metatarsal and sometimes patellary spines on the four pairs; metatarsi of the fourth, spined throughout their length.

## PHIDIPPUS MORSITANS WALCKENAER.

Plate I, figures 1, 1 a. Plate 11, figure 1.

- Syn.*: 1837. ? *ATTUS morsitans* Walck., Hist. Nat. des Insectes Aptères, I. p. 432.
1844. “ *audax* Hentz, Journal Boston Soc. Nat. Hist., Vol. IV.
1845. “ *tripunctatus* id., *ibid.*, Vol. V.
1846. *PHIDIPPUS variegatus* C. K., Die Arachn., XIII, p. 125.
1846. “ *purpurifer* id., *ibid.*, XIII, p. 127.
1846. “ *smaragdifer* id., *ibid.*, XIII, p. 128.
1846. “ *alchymista* id., *ibid.*, XIII, p. 131.
1846. “ *rustmanus* id., *ibid.*, XIII, p. 132.
1846. “ *lunulatus* id., *ibid.*, XIII, p. 133.
1846. “ *mundulus* id., *ibid.*, XIII, p. 137.

- Syn.*: 1847. *ATTUS morsitans* Walck., Hist. Nat. des Insectes Aptères, IV, p. 419.  
 1875. *ATTUS audax* HENTZ, Coll. Arachn. Writings ed. by Burgess, Boston, p. 50.  
 1875. “ *tripunctatus* id., *ibid.*, p. 58.  
 1883. “ “ Peckham, Descr. new or little known, Attidæ, p. 33.

♂. Total length 11 mm. Width of abdomen 4.3 mm.

Cephalothorax: length 5.3; width 5.1; height 2.8. Legs: 11, 9.1, 9.1, 10.7; patella and tibia of the first, 5.5; patella and tibia of the third, 3.2; patella and tibia of the fourth, 4; metatarsus and tarsus of the fourth, 4. Lateral separated from middle eyes by  $\frac{2}{3}$  their diameter. Clypeus  $\frac{1}{4}$  as high as large as middle eyes. Maxillæ slightly diverging, wide at extremity, with a projection at the outer corner, inner margin slanting toward labium. Labium  $\frac{1}{2}$  as long as maxillæ, contracted and rounded at tip. Sternum convex, oval. Anterior coxæ separated by width of labium.

♀. Total length 15 mm. Width of abdomen 5.6 mm.

Cephalothorax: length 5.5; width 4.4; height 2.2.

Legs 10.6, 9, 9, 12.1; patella and tibia of the first, 4.2; patella and tibia of the third, 2.4; patella and tibia of the fourth, 3.2; metatarsus and tarsus of the fourth, 3.2.

Relative length of legs 4, 1, 2, 3.

*Coloration.* ♂. ♀. Cephalothorax black, covered with short black and gray hairs, and having some long black hairs on the sides near the small median eyes; there are sometimes white bands on the sides. Clypeus covered with white hairs. Femur of palpus reddish, with a black band on inner side, three black spines, and some black and white hairs. The falces are bright iridescent green, with reddish fangs. The sternum and venter are black, the venter having two whitish longitudinal bands which approach each other, but terminate near the apex without meeting. The abdomen is black, with thick, short, black hairs, and some long white hairs; at the middle point is a large, more or less triangular, white spot; posterior to this are two smaller, somewhat oblique, white spots; lower down, and nearer the apex than these, but in a line with them, are two minute white dots. The spots are formed by scales, which, through the microscope, look like grains of rice. In some specimens there are two oblique white bands on each side, and a white band at the base. Immature specimens frequently have the spots orange-colored instead of white. The legs are black and hairy, barred with rufus in young specimens; on the inner side of the patella of the first leg is a brush of white hairs.

*Habitat.* United States.

Although the markings of this spider are similar to those of *P. miniatus*, it has no red hairs when adult, and is thus easily distinguished from that

species. It is possible that *morsitans* grows larger in the western than in the eastern states, as Emerton gives 8.6 mm. as the total length of the ♀. A period of from fourteen to fifteen days is required for the development of the eggs of this species.

PHIDIPPUS RUFUS HENTZ.

Plate I, figure 2 a. Plate II, figure 2.

- Syn.*: 1845. *ATTUS rufus* H., Journal Boston Soc. Nat. Hist., Vol. V.  
 1845. " *castaneus* id., *ibid.*, Vol. V.  
 1846. *PLEXIPPUS rufus* C. K., Die Arach., XIII, p. 120.  
 1846. " *bi-vittatus* id., *ibid.*, XIII, p. 120.  
 1875. *ATTUS rufus* H., Coll. Arachn. Writ., ed. by Burgess, Boston, p. 60.  
 1875. " *castaneus* id., *ibid.*, p. 55.  
 1885. *PHIDIPPUS ruber* Keyserling, Neue Spinnen aus Amerika, VI, Verhandlungen Zoologisch — botanischen gesellschaft, p. 7.

♂. Total length 8.5 mm. Width of abdomen 3 mm.

Cephalothorax: length 4.1; width, 3.4; height 2.5.

Legs, 9.9, 7.3, 6.8, 9.2; patella and tibia of the first 4.2; patella and tibia of the third 2.4; patella and tibia of the fourth 3.4; metatarsus and tarsus of the fourth 3.

Lateral rather more than one-half as large as middle eyes, separated from these by two-thirds their own diameter. Clypeus one-fourth as high as middle eyes. Maxillæ nearly parallel, enlarged at extremity, with projection at outer corner, slanting within toward labium. Labium a little more than one-half as long as maxillæ, contracted at tip. Sternum oval, convex, nearly twice as long as wide. Anterior coxæ separated by width of labium. Legs without patellary spines.

♀. Total length 11.8 mm. Width of abdomen 4.8.

Cephalothorax: length 5; width 3.8; height 2.7.

Legs 9.4, 8.1, 8.4, 9.9; patella and tibia of the first 3.8; patella and tibia of the third 3; patella and tibia of the fourth 3.5; metatarsus and tarsus of the fourth 3.4.

Maxillæ rounded at extremity; labium two-thirds as long as maxillæ; relative length of legs 4, 1, 3, 2.

Coloration. ♂. The cephalothorax is covered with bright yellowish-red hairs, excepting the lower sides which are white; there are some long black hairs in the eye region. The face, clypeus and palpi are covered with white hairs; the falces are dark iridescent green; the mouth parts and coxæ are dark reddish brown; the sternum is black with white hairs; the venter is black, with two longitudinal lines of white hairs which converge behind. The abdomen is covered with

red hairs like those on the cephalothorax; it has a white basal band which extends on to the sides, and four indented dots. The legs are dark reddish brown, with many white hairs.

- ♀. The color is much less brilliant than in the ♂, being usually of a dull brick-red hue. The abdomen, besides the white basal band, has an oblique white band on each side, and two black bands on the posterior dorsal parts; these black bands reach the apex, and curve toward each other anteriorly; each has a white dot at its anterior, and one at its posterior end, and a transverse white line across the middle, where it is widest. The legs are reddish brown with black rings.

In *cardinalis*, with which it might be confused, the clypeus is one-third not one-fourth, and the lateral anterior eye is separated by one-half not two-thirds of its own diameter from the large middle eye. The second and third legs in *cardinalis* are about equal; in *rufus* the second is plainly longer than the third.

*Habitat*: United States.

#### PHIDIPPUS GALATHEA WALCK.

Plate I, figures 3, 3a.

- Syn.*: 1837. *ATTUS galathea* Walck., Hist. Nat. des Insectes Aptères, I, p. 456.  
 1845. *ATTUS mystaceus* Hentz, Jour. Bost. Soc. of Nat. Hist., Vol. V.  
 1846. *PHIDIPPUS asinarius* C. K., Die Arachniden, XIII, p. 139.  
 1847. *ATTUS galathea* Walck., Hist. Nat. des Insectes Aptères, IV, p. 422.  
 1875. *ATTUS mystaceus* Hentz. Coll. of Arachnological Writings, ed. by Burgess, p. 58.

♀ Total length 11.6 mm. Width of abdomen 4 mm.

Cephalothorax: length 5.2; width 3.8; height 2.

Legs 9.6, 8.5, 8, 10.6; patella and tibia of the first 4; patella and tibia of the third, 3; patella and tibia of the fourth, 3.9; metatarsus and tarsus of the fourth, 3.4.

Lateral separated from middle eyes by  $\frac{2}{3}$  their own diameter. Clypeus  $\frac{1}{2}$  as high as large middle eyes. Maxillæ widened and rounded at tip, nearly parallel. Labium  $\frac{1}{2}$  as long as maxillæ, about twice as long as wide, contracted toward tip. Sternum widest in the middle. Anterior coxæ separated by scarcely the width of the labium. Relative length of legs 4, 1, 2, 3.

*Coloration*: Cephalothorax black, covered with heavy gray hairs, and two tufts of black hairs on each side of the eye region. Abdomen covered with gray hairs with two pairs of white spots on the anterior part of the dorsum; when somewhat rubbed a blackish, scalloped band ap-

pears which occupies the central region. Clypeus covered with white hairs; palpi, legs, sternum, and venter with gray hairs; falces iridescent green; mouth parts reddish brown.

*Habitat:* Eastern United States.

PHIDIPPUS CARDINALIS HENTZ.

Plate II, figure 4.

*Syn.*: 1844. *ATTUS cardinalis* Hentz, Journal Boston Soc. Nat. Hist., p. 386.

1875. *ATTUS cardinalis* id., Coll. of Arachn. Writ. ed. by Burgess, Boston, p. 51.

1883. *ATTUS cardinalis* Peckham, Descr. new or little known Attidæ, p. 31.

♂. Total length 9.5 mm. Width of abdomen 3 mm.

Cephalothorax: length 4.1; width 4; height 2.8.

Legs 11.1, 8.2, 8.2, 10.7; patella and tibia of the first 4.5; patella and tibia of the third, 3; patella and tibia of the fourth, 3.6; metatarsus and tarsus of the fourth, 3.3.

Lateral separated from middle eyes by  $\frac{1}{2}$  their own diameter; four anterior eyes looking downward. Clypeus  $\frac{1}{3}$  as high as middle eyes. Maxillæ enlarged and blunt at extremity with a projection at the outer corner, and parallel. Labium  $\frac{1}{2}$  as long as maxillæ, a little longer than wide, blunt and slightly contracted at tip. Sternum, widest in middle,  $\frac{1}{2}$  longer than wide. Anterior coxæ separated by scarcely the width of the labium.

*Coloration:* Cephalothorax, abdomen, and venter entirely covered with brilliant red hairs; there are four indented dots on the anterior part of the abdomen, and sometimes two longitudinal black bands each with two red dots, extending from the middle of the dorsum to the spinnerets, and converging a little behind.

*Habitat:* Southern United States.

PHIDIPPUS MINIATUS PECKHAM.

Plate I, figures 6, 6a.

*Syn.*: 1883. *ATTUS miniatus* P., Descr. new or little known Attidæ of U. S., p. 15.

♀. Total length 13 mm. Width of abdomen 5 mm.

Cephalothorax: length 5.9; width 5; height 3.8.

Legs 13.5, 10.7, 10.7, 13.7; patella and tibia of the first, 5.5; patella and tibia of the third, 3.8; patella and tibia of the fourth, 5.1; metatarsus and tarsus of the fourth, 4.

Large ♀. Total length 18 mm.



Anterior row of eyes very little curved; lateral  $\frac{1}{2}$  as large as middle eyes separated from them by  $\frac{2}{3}$  their own diameter; dorsal a little smaller than lateral eyes, a little further from each other than from lateral borders. Clypeus about  $\frac{1}{2}$  as high as middle eyes. Maxillæ enlarged and rounded at extremity, diverging. Labium a little more than  $\frac{1}{2}$  as long as maxillæ, contracted and truncated at tip. Sternum not so wide as anterior coxæ. Anterior coxæ separated by width of labium. Relative length of legs 4, 1, 2, 3; no patellary spines.

*Coloration:* The cephalothorax has the eye-region covered with short, bright red hairs, intermixed with long black hairs, the latter forming small tufts between the small median and dorsal eyes; the thoracic part and sides are covered with coarse yellowish white hairs; the narrow lower margin is black. The abdomen has a wide band of gray hairs around the base, and is otherwise covered with short bright red, and long whitish hairs; at about the middle of the dorsum is a large somewhat triangular spot, and behind this are two others, not so large and transversely elongated, all of the same bright red color, and encircled by black rings; the sides are covered with long gray hairs. In specimens which are kept in alcohol the color becomes faded, the red changing to whitish yellow. The clypeus and palpi are covered with long white hairs; the legs are blackish, excepting the metatarsi, which are reddish brown; they are covered with gray hairs; under the femur is a stout fringe of hairs which extends less heavily on to the patella and tibia; the falces are dark, but very iridescent; the mouth-parts, sternum, and coxæ are dark brown or black; the venter has a wide central, longitudinal band black, limited by the gray hairs which come low on the sides; just at the apex, between the black band and the black spinnerets, is a narrow, transverse band of gray hairs.

*Habitat:* Florida. Texas.

#### PHIDIPPUS OBSCURUS Nov. Sp.

Plate I, figure 5. Plate II, figure 5.

(♀) Total length 13 mm. Width of abdomen 5.4 mm.

Cephalothorax: length 4.8; width 4.1; height 2.4.

Legs 9.3, 7.5, 7.7, 10; patella and tibia of the first 4; patella and tibia of the third 2.8; patella and tibia of the fourth 3.9; metatarsus and tarsus of the fourth 3.4.

Lateral eyes  $\frac{1}{2}$  as large as middle eyes, and separated from them by  $\frac{2}{3}$  their own diameter. Clypeus  $\frac{1}{2}$  as high as middle eyes. Maxillæ wide at extremity with projection at outer corner. Labium  $\frac{1}{2}$  as long as maxillæ, contracted and rounded at tip. Falces rather narrower than is usual in this genus, extending, in width only to the inner

edges of the lateral eyes. Sternum oval, convex. Anterior coxæ separated by scarcely the width of the labium. Patellary spines on the second, third and fourth legs.

*Coloration:* Cephalothorax black, covered on the sides and above anterior row of eyes with white hairs, and having a transverse band of yellow hairs extending between the dorsal eyes. Abdomen with a dark brown band extending around the lower base and sides to apex; above this, at the base is a shorter curved pale band; central region of dorsum dark brown, changing toward the anterior portion to black, and marked, in this region with a pair of elongated white spots; behind these is a large white spot; behind this and near the apex is a pair of pale curved bands which take the form of a parenthesis, nearly meeting in the middle line. The dark central region of the dorsum surrounded excepting behind, by a pale region mottled with brown; opposite the large white spot on each side, is an oblique white band which extends downward through the encircling dark band. Legs and palpi brown, covered (especially the palpi) with white hairs. Venter pale, sternum, coxæ and mouthparts brown, all clothed with white hairs. Falces iridescent green.

The curved white bands on the posterior part of the dorsum sometimes meet anteriorly, extending a little forward to form a chevron.

*Habitat:* Texas.

PHIDIPPUS MCCOOKII PECKHAM.

Plate II, figure 9.

*Syn.:* 1883. *ATTUS McCookii* P., *Descr. new or little known Attidæ of U. S.*, p. 16.

♀. Total length 14.4 mm. Width of abdomen 6 mm.

Cephalothorax: length 4.9; width 4.2; height 2.5.

Legs 10.7, 8, 8.2, 11; patella and tibia of the first 4; patella and tibia of the third 2.7; patella and tibia of the fourth 4.3; metatarsus and tarsus of the fourth 3.

Lateral eyes of the first row one-half as large as middle eyes, and separated from them by more than one-half their own diameter. Dorsal eyes, a little further from each other than from the lateral borders. Clypeus one-third as wide as middle eyes. Maxillæ parallel, enlarged and rounded at extremity. Labium nearly two-thirds as long as maxillæ, widest in middle, rather pointed. Sternum convex, about twice as long as wide. Anterior coxæ separated by a little less than the width of the labium. Relative length of legs 4, 1, 2, 3.

*Coloration:* Cephalothorax dark rufus covered with tawny hair. Abdomen golden yellow with short hairs of the same color; there are four indented dots near the base, and posterior to these two indistinct dark

bands extend to the apex; the sides are creased (the abdomen is distended with eggs in the only specimen which we have of this species). Clypeus and palpus dark rufus with long white hairs. Falces, mouth-parts, sternum and legs dark rufus, the inner edges of maxillæ and tip of labium being pale, and the legs having blackish bars. Venter golden yellow with three iridescent dark bands.

*Habitat:* Pennsylvania.

PHIDIPPUS ARIZONENSIS PECKHAM.

Plate I, figure 10. Plate II, figure 10.

*Syn.*: 1883. *ATTUS arizonensis* P., Descr. new or little known Attidæ of U. S., p. 13.

♂. Total length 11 mm. Width of abdomen 3 mm.

Cephalothorax: length 4.9; width 4.2; height 2.

Legs 11.4, 9.9, 9.9, 10.3; patella and tibia of the first 4.9; patella and tibia of the third 3.6; patella and tibia of the fourth 4.1; metarsus and tarsus of the fourth 3.

Cephalic part with sides very widely rounded.

Ocular area about one-half wider than long, this being relatively wider than is usual in *Phidippus*. Anterior lateral one-half as wide as middle eyes, and separated from them by their own diameter. Clypeus two-thirds as high as middle eyes. Dorsal eyes nearly twice as far from each other as from lateral borders. Maxillæ parallel, enlarged at extremity, with the outer corner sharp; labium one-half as long as maxillæ, rounded. Sternum as wide as intermediate coxæ. Anterior coxæ much stouter and longer than the others, and separated by the width of the labium. There are sometimes patellary spines on the four pairs. Abdomen long and slender, with its posterior face truncated; spinnerets turned downward.

*Coloration:* Cephalothorax velvety black, with two wide, white, lateral bands beginning just before and below the dorsal eyes and almost meeting in the middle of the thorax behind the depression. There is a band of grayish brown hairs above the anterior eyes, and a tuft of black hairs near each small median eye. Abdomen light brown; behind the middle is a median, longitudinal velvety black band, the truncated face, and the spinnerets being also black; in the middle of the dorsum is a pair of indented dots, and a second pair, just in front of these, is very indistinct; at the apex are two white spots one on each side of the black band; on each upper side of the abdomen is a black line extending to the apex; the under sides have wide white bands, formed of hairs directed downwards, which extend beneath on to the venter. The venter is velvety black, darkest behind, the white bands marking it off into a long triangle. Cly-

peus covered with white hairs; sternum, coxæ and mouthparts black; falces black with some white hairs on the anterior surface; palpi and legs yellowish, excepting the femur I which is black above and pale beneath; third and fourth pairs darker than first and second, and showing some reddish rings on patella and tibia. All the legs have, on the under side, long, fine, yellow hair, which is strikingly long and thick on the first pair.

The abundance of fine yellowish hairs on the undersides of the first pair of legs, together with the great distance between the anterior lateral and large middle eyes distinguishes it from all other species of this genus.

*Habitat:* Arizona, Texas, California.

#### PHIDIPPUS ALBOMACULATUS KEYS.

(Plate I, figure 13. Plate II, figure 13.)

*Syn:* 1885. PHIDIPPUS *albomaculatus* Keyserling, Neue Spinnen aus Amerika, vi, Verhandlungen Zoologisch-botanischen gesellschaft, p. 5 (491).

♀. Total length 13.4 mm. Width of abdomen 5.3 mm.

Cephalothorax: length 6; width 4.3; height 3.2.

Legs 13.5, 10.7, 10.6, 14; patella and tibia of the first, 5.6; patella and tibia of the third, 4; patella and tibia of the fourth, 5.3; metatarsus and tarsus of the fourth, 4.5.

Anterior lateral eyes scarcely one-half as large as middle eyes, and separated from them by two-thirds of their own diameter; dorsal eyes equally distant from each other and the lateral borders. Clypeus one-third as high as middle eyes. Maxillæ parallel, enlarged and rounded at extremity; labium a little more than one-half as long as maxillæ, oval, or a little contracted at tip. Sternum long, narrow, pointed in front, very convex. Anterior coxæ separated by less than the width of the labium. Relative length of legs, 4, 1, 3, 2; no patellary spines.

*Coloration:* Cephalothorax dark brown, entirely covered with short white hairs, and having some long, black and white hairs on the eye-region. Abdomen with a large, dark central region, in which is a median, forked, white band, and two pairs of white dots, while the sides have a mottled appearance, being covered with mixed white and brown hairs; usually there may be distinguished two or three oblique white bands extending downward over the sides. The pattern on the dorsum is frequently indistinct owing to the rubbing off of hairs; frequently all that appears is two dark longitudinal bands, on each of which are three or four white dots. Clypeus with a thick fringe of white hairs; falces most brilliantly iridescent; mouth-parts blackish; sternum, coxæ, and venter brown, covered with short, white hairs; palpi and legs yellowish brown, all covered with thick, long, white hair.

*Habitat:* United States.

PHIDIPPUS OPIFEX McCOOK.

Plate II, figure 11.

*Syn.*: 1873. *ATTUS opifex* McCook, Proc. Acad. Nat. Sci. of Philadelphia, p. 276.

♀. Total length, 15 mm. Width of abdomen, 7 mm.

Cephalothorax: length, 6.3; width, 4.9; height, 3.5.

Legs 13.3, 11.1, 10.4, 14.2; patella and tibia of the first, 5.2; patella and tibia of the third, 3.8; patella and tibia, fourth, 5.2; metatarsus and tarsus of the fourth, 4.7.

Quadrangle of eyes two-thirds wider than long. Lateral anterior eyes more than one-half as large as middle eyes, separated from them by two-thirds their own diameter. Middle eyes plainly separated. Clypeus one-half as high as middle eyes. Falces wider than the two middle eyes, three times as long as face, inclined forward, divergent. Maxillæ parallel, enlarged and blunt at extremity, slanting within toward labium. Labium one-half as long as maxillæ. Sternum projecting but little between anterior coxæ. Anterior coxæ separated by width of labium.

*Coloration*: Cephalothorax dark reddish, covered with white hair, and having a black marginal line. Clypeus and face covered with long white hairs. Abdomen black, covered with gray hair, with four white dots on the anterior part of the dorsum. Falces black with white hairs at base. Mouth-parts brown. Sternum, coxæ and venter covered with white hairs. Palpi light reddish brown, with long white hairs. Legs banded with black and dark reddish brown, with some white hairs, especially below. The hairs on cephalothorax, abdomen and venter are scale-like.

*Habitat*: California.

PHIDIPPUS JOHNSONII PECKHAM.

Plate I, figure 14. Plate II, figures 14, 14a.

*Syn.*: *ATTUS johnsonii* P., Descr. new or little known Attidæ of U. S., p. 22.

♂. Total length 10 mm. Width of abdomen 3.2 mm.

Cephalothorax: length 5.1; width 3.3; height 2.1.

Legs 10.9, 8.6, 8.9, 10.9; patella and tibia of the first, 4.8; patella and tibia of the third, 3.2; patella and tibia of the fourth, 4; metatarsus and tarsus of the fourth, 3.3.

Lateral eyes of first row one-half as large as middle eyes, and separated from them by half their own diameter. Clypeus half as high as middle eyes. Maxillæ parallel, with sharp outer corners, and slanting within toward the labium. Labium a little longer than wide, more than one-

half as long as maxillæ, contracted and rounded at tip. Sternum oval, half longer than wide. Anterior coxæ separated by width of labium. No patellary spines.

♀. Total length 12.2 mm. Width of abdomen 3.9 mm.

Cephalothorax: length 4.3; width 2.8; height 2.1.

Legs 10.4, 8.4, 8.4, 11.1; patella and tibia of the first, 4.3; patella and tibia of the third, 3.6; patella and tibia of the fourth, 4.5; metatarsus and tarsus of the fourth, 3.5.

Clypeus one-third as high as middle eyes. Maxillæ rounded. Sternum relatively wider than in ♂. Anterior coxæ separated by less than the width of the labium.

*Coloration:* ♂. Cephalothorax jet black, sometimes with a few short bright red hairs (perhaps, in a fresh state, entirely covered with these). Abdomen bright vermilion red, sometimes with a white band at base; clypeus dark with a fringe of white hairs; palpus black; falces dark but iridescent; maxillæ and labium brown; sternum black with white hairs; venter dark brown with white hairs; legs dark rufus barred with black. ♀. Abdomen with a white band at base, and a wide central longitudinal black band, upon which are three pairs of white dots.

This species is nearest *cardinalis*; it is, however, not so high; its color is crimson rather than scarlet; and on the anterior inner edge of the falx is a sharp, rather long point, which in *cardinalis* is but little developed. The cephalothorax in *cardinalis* is covered with scarlet hairs, in *johnsonii* it is jet black. The latter also has on the palpi of the first pair of legs many white, rice-like scales or hairs.

*Habitat:* Washington Territory.

#### PHIDIPPUS OCTO-PUNCTATUS PECKHAM.

Plate II, figure 15.

*Syn.:* 1883. *P. octo-punctatus* Peckham, Descr. new or little known Attidæ of U. S., p. 6.

♂. Total length 8 mm. Width of abdomen 2.8 mm.

Cephalothorax: length 3.1; width 3; height 2.3.

Legs 8.4, 5.6, 5.9, 7.9; patella and tibia of the first, 3.2; patella and tibia of the third, 2; patella and tibia of the fourth, 2.9; metatarsus and tarsus of the fourth, 2.8.

Lateral anterior a little more than  $\frac{1}{2}$  as large as middle eyes, separated from them by  $\frac{1}{2}$  their own diameter. Clypeus  $\frac{2}{3}$  as high as middle eyes. Falces wider than first row of eyes, three times as long as face. Maxillæ short, truncated, with projection at outer corner, inclined toward labium. Labium  $\frac{1}{2}$  as long as maxillæ,  $\frac{1}{2}$  longer than wide, contracted and blunt at tip. Anterior coxæ separated by more than width of labium.

*Coloration:* Cephalothorax above, black covered with short white hairs, sides dark brown with some irregular whitish spots and sparse yellowish hairs, the lower margin being slightly darker; there are some long yellow hairs on the eye-region. Clypeus dark brown mottled with white, with a few yellowish hairs. Abdomen black covered with short white hairs and longer yellowish hairs; near the base is a short curved white line, posterior to which are two longitudinal rows of white spots, four spots in each row; these are divided into two anterior and two posterior pairs, the four posterior spots being obliquely elongated; on the posterior sides are two or three short oblique white lines. Falces, mouth-parts, sternum, coxæ and legs dark brown. Venter black with short yellowish hairs.

*Habitat:* Missouri.

PHIDIPPUS RAUTERBERGII Nov. Sp.

Plate I, figure 8. Plate II, figure 8.

♀. Total length 16 mm. Width of abdomen 7.3 mm.

Cephalothorax: length 6.2; width 5.8; height 3.8.

Legs 15.3, 11.3, 11.3, 15.2; patella and tibia of the first, 6.4; patella and tibia of the third, 4.4; patella and tibia of the fourth, 6; metatarsus and tarsus of the fourth, 5.1.

Cephalothorax nearly plane; ocular area much wider behind; anterior lateral one-half as large as middle eyes, and separated from them by a little more than one-half their own diameter; eyes of second row more than twice as far from dorsal as from lateral eyes; third row of eyes considerably narrower than the cephalothorax at that place; clypeus one-third as high as the middle eyes. Maxillæ wide, parallel, rounded. Labium one-half as long as maxillæ, but little longer than wide, blunt at tip. Sternum oval, convex in front, less than twice as long as wide, projecting but little between the anterior coxæ, which are separated by less than the width of the labium. Relative length of legs  $\overline{4}$ ,  $\overline{1}$ ,  $\overline{2}$ ,  $\overline{3}$ ; no patellary spines.

*Coloration:* Cephalothorax dark reddish brown, almost black in the eye-region, with some short white hairs on the sides and between the dorsal eyes. Abdomen mottled with brown and white, with two black spots on the anterior portion, and one large irregular black spot in the middle from which two black bands extend to the apex; in the middle of the black spot is a large white spot, and on the black bands, is a pair of smaller white spots; there are sometimes two white dots nearer the apex, and a white spot on the inner side of each of the black spots on the anterior part of the dorsum, while the space between the black bands is occupied by a series of white and brown chevrons. Clypeus brown; palpus brown with three white rings;

falces iridescent; mouth-parts, sternum, and coxæ reddish brown; venter with two white longitudinal bands enclosing a darker central region; legs black, barred with dark red, with short white hairs, and a heavy fringe of black hairs on the underside of the tibia of the first.

*Habitat*: Texas.

PHIDIPPUS MEXICANUS Nov. Sp.

Plate II, figure 7.

♂. Total length 11.4 mm. Width of abdomen 5 mm.

Cephalothorax: length 6.5; width 5; height 3.6.

Legs 16.3, 12.7, 11.2, 14.5; patella and tibia of the first, 6.7; patella and tibia of the third, 4; patella and tibia of the fourth, 5.3; metatarsus and tarsus of the fourth, 4.8.

Cephalothorax widely rounded. First row of eyes much curved; lateral separated from middle eyes by one-half their own diameter. Clypeus one-fourth as high as large middle eyes. Falces wider than first row of eyes, more than twice as long as face. Maxillæ long, widened and truncated at extremity, with projection at outer corner, cut obliquely on inner side, and excavated for labium. Labium less than half as long as maxillæ, contracted and blunt at tip. Sternum one-half longer than wide. Anterior coxæ separated by a little less than width of labium.

*Coloration*: Cephalothorax probably covered with snowy white hairs, excepting a dark brown band around the margin; in our specimen these hairs are largely rubbed off. Clypeus with white hairs. Abdomen black with a hairy white band at base, a large central white spot behind middle, and posterior to this an interrupted, curved, white band. Falces brilliant iridescent green. Palpi covered with white hairs. Legs very hairy; femoral and tibial joints with black, other joints with white hairs. Other parts all black.

From the collection of Count Keyserling.

*Habitat*: Mexico.

PHIDIPPUS INSOLENS HENTZ.

Plate I, figure 12. Plate II, figures 12, 12a.

- Syn.*: 1844. ATTUS *insolens* Hentz, Journal Bost. Soc. Nat. Hist., Vol. IV.  
 1845. " *podogrosus* id., *ibid.*, Vol. V.  
 1875. " *insolens* id., Coll. Arach. Writ. by N. M. Hentz. Ed. by Burgess, Boston, p. 51.  
 1875. " *podogrosus* id., *ibid.*, p. 61.  
 1877. PHIDIPPUS *coloradensis* Thorell, Descr. Araneæ coll. in Colorado, p. 523.



♂. Total length 9.5 mm. Width of abdomen 3 mm.  
 Cephalothorax: length 5; width 4; height 2.4.  
 Legs 14, 9, 8, 10.2; patella and tibia of the first, 6.3; patella and tibia of the third, 2.8; patella and tibia of the fourth, 3.2; metatarsus and tarsus of the fourth, 3.

Small ♂. Total length 6.8 mm.

♀. Total length 12mm. Width of abdomen 4.5.  
 Cephalothorax: length 4.8; width 4; height 2.5.  
 Legs 9.2, 7.8, 8, 10; patella and tibia of the first, 4.2; patella and tibia of the third, 3; patella and tibia of the fourth, 4; metatarsus and tarsus of the fourth, 3.3.

Anterior lateral separated from middle eyes by one-half their own diameter. Middle nearly twice as large as lateral eyes, and a little separated. Clypeus one-third as high as middle eyes. Maxillæ long inner margin oblique, ♂ with marked apophysis on outer corner, ♀ enlarged and blunt at extremity. Sternum nearly twice as long as wide. Anterior coxæ separated by less than the width of the labium.

*Coloration:* Cephalothorax covered with bright red hairs excepting the lower margin which has a white line above a black line; the ♀ has a tuft of black hairs on the outer side of each lateral eye. Clypeus with some long white hairs. Abdomen with a silvery white band at base behind which is a deep black band; the dorsum is of a bright red color, which is interrupted in the posterior two-thirds by a central, longitudinal, angular, black band which is contracted behind, upon which, in the posterior part, are two pairs of white dots; the sides are black with two curved white bands. Palpi ♂ black, conspicuously marked by a silvery white line along the upper surface. ♀ reddish with long white hairs. Falces brilliant iridescent green, those of the ♂ with a slight brownish tinge; fang black. Mouth-parts dark brown. Sternum and coxæ black with white hairs. Venter deep black with white hairs on the sides, and, in the center, a wide somewhat triangular band (narrowing behind), of a clear silvery white color. Legs banded with black and rufus. In the ♂ the first leg has fringes of black hairs; in the ♀ the same leg is covered with long white hairs.

The hairs in this species seem to rub off even more easily than is usual with the Attidæ. When they are gone the spider appears as in Hentz's drawing.

In general appearance *insolens* is much like *Philæus rimator*, but may be distinguished by the difference in the shape of the cephalothorax, and the position of the eyes.

*Habitat:* Georgia, Florida, Colorado.

PHIDIPPUS OTIOSUS HENTZ.

Plate I, figure 15. Plate II, figure 15 a.

*Syn.*: 1845. *ATTUS otiosus* Hentz, Journal Boston Soc. Nat. Hist., Vol V.  
1875. *ATTUS otiosus* id., Coll. Arachn. Writ. by N. M. Hentz. Ed.  
by Burgess, Boston, p. 59.

♀. Total length 11.5 mm. Width of abdomen 4 mm.

Cephalothorax: length 5; width 4; height 2.5.

Legs 9.6, 7.5, 8, 10; patella and tibia of the first 4; patella and tibia of the third, 3.4; patella and tibia of the fourth 4; metatarsus and tarsus of the fourth, 3.8.

Lateral eyes of first row one-half as large as middle eyes and separated from them by one-third their own diameter. Clypeus one-half as high as middle eyes. Maxillæ enlarged and rounded at extremity. Labium two-thirds as long as maxillæ. Falces nearly as wide as first row of eyes, as long as face, vertical, diverging. Sternum, very deepset, oval, projecting between the anterior coxæ which are separated by the width of the labium.

*Coloration*: A wide band of white hairs extends across the clypeus and on to the sides, under the eyes, nearly encircling the cephalothorax; above is a black band which occupies the cephalic part, but grows narrower on the thoracic, where the white band curves upward. On each side of the cephalothorax are two tufts of black hairs, one between the eye of the second row and the dorsal eye, and one just behind and below the anterior lateral eye. Abdomen black with a band of long white hairs at base, and several lines of white hairs on each side; on the anterior part of the dorsum are two white dots; on the middle part and nearer together, are two larger white spots; near the apex are two large curved spots of a light yellowish red color; these with the white spots, and the lines on the sides mark off a somewhat irregular black figure on the posterior part of the dorsum. Falces darkly iridescent with a fringe of white hairs at their insertion. Palpi and legs black with long white hairs. Mouth-parts, sternum, coxæ and venter black, the venter nearly encircled by white hairs which form wide white bands on the sides, and with two white spots in the middle.

This is a very hairy species, in this respect, and in its general coloring, resembling *P. galathea*.

*Habitat*: Georgia, Alabama.

PHILÆUS (THORELL).

Cephalothorax high and convex, contracted in front and behind, sides rounded, cephalic part inclined forward, thoracic part slanting, at first gradually, and then more steeply from dorsal eyes. Ocular area

at least one-third wider than long, wider behind than in front; anterior row of eyes more or less curved, the middle slightly separated, the lateral at least one-half as large, separated from the middle by from one-third to two-thirds their own diameter; eyes of second row very slightly nearer the lateral than the dorsal eyes; dorsal as large or nearly as large as the lateral eyes, at least as far from each other as from the lateral borders, forming a row narrower than the cephalothorax at that place. Clypeus not more than half as high as middle eyes. Labium about one-half as long as maxillæ, usually longer than wide, sometimes as wide as long. Anterior coxæ separated by width of labium or by a little less. Legs ( $\delta$ ) 1, 2, 4, 3. 1, 4, 2, 3. 1, 4, 3, 2; ( $\varphi$ ) 1, 4, 2, 3. 1, 4, 3, 2. 4, 1, 3, 2; first pair stoutest, second next. Femur and tibia of the first enlarged, stouter than patella and much stouter than metatarsus and tarsus; tibia and patella of the third shorter than tibia and patella of the fourth. Femoral, tibial and metatarsal spines on the four pairs; metatarsi of the fourth usually spined throughout their length.

This genus differs from *Phidippus* in having the eyes of the second row nearly half way between the lateral and dorsal eyes; the width of the ocular area, moreover, is frequently greater in proportion to its length.

PHILÆUS FARNEUS Nov. Sp.

Plate II, figure 16.

$\varphi$ . Total length 9.2 mm. Width of abdomen 3.2 mm.

Cephalothorax: length 4; width 3.4; height 2.1.

Legs 8.4, 6.6, 7.2, 9.2; patella and tibia of the first, 3.6; patella and tibia of the third, 2.8; patella and tibia of the fourth, 3.6; metatarsus and tarsus of the fourth, 3.1.

Cephalic part plane, and but little inclined; thoracic convex, falling abruptly a little way behind dorsal eyes. Ocular area one-third wider than long, much wider behind than in front. Anterior eyes small, in a moderately curved row; lateral one-half as large as middle eyes, separated from them by two-thirds their own diameter; dorsal a little smaller than lateral eyes, further from each other than from lateral borders. Clypeus one-third as high as middle eyes, vertical; falces as wide as first row of eyes, twice as long as face, vertical, diverging. Maxillæ parallel, enlarged and rounded at extremity. Labium a little more than one-half as long as maxillæ, about twice as long as wide, contracted and blunt at tip. Sternum twice as long as wide, deepset, a little rounded behind. Anterior coxæ separated by less than width of labium.

*Coloration*: Cephalothorax black with long stiff black hairs on the eye-region, which form one or two small tufts on each side. Clypeus covered with short white hairs. Abdomen black, encircled except at

apex by a scalloped white band; on the middle of the dorsum is a large triangular white spot, in front of, and behind which are two white dots; near the apex, extending upward from the encircling band, are two short oblique white bars. Palpi reddish with long white hairs. Falces iridescent purple. Mouth-parts, sternum and coxæ dark brown. Venter black in the middle with a whitish longitudinal band on each side. Legs dark brown with long black and gray hairs.

*Habitat:* Texas.

PHILÆUS FARTILIS Nov. Sp.

Plate II, figure 17.

♀. Total length 10 mm. Width of abdomen 4 mm.

Cephalothorax: length 4.4; width 3.8; height 2.4.

Legs 9, 7.2, 7.3, 9.5; patella and tibia of the first, 4; patella and tibia of the third, 2.8; patella and tibia of the fourth, 3.6; metatarsus and tarsus of the fourth, 3.3.

Ocular area one-third wider than long; anterior eyes small, in a slightly curved row; middle eyes more than twice as large as lateral eyes, separated from them by one-half the diameter of the lateral; dorsal as large as lateral eyes, further from each other than from lateral borders. Clypeus one-third as high as middle eyes, vertical. Falces as wide as first row of eyes, more than twice as long as face, vertical, slightly diverging. Maxillæ divergent, enlarged and rounded at extremity, excavated on inner side for labium. Labium a little more than one-half maxillæ, one-half longer than wide, a little contracted and truncated at tip. Sternum one-half longer than wide, rather deep set. Anterior coxæ separated by less than width of labium. Legs 1, 4, 2, 3; metatarsi of the third and fourth with only terminal circles of spines.

*Coloration:* Cephalothorax and clypeus covered with long white hairs, the former with a black marginal line. Abdomen gray except the posterior part which is blackish; the base and anterior sides are white; there is a large irregular reddish spot on each side, and on the dorsum are indistinctly marked three pairs of white spots. Near the apex on each lower side is a wide white band, and on the upper surface is a white parenthesis, the black region enclosed having a pair of white dots. Falces black, the upper part being covered with long white hairs. Mouth parts, sternum and coxæ, black. Venter white with a wide, central, longitudinal black band. Legs and palpi dark brown covered with long white hairs.

*Habitat:* Mexico.

## PHILÆUS MEXICANUS Nov. Sp.

Plate I, figure 18. Plate II, figure 18.

♀. Total length 10 mm. Width of abdomen 3.1 mm.

Cephalothorax: length 4; width 3.2; height 2.

Legs 8.3, 6.4, 6.4, 7.8; patella and tibia of the first, 3.4; patella and tibia of the third, 2.8; patella and tibia of the fourth, 3.2; metatarsus and tarsus of the fourth, 2.4.

Ocular area occupying nearly two-fifths of cephalothorax, one-third wider than long; anterior row of eyes very little curved; lateral one-half as large as middle eyes, separated from them by one-half their own diameter; middle eyes sub-touching; dorsal as large as lateral eyes, equally distant from each other and the lateral borders. Clypeus a little inclined, one-fifth as high as the middle eyes. Falces stout and rather long, inclined forward, and somewhat diverging. Maxillæ parallel, enlarged and rounded at extremity; labium two-thirds as long as the maxillæ, pointed. Sternum convex, nearly as wide as long, truncated in front. Anterior coxæ separated by scarcely the width of the labium, much the stoutest and longest. First legs much the stoutest.

*Coloration:* Cephalothorax dark brown in the thoracic region, and blackish on the cephalic plate; the lower margin has a fine black line between two fine white lines; there is a wider band of white hairs which passes around the face and extends on the sides, below the second and third rows of eyes, to the posterior margin. Dorsum of the abdomen bronze brown; a little behind the middle are four white dots, two on each side. Around the base is a wide white band; on each side, opposite the dots, is a large white spot; on each side, near the apex, is a short, wide, ribbon-like white band, extending from below on to the dorsum, and bifurcating at the end; this makes a diamond-shaped figure of the bronze color, which connects a small bronze-colored region at the apex with the larger region of the same color on the anterior part of the dorsum. First and second pairs of legs darkest in color; all the legs brown, banded with blackish; tibia of the first leg black with a fringe of black hairs below. Clypeus covered with gray hairs. Falces dark brown. Mouthparts, coxæ, sternum, and venter, brown, thinly covered with gray hairs.

*Habitat:* Mexico.

## PHILÆUS MILITARIS HENTZ.

Plate I, figures 19, 19a. Plate II, figures 19, 19a.

*Syn.:* 1844. *ATTUS militaris* H., Journal Bost. Soc. Nat. Hist., Vol. IV.1846. *ERIS aurigera* (♂) C. K., Die Arachn., XIII, p. 189.? 1846. *PHIDIPPUS asinarius* id., *ibid.*, XIII, p. 139.1875. *ATTUS militaris* H., Coll. Arachn. Writ. by N. M. Hentz, ed. by Burgess, Boston, p. 62.

♂. Total length 6 mm. Width of abdomen 1.9 mm.

Cephalothorax: length 2.1; width 1.9; height 1.8.

Legs 7.5, 3.8, 3.9, 4.6; patella and tibia of the first, 3.2; patella and tibia of the third, 2.1; patella and tibia of the fourth, 2.1; metatarsus and tarsus of the fourth, 2.1.

Falces 1.6.

Ocular area one-third wider than long; anterior eyes small, lateral more than one-half as large as middle eyes, and separated from them by one-half their own diameter; dorsal a little smaller than lateral eyes, and further from each other than from the lateral borders. Clypeus one-fourth as high as middle eyes. Falces nearly as wide as the first row of eyes, long, inclined forward, and diverging, fang long. Maxillæ narrow at base, wider at extremity, long, truncated, slanting on the inner edge, and excavated for labium; labium less than one-half as long as maxillæ, longer than wide, a little contracted and rounded at the extremity. Sternum nearly twice as long as wide, truncated in front and rounded behind. Anterior coxæ separated by scarcely the width of the labium.

♀. Total length 9.4 mm. Width of abdomen 4.1 mm.

Cephalothorax: length 3.2; width 2.4; height 1.6.

Legs 5.9, 4.7, 4.7, 5.7; patella and tibia of the first, 2.1; patella and tibia of the third, 1.8; patella and tibia of the fourth, 1.9; metatarsus and tarsus of the fourth, 1.9.

Falces parallel and vertical, shorter and less robust than in ♂; fang short.

Maxillæ enlarged and rounded at extremity; labium more than one-half as long as maxillæ, twice as long as wide.

*Coloration:* ♂. Cephalothorax and abdomen bright bronze brown, the former with a wide white band on each upper side, and a white spot in the middle of the eye region, the latter with a wide white band around the base and sides, and sometimes two rows of white dots on the dorsum; clypeus, falces, palpi, mouthparts and sternum dark brown; venter brown, covered with short white hairs; legs brown, with femur of the first very dark, and proximal parts of the femora of the second, third and fourth, and all the coxæ, light yellowish.

♀. Cephalothorax bronze, nearly covered with gray hairs, the abdomen with a whitish band down the middle, and four pairs of more or less elongated white spots; the lower sides are nearly white; clypeus covered with long white hairs; falces, mouthparts and sternum brown; venter brown with short white hairs and a darker central region; legs and palpi light brown, with white hairs.

*Habitat:* United States, Mexico.

## PHILAEUS CHRYSIS WALCK.

Plate I, figure 20. Plate II, figure 20. Plate III, figure 20a.

- Syn.*: 1837. *ATTUS chrysis* ( $\delta$ ) Walck., Hist. Nat. des Insectes Aptères, I, p. 454.  
 1837. " *iris* ( $\varphi$ ) Walck., id., ibid., p. 455.  
 1846. *PLEXIPPUS aurecalceus*, C. K., Die Arachniden, XIII, p. 113.  
 1847. *ATTUS chrysis* Walck., Hist. Nat. des Insectes Aptères, IV, p. 422.  
 1847. " *iris*, id., ibid., p. 423.

$\delta$ . Total length 9 mm. Width of abdomen 2.8 mm.

Cephalothorax: length 3.9; width 3.5; height 2.8.

Legs 13.7, 9.5, 9.4, 10.9; patella and tibia of the first, 5.7; patella and tibia of the third, 3.4; patella and tibia of the fourth, 4.4; metatarsus and tarsus of the fourth, 3.2.

Falces 3 mm.

Ocular area one-third wider than long; anterior row of eyes very little curved; lateral rather more than one-half as large as middle eyes, and separated from them by one-half their own diameter; dorsal smaller than lateral eyes, and equally distant from each other and the lateral borders. Clypeus one-fourth as high as middle eyes. Falces compressed, as wide as the middle eyes, two and one-half times as long as the face, inclined forward, and diverging; the fang is two-thirds as long as the falx. Maxillæ parallel, long, truncated, with a projection at the outer corner; labium blunt, one-half longer than wide, and one-half as long as the maxillæ. Sternum truncated in front, rounded behind, one-fourth longer than wide. Anterior coxæ separated by width of labium. Relative length of legs 1, 4, 2, 3.

$\varphi$ . Total length 10.9 mm. Width of abdomen 4.2 mm.

Cephalothorax: length 4.2; width 3.8; height 2.1.

Legs 9.2, 7.9, 8.1, 9.4; patella and tibia of the first, 4.1; patella and tibia of the third, 2.8; patella and tibia of the fourth, 3.5; metatarsus and tarsus of the fourth, 3.

Falces 1.9 mm.

Falces vertical, parallel, and not so long as in  $\delta$ ; maxillæ rounded; labium more than one-half as long as maxillæ; anterior coxæ separated by more than the width of the labium. Relative length of legs 4, 1, 3, 2.

*Coloration*: As well as it can be distinguished from our badly rubbed specimens, the coloration is as follows:  $\delta$ , cephalothorax black; abdomen black, encircled, excepting at the apex, by a white band, and with two pairs of white spots, or rather of short transverse white lines, on the posterior part of the dorsum; the under side of the body, and the legs, black, or very dark brown.  $\varphi$ , cephalothorax black; abdomen covered with golden scales, with a white band around the

anterior margin which extends on to the sides, a short oblique white line on each side at the termination of this band, and posterior to these lines, on each side a semi-circular band, white; the dorsum has, on the anterior part, four indented dots, and on the posterior part, opposite the oblique lines one pair of short transverse white lines like those of the ♂; the mouthparts and falces are black, the sternum and coxæ dark brown; the venter is brown with a central longitudinal white band; the legs are light brown excepting the femoral, patellary, and tibial joints of the first pair, which are black.

*Habitat:* Mexico, Guatemala. (South Carolina, Georgia, Walckenaer.)

#### PHILÆUS PRINCEPS PECKHAM.

Plate III, figure 21.

*Syn.*: 1883. *ATTUS princeps* P., Descr. new or little known Attidæ of U. S., p. 18.

♀. Total length 8.1 mm. Width of abdomen 3 mm.

Cephalothorax: length, 3.9; width, 3.2; height, 2.

Legs 7.1, 5.9, 6, 7.5; patella and tibia of the first, 3.4; patella and tibia of the third, 2; patella and tibia of the fourth, 2.6; metatarsus and tarsus of the fourth, 2.4.

Ocular area nearly twice as wide as long, and much wider behind; anterior row a little curved, the eyes composing it being unusually small, the lateral about one-half as large as the middle, and separated from them by nearly two-thirds their own diameter; dorsal almost as large as lateral eyes, and further from each other than from the lateral borders. Clypeus, one-third as high as middle eyes. Falces as wide as the first row of eyes, nearly twice as long as the face, vertical, slightly diverging. Maxillæ parallel, enlarged and blunt at extremity, slanting on the inner edge to the labium; labium less than one-half as long as maxillæ, as wide as long, a little contracted and truncated at tip. Sternum deep set, small, one-half longer than wide, widest in the middle. Anterior coxæ separated by less than the width of the labium. Relative length of legs, 4, 1, 3, 2.

*Coloration:* ♀. Cephalothorax dark rufus, covered with short yellowish white hairs, and having some long black hairs on the eye region; abdomen covered with coarse tawny and gray hairs, with a whitish band at base, and two gray spots, one on either side of the middle point of the dorsum. Clypeus with thick white hairs; falces darkly iridescent; mouthparts brown; maxillæ tipped with white; sternum black; venter with grayish yellow hairs; legs, palpi, and spinnerets bright reddish brown, the legs and palpi with white hairs.

*Habitat:* Pennsylvania.



## PHILÆUS RIMATOR WALCK.

Plate I, figure 22.

- Syn.*: 1837. ? *ATTUS rimator* Walck., Hist. Nat. des Insectes Aptères, I, p. 446.  
 1846. *PHIDIPPUS auctus* C. K., Die Arachniden, XIII, p. 148.  
 1847. *ATTUS rimator* Walck., His. Nat. des Insectes Aptères, IV, p. 422.  
 1883. “ *formosus* Peckham, Descr. new or little known Attidæ, of U. S., p. 23.

♀. Total length 8.4 mm. Width of abdomen 2.9 mm.

Cephalothorax: length 4; width 2.9; height 2.

Legs 7, 5.2, 4.9, 7.5; patella and tibia of the first, 3; patella and tibia of the third, 1.7; patella and tibia of the fourth, 2.7; metatarsus and tarsus of the fourth, 2.

Ocular area one-third wider than long; anterior row of eyes slightly curved; lateral rather more than one-half as large as middle eyes, and separated from them by two-thirds their own diameter; eyes of this row unusually small; eyes of second row very minute; dorsal eyes a little smaller than the lateral, and placed further from each other than from the lateral borders. Clypeus one-half as high as middle eyes. Falces as wide as the first row of eyes, once and one-half as long as the face, vertical and a little divergent. Maxillæ parallel, enlarged and blunt at extremity, cut a little on the inner edge; labium one-half as long as maxillæ, twice as long as wide, contracted and rounded at tip. Sternum deepset, oblong, narrow in front, one-half longer than wide. Anterior coxæ separated by scarcely the width of the labium.

*Coloration*: ♀. Cephalothorax and abdomen covered with bright red hairs, the abdomen with a white band around the base, and a wide, central, longitudinal, black band which begins in front of the middle of the dorsum and extends around the lower, posterior sides; upon this band are three pairs of white dots. Clypeus and palpi covered with red hairs; falces brilliant green; mouthparts, sternum and coxæ varying from brown to black; venter black; legs brownish with some red hairs.

*Habitat*: Pennsylvania, Florida, Iowa.

## PLEXIPPUS PUERPERUS HENTZ.

Plate I, figures 23, 23a. Plate II, figure 23a. Plate III, figure 23b.

- Syn.*: 1845. *ATTUS puerperus* Hentz, Journal Boston Soc. Nat. Hist., Vol. V.  
 1845. " *sylvanus* id., *ibid.*, Vol. V.  
 1846. *ALCMEHA pallida* C. K., Die Arachn., XIII, p. 179.  
 1874. *ATTUS branickii* Tacz., Les Araneides de la Guyane française, Horæ Soc. Entomol. Ross. T., VIII, p. 94.  
 1875. *ATTUS puerperus* Hentz, Coll. Arachn. Writ. Ed. by Burgess, p. 64.  
 1879. *MARFISSA branickii* Tacz., Les Aranéides du Pérou. Bull. Soc. Imp. des Nat. de Moscou. T. LIII, p. 227.  
 1883. *ATTUS agrestis* Peckham, Descr. new or little know Attidæ of U. S., p. 12.  
 1885. *PLEXIPPUS puerperus* id., Proc. Nat. Hist. Soc. of Wisconsin, p. 68.

As Dr. Taczanowski has kindly sent us specimens of his *Attus branickii* we have been able to compare them with *puerperus* Hentz. They are undoubtedly identical. We have the same spider in our own collection, from Central America.

♂. Total length<sup>1</sup> 11 mm. Width of abdomen 2.4 mm.

Cephalothorax: length 4; width 2.4; height 2.8.

Legs 12.3, 10.3, 10.5, 10.8; patella and tibia of the first 5.4; patella and tibia of the third 3.9; patella and tibia of the fourth, 3.8; metatarsus and tarsus of the fourth, 3.9.

♀. Total length 13.6 mm. Width of abdomen 4.7 mm.

Cephalothorax: length 4.8; width 4.2; height 2.8.

Legs 10.6, 9.1, 10.4, 11.7; patella and tibia of the first, 4.8; patella and tibia of the third, 3.9; patella and tibia of the fourth, 4.1; metatarsus and tarsus of the fourth, 4.3.

Cephalothorax high, rounded on the sides and widest behind the dorsal eyes. The cephalic part occupies two-fifths of the cephalothorax; it is nearly plane and slightly inclined. The thoracic part is somewhat rounded but falls steeply from the dorsal eyes. The ocular area is one-fourth wider than long and is a little wider behind than in front. The anterior row is moderately curved: the middle eyes are sub-touching and are scarcely twice as large as the lateral eyes, the lateral being separated from the middle by one-third their own diameter. The eyes of the second row are placed not quite as far from the dorsal as from the lateral eyes. The dorsal eyes are a little smaller than the lateral eyes and are placed by more than their own diameter in-

<sup>1</sup> The size of the male is very variable, ranging from 5.6 mm., total length, to 11 mm.

side the margin: they are further from each other than from the lateral borders. The clypeus is one-third as high as the large middle eyes. The falces are stout, being a little wider than the first row of eyes, and are flattened in front; they are nearly twice as long as the face, parallel and vertical. The fang is short. The maxillæ are long and parallel, enlarged and slightly rounded at the extremity. The labium is but little longer than wide, a little more than one-half the maxillæ, contracted and rounded at the tip. Sternum one and one-half times as long as wide, truncated in front and rounded behind. It projects between the anterior coxæ which are separated by the width of the labium. Legs, relative stoutness, first, second, third, fourth, the fourth being plainly more slender than the third. There are femoral, patellary, tibial and metatarsal spines on the four pairs, those on the tibiæ and metatarsi of the third and fourth being found both above and below, and those on the metatarsi extending to the base. The ♀ has no patellary spines on the first and second pairs.

*Coloration:* (♂.) The cephalothorax varies from reddish brown to black and has on the dorsum a central spot of white, two white lines on each side near the posterior border, running upward from the lower margin, and just behind and below each dorsal eye two short parallel white lines; the abdomen varies from light testaceous to dark brown and has on the dorsum two longitudinal white bands; on each side of the bands are some scattered black dots. The legs and falces are dark brown; the clypeus is dark brown above with a pale band just over the falces; on the upper portion two lines of white hairs beginning between the middle eyes run obliquely outward to the insertion of the palpi; the palpus is brown, with a white line above, meeting that on the clypeus. The sternum, coxæ and mouthparts vary from light testaceous to dark brown; the venter is brown with a longitudinal white line on each side. (♀) The cephalothorax is yellow, darkest in the eye region, the eyes are jet black, the small middle eye is on a black spot, thus offering a striking contrast to the light yellow of the cephalothorax; there is a brown spot just above the anterior middle eyes; the abdomen is light yellow with three longitudinal white bands, the middle band often less distinct, and many black dots. The legs, palpi, falces and clypeus are yellow, the sternum, coxæ and venter pale brown, the venter having a line of white hairs on each side.

*Habitat:* California, Florida, Texas, Georgia (Gentry collection), Mexico, Guatemala, New Grenada (in collection of Count Keyserling), Brazil.

## PLEXIPPUS PUTNAMII PECKHAM.

Plate III, figure 24.

*Syn.*: 1883. *ATTUS putnamii* P., Descriptions of new or little known Attidæ, p. 1.

♂. Total length 9 mm. Width of abdomen 2.6 mm.

Cephalothorax: length 4.5; width 3.3; height 2.3.

Cephalothorax high, convex, widest just behind dorsal eyes; cephalic a little shorter than thoracic part; rounded on the sides and slanting abruptly behind. Ocular area nearly twice as wide as long; wider behind than in front; anterior row of eyes a little curved; lateral  $\frac{1}{2}$  as large as middle eyes, and separated from them by  $\frac{2}{3}$  their own diameter, while the middle eyes are slightly separated from each other; eyes of the second row a very little nearer the lateral than the dorsal eyes; dorsal nearly as large as lateral eyes, further from each other than from the lateral borders, forming a row which is a little narrower than the cephalothorax at that place. Clypeus  $\frac{1}{2}$  as high as middle eyes. Falces extending in width to inner edges of lateral eyes, square,  $1\frac{1}{2}$  times as long as the face, vertical, parallel; fang small. Maxillæ parallel, truncated at tip, cut obliquely on the inner edges; labium  $\frac{1}{2}$  as long as maxillæ, as wide as long, pointed. Sternum very deep-set, oval, projecting between the anterior coxæ, which are separated by less than the width of the labium. Relative length of legs 4, 3, 1, 2; first and second pairs stoutest. Femur of the first rather short, narrow at the ends, and much enlarged below, in the middle. All the legs have femoral, tibial and metatarsal spines, and there are patellary spines on the third and fourth; metatarsi of the fourth spined throughout their length.

*Coloration*: Cephalothorax reddish brown; there is a large white spot just behind the dorsal eyes, and a short white band on each side of the eye-region extending from the smaller median to the dorsal eyes; just back of the small median eye is a tuft of black hairs; there are thick, light brownish hairs above the anterior row of eyes. Abdomen light reddish brown, encircled by a white band; near the apex two short, transverse, parallel, white bars, on each side, extend from the encircling band toward the middle of the abdomen; at about the middle point of the dorsum is a large white spot, and near the base are two small, indistinct, white spots formed by a few white hairs. Clypeus covered with short red and long white hairs. Palpus brownish, with black and white hairs. Mouthparts, sternum and coxæ dark brown, sternum and coxæ covered with white hairs. Venter covered with whitish hairs, with a central, longitudinal, darker band. Legs brownish red with many long white hairs.

*Habitat*: Iowa.

## DENDRYPHANTES CAPITATUS HENTZ.

Plate I, figures 25, 25a. Plate III, figure 25a.

- Syn.*: 1844. *ATTUS capitatus* H., Journal Bost. Soc. Nat. Hist., Vol. IV.  
 1845. *ATTUS parvus* (♀) id., ibid., Vol. V.  
 1875. *ATTUS parvus* (♀) id., Coll. Arachn. Writ. by N. M. Hentz.  
 Ed. by Burgess, Boston, p. 62.  
 1875. *ATTUS capitatus* id., ibid., p. 51.  
 1883. *ATTUS æstivalis* Peckham, Descr. new or little known Attidæ  
 of U. S., p. 2.

♂. Total length 4.8 mm. Width of abdomen 1.4 mm.

Cephalothorax: length 2.1; width 1.5; height 1.2.

Legs 4.1, 3, 2.6, 3.9; patella and tibia of the first, 1.9; patella and tibia of the third, 9; patella and tibia of the fourth, 1.7; metatarsus and tarsus of the fourth, 9.

Cephalothorax high, convex, slightly dilated behind dorsal eyes; cephalic part inclined, but little shorter than thoracic. Ocular area one-third wider than long, a little wider behind than in front; first row of eyes a little curved; lateral a little less than one-half as large as middle eyes, and slightly separated from them; middle eyes sub-touching; eyes of second row a very little nearer lateral than dorsal eyes; dorsal eyes further from each other than from lateral borders. Clypeus one-third as high as middle eyes, retreating. Falces extending to inner edges of lateral eyes, flattened, once and a half as long as face, vertical, somewhat diverging; fang moderately long and stout. Maxillæ parallel, long, enlarged and rounded at extremity, with a projection at the outer corner; labium less than half as long as maxillæ, contracted and rounded at tip. Sternum oval, twice as long as wide, narrow at both ends. Anterior coxæ separated by a little more than the width of the labium; considerably longer than the others. Legs relatively long; first pair stoutest. Femoral, tibial and metatarsal spines on the four pairs; on the metatarsi of the fourth throughout their length.

♀. Total length 6.2 mm. Width of abdomen 2.3 mm.

Cephalothorax: length 2; width 1.5; height 8.

Legs 3.5, 2.8, 2.5, 4.3; patella and tibia of the first, 1.3; patella and tibia of the third, 9; patella and tibia of the fourth, 1.7; metatarsus and tarsus of the fourth, 9.

Middle anterior only twice as large as lateral eyes; lateral not so much separated from middle eyes as in ♂. Falces parallel, fang short and weak. Maxillæ parallel, without projection at outer corner; labium more than once and one-half as long as maxillæ. Anterior coxæ separated by scarcely the width of the labium and not so long as in ♂.

*Coloration*: ♂. Cephalothorax bronze brown with three longitudinal white bands on each side; the highest of these is much the widest and ex-

tends from the anterior lateral eye to the posterior border; the middle band has its origin on the upper surface of the caput and passing down between the middle and lateral eye of the first row curves backward and extends along the side of the cephalothorax through about half its length; the lowest of the bands is the narrowest; it begins opposite the origin of the palpus, and passes backward just above the lower border, terminating a little beyond the middle band. A wide vertical white band passes between the anterior middle eyes from the upper surface of the caput to the origin of the falces. Abdomen bronze brown, nearly encircled by a white band which extends around the base and sides and ends abruptly just above and in front of the spinnerets. Clypeus, falces, mouthparts and sternum brown; venter brown with three white bands, one on each side, and one connecting these at the apex.

- ♀. Cephalothorax brown with short white hairs. Abdomen very variable; sometimes pinkish with white bands at base and on the sides, and four pairs of white spots; sometimes brown with many pale spots and curved bands; sometimes brown with four pairs of black spots (resembling *E. octavus*); sometimes bronze with white hairs at base and on the sides, and two longitudinal black bands upon which are three or four pairs of white dots (resembling *P. militaris*). Clypeus white. Other parts varying between light and dark brown.

This species is much like *P. militaris*, but is easily distinguished from it by the difference in size, *P. militaris* being considerably larger. The male sometimes retains the markings of the female, these being proper to it in the immature stage. It was a male of this kind that we described as new under the name of *A. æstivalis*.

*Habitat*: United States, Mexico.

#### DENDRYPHANTES ELEGANS HENTZ.

Plate III, figures 26, 26a, 26b. Plate IV, figure 26c.

- Syn.*: 1845. *ATTUS elegans* H. (♀), Jour. Bost. Soc. Nat. Hist., Vol. V.  
 1845. “ *superciliosus* id. (♂), *ibid.*, Vol. V.  
 1848. *MAEVIA cristata* C. K. (♂), *Die Arachn.*, XIV, p. 70.  
 1875. *ATTUS elegans* H. (♀), *Coll. Arachn. Writ. by N. M. Hentz*,  
 Ed. by Burgess, Boston, p. 56.  
 1875. “ *superciliosus* id. (♂), *ibid.*, p. 68.  
 1883. “ *tibialis* Peckham (♂), *Descr. new or little known Attidæ of U. S.*, p. 11.

♂. Total length 4.3 mm. Width of abdomen 1.1 mm.

Cephalothorax: length 1.9; width 1.2; height .8.

Legs 5.4, 3.2, 3.2, 5; patella and tibia of the first, 2; patella and tibia of the third, 1.2; patella and tibia of the fourth, 1.9; metatarsus and tarsus of the fourth, 1.6.

♀. Total length 5.5 mm. Width of abdomen 2 mm.

Cephalothorax: length 2.1; width 1.2; height 1.

Legs 3.7, 3.1, 3.4, 4.3; patella and tibia of the first, 1.3; patella and tibia of the third, 1.1; patella and tibia of the fourth, 2; metatarsus and tarsus of the fourth, 1.6.

Cephalothorax moderately high, convex, dilated behind dorsal eyes; sides nearly vertical in cephalic, rounded in thoracic part; cephalic part inclined, especially in ♂; thoracic part slanting gradually for the first three-fifths of its length, then steeply. Ocular area occupying about two-fifths of cephalothorax, one-fourth wider than long, slightly wider behind than in front; first row of eyes on a ridge, curved (more in ♂ than in ♀); middle eyes sub-touching; lateral one-half as large as middle eyes, separated from them by one-half their own diameter; eyes of second row halfway between dorsal and lateral eyes; ♂ with two ridges of stout hairs oblique and converging, extending from eyes of second row to anterior middle eyes; dorsal as large as lateral eyes, further from each other than from lateral borders, forming a row as wide as the cephalothorax at that place. Clypeus vertical, scarcely one-fourth as high as the middle eyes. Falces (♂) extending to inner edges of lateral eyes, (♀) nearly as wide as first row, a little longer than face, parallel, vertical; fang weak; maxillæ parallel, enlarged and (♂) truncated, (♀) rounded at extremity; labium about one-half as long as maxillæ, as wide as long, rounded and much contracted at tip; sternum one and one-half times as long as wide, truncated in front, contracted and rounded behind; anterior coxæ separated (♂) by width of labium, (♀) by less; legs all fine and glabrous, first a little the stoutest; femur of the third long; very weak tibial and metatarsal (and in ♂ femoral) spines on the four pairs; on metatarsi of the third and fourth only in terminal circles.

*Coloration:* ♂. Cephalothorax black in eye region, reddish on sides and thoracic part, entirely covered with light green iridescent scales, excepting a narrow black line between two white lines around the margin; two whitish tufts of hairs above anterior eyes. Abdomen and venter covered with green iridescent scales. Clypeus iridescent; falces brown; sternum black with white hairs; mouthparts and coxæ brown; palpi and legs light brown, legs with a black longitudinal line above, first and second darker than third and fourth; tibia of the first black at distal end, with a strong black spine and a brush of black hairs. ♀. Cephalothorax dark, covered with iridescent scales, excepting marginal lines as in ♂. Abdomen dark and highly iridescent, with a whitish band around base and anterior sides. Clypeus iridescent; falces, palpi, mouthparts, sternum and coxæ as in ♂. Venter iridescent; legs pale with black lines as in ♂, excepting femur of the first which is dark.

*Habitat:* Middle, Eastern and Southern United States.

## DENDRYPHANTES FLAVUS Nov. Sp.

Plate I, figure 27. Plate III, figures 27, 27 a.

♀. Total length 6.2 mm. Width of abdomen 1.8 mm.

Cephalothorax: length 2.7; width 2; height 1.2.

Legs 4.6, 3.5, 3.8, 4; patella and tibia of the first, 2; patella and tibia of the third, 1.6; patella and tibia of the fourth, 1.6; metatarsus and tarsus of the fourth, 1.2.

Cephalothorax not high, convex, dilated at the dorsal eyes, with sides rounded more widely behind than in front; cephalic part inclined. Ocular area occupying a little more than one-third of cephalothorax, one-third wider than long, wider behind than in front; anterior eyes looking downward, in a slightly curved row; middle eyes sub-touching; lateral less than one-half as large as middle eyes, separated from them by one-half their own diameter; eyes of second row a little nearer the lateral than the dorsal eyes; dorsal as large as lateral eyes, further from each other than from lateral borders, forming a row as wide as the cephalothorax at that place. Clypeus only a line. Falces nearly as wide as first row of eyes, two and one-half times as long as face, a little inclined forward, parallel; fang short. Maxillæ parallel, one-half as long as falces, enlarged and rounded at extremity. Labium a little more than one-half as long as maxillæ, longer than wide, rounded. Sternum deep set, twice as long as wide, truncated in front, rounded behind. Anterior coxæ separated by width of labium; coxæ of the first and second much the stoutest. Legs of the first and second stoutest, with femoral joints compressed, and having a single row of spines above, and several at the extremity; there are femoral, tibial, metatarsal, and sometimes small patellary spines on all the legs; metatarsi of the fourth spined to the base.

*Coloration:* Cephalothorax covered with yellow hairs, with a transverse brown band at dorsal eyes, and, around the margin, a white line between two black lines. Clypeus covered with white hairs. Abdomen covered by yellow hairs which have a somewhat metallic lustre, and having two longitudinal black bands, on each of which are three white dots. Falces, mouthparts and sternum dark brown, with some white hairs. Coxæ light brown. Palpi covered with gray hairs. Legs brown with gray hairs, and tipped with black. Venter brown with gray hairs.

*Habitat:* New York.



## DENDRYPHANTES MULTICOLOR HENTZ.

Plate III, figures 28, 28a.

*Syn.*: 1844. *ATTUS multicolor* H., Jour. Bost. Soc. Nat. Hist., Vol. IV.  
 1875. " " id., Coll., Arachn. Writ. by N. M. Hentz.

Ed. by Burgess, Boston, p. 53.

♀. Total length 6.8 mm. Width of abdomen 2.4 mm.

Cephalothorax: length 3; width 2.5; height 1.5.

Legs 6.1, —, 4.9, 6.1; patella and tibia of the first, 2.7; patella and tibia of the third, 1.9; patella and tibia of the fourth, 2.2: metatarsus and tarsus of the fourth, 2.1.

Cephalothorax high, convex, a little dilated behind dorsal eyes, with sides rounded more widely behind than in front, cephalic part inclined; thoracic part falling slightly in the first half, and much more steeply in the second. Ocular area occupying nearly one-half the cephalothorax, one-third wider than long, wider behind than in front. First row of eyes on a ridge, slightly curved; middle eyes sub-touching; lateral one-half as large as middle eyes, separated from them by nearly one-half their diameter; second row a little nearer lateral than dorsal eyes; dorsal nearly as large as lateral eyes, further from each other than from lateral borders, forming a row a little narrower than the cephalothorax at that place. Clypeus one-fifth as high as middle eyes, vertical. Falces extending to inner edges of lateral eyes, twice as long as face, vertical, parallel; fang short. Maxillæ parallel, dilated and rounded at extremity. Labium one-half as long as maxillæ, a little longer than wide, contracted and rounded at tip. Sternum nearly twice as long as wide, a little more contracted behind than in front, narrowest in the middle. Anterior coxæ separated by nearly the width of the labium. Legs of the first stoutest, with femoral joints enlarged and compressed. Femoral, tibial and metatarsal spines on the four pairs; metatarsi of the fourth spined throughout their length.

*Coloration*: Our single specimen of this species being badly injured, we quote the following description from Hentz:

"Cephalothorax black, with a pale, irregular band each side of the disc; abdomen metallic green, with a band at base, and a diagonal spot each side, orange, and with eight small white spots; underneath obscure gray, with inflections of green on the pectus; feet rufous or pale, varied with piceous  $\overline{1. 4. 2. 3.}$  This species is related to *A. otiosus* and *mystaceus*, but distinct from both by the absence of the tufts of hair on the cephalothorax, and other characters. The palpi are pale yellow, and there is a black band more or less visible on each side of the abdomen."

*Habitat*: Pennsylvania, Alabama.

DENDRYPHANTES ALBO-IMMACULATUS PECKHAM.

Plate III, figure 29.

*Syn.*: 1833. *ATTUS albo-immaculatus* P., Descr. new or little known *Attidæ* of U. S., p. 5.

♀. Total length 5 mm. Width of abdomen 2 mm.

Cephalothorax: length 1.8; width 1.3; height .8.

Legs 3.2, 2.6, 2.4, 3.9; patella and tibia of the first, 1.1; patella and tibia of the third, 8; patella and tibia of the fourth, 1.4; metatarsus and tarsus of the fourth, 1.3.

Cephalothorax rather low, slightly convex, a very little dilated at dorsal eyes, sides almost vertical, posterior margin truncated; cephalic part slightly inclined; ocular area occupying two-fifths of cephalothorax, nearly one-third wider than long, wider behind than in front. Anterior eyes small, in a slightly curved row; middle eyes touching; lateral a little less than one-half as large as middle eyes, separated from them by one-half their own diameter; eyes of second row very small, slightly nearer the lateral than the dorsal eyes; dorsal a little larger than lateral eyes, further from each other than from lateral borders, forming a row as wide as the cephalothorax at that place. Clypeus vertical, one-third as high as middle eyes. Falces as wide as first row of eyes, twice as long as face, vertical, parallel; fang short. Maxillæ parallel, long, enlarged and rounded at extremity; labium one-fourth longer than wide, one-half as long as maxillæ, contracted and rounded at tip. Sternum twice as long as wide, contracted and truncated in front. Anterior coxæ separated by nearly the width of the labium. Femur, patella and tibia — especially tibia — of the first enlarged; femur with a row of short and strong black hairs near the middle of the lower border; patella with two circles of white hair separated by a hairless median part; the tibia has, on the upper border, a short ridge of strong black hairs, and on the lower border a longer ridge, the hairs below being as long as the articulation is thick; metatarsus and tarsus slender. Weak femoral, tibial and metatarsal spines on the four pairs, on the metatarsi of the third and fourth only in terminal circles.

*Coloration*: Cephalothorax and abdomen closely covered with short white hairs, with a few, scattered, long black hairs; clypeus, falces, palpi, sternum, coxæ and venter covered with white hairs; mouth-parts pale; first leg brown, excepting the tibia, which is black; other legs light brown with longitudinal lines of white hairs.

*Habitat*: Iowa, New York.

## DENDRYPHANTES FLAVIPEDES Nov. Sp.

Plate III, figure 29a.

♂. Total length 4.6 mm. Width of abdomen 2 mm.

Cephalothorax: length 2; width 1.4; height 1.

Legs 4, 3, 2, 8, 3, 4; patella and tibia of the first, 1.5; patella and tibia of the third, 1; patella and tibia of the fourth, 1.4; metatarsus and tarsus of the fourth, 1.

Cephalothorax moderately high, slightly convex; a little dilated behind dorsal eyes, with sides nearly vertical in front and rounded behind; cephalic part a little inclined forward; thoracic part falling a very little in the first half, then more steeply. Quadrangle of eyes occupying two-fifths of cephalothorax, one-quarter wider than long, a little wider behind than in front. First row of eyes bent; middle eyes sub-touching; lateral more than one-half as large as middle eyes, and separated from them by one-fourth their own diameter. Eyes of second row half way between lateral and dorsal eyes. Dorsal as large as lateral eyes, further from each other than from lateral borders, forming a row as wide as cephalothorax at that place. Clypeus vertical, one-third as high as middle eyes. Falces as wide as the two middle eyes, once and a half as long as face, vertical, parallel; fang weak. Maxillæ blunt, cut on inner margins toward labium. Labium a little longer than wide, less than one-half as long as maxillæ. Sternum oval, one-third longer than wide, projecting between anterior coxæ. Anterior coxæ separated by width of labium, stouter and longer than the others. Legs of the first pair much the stoutest and longest, with femoral joints compressed and enlarged. Femoral, tibial and metatarsal spines on the four pairs, only in terminal circles on metatarsi of the third and fourth.

*Coloration:* Cephalothorax dark brown, with the eyes on a black band, a black line around the lower margin, and some white hairs on the sides. Abdomen dark brown with six impressed dots on the anterior, and several darker chevrons on the posterior part. Legs light brown, tipped with black, and having a black line along the anterior faces of the femur, patella and tibia of the first and second. Palpi light brown, excepting the tarsus, which is black. Face, falces, mouth-parts and coxæ, light brown; sternum and venter a little darker.

*Habitat:* Canada.

ATTUS PALUSTRIS PECKHAM.

Plate I, figure 30. Plate III, figures 30, 30a.

*Syn.*: 1883. ATTUS *palustris* P., Descr. new or little known Attidæ of U. S., p. 25.

♂. Total length 5 mm. Width of abdomen 2 mm.

Cephalothorax: length 2.7; width 1.6; height 1.

Legs 4.6, 3.6, 3.4, 4.4; patella and tibia of the first, 1.9; patella and tibia of the third, .9; patella and tibia of the fourth, 1.7; metatarsus and tarsus of the fourth, 1.3.

♀. Total length 5.3 mm. Width of abdomen 2.4 mm.

Cephalothorax: length 2.1; width 1.8; height 1.2.

Legs 3, 2.7, 2.5, 4.2; patella and tibia of the first, 1.1; patella and tibia of the third, .9; patella and tibia of the fourth, 1.5; metatarsus and tarsus of the fourth, 1.4.

Cephalothorax moderately high, and convex, very slightly dilated behind dorsal eyes, with sides nearly vertical in front, rounded behind; cephalic part inclined; thoracic part falls gradually in the first half, then steeply. Ocular area occupying two-fifths of cephalothorax, nearly twice as wide as long, a little wider behind than in front. Anterior eyes on a ridge, in a straight row; middle eyes touching; lateral one-half as large as middle eyes, separated from them by one-half their own diameter; eyes of second row slightly nearer lateral than dorsal eyes; dorsal a little smaller than lateral eyes, further from each other than from lateral borders, forming a row as wide as cephalothorax at that place. Clypeus one-half as high as middle eyes, inclined backward. Falces extending to inner edges of lateral eyes, twice as long as face, flat, vertical, divergent; fang weak. Maxillæ parallel, short, enlarged and rounded at extremity. Labium a little more than one-half as long as maxillæ, as wide as long, (♀) rounded, (♂) more pointed. Sternum oval, not one-half longer than wide. Anterior coxæ separated by more than width of labium. Legs of the first pair a little stoutest; femoral, tibial and metatarsal spines on the four pairs; metatarsi of the fourth spined throughout their length.

*Coloration*: ♂. Cephalothorax dark brown, reddish toward eyes, nearly black behind; three white lines begin at the posterior end and run forward; the median line ends before reaching the anterior eyes; the lateral lines pass just outside the dorsal eyes and inside the small median eyes, and are connected by a transverse white line which crosses the eye region just above the anterior eyes; there is sometimes a less distinct white line behind the dorsal eyes, which, with the median longitudinal line, forms a white cross; the margin has a narrow line of white hairs which appear to be combed upward. Clypeus brown

except a white line just under the eyes, and a fringe of white hairs. Abdomen with a narrow central longitudinal brown band, on either side of which the dorsum is black; in the center of the dorsum are two transverse white bars or large spots, one on each side, in front of which are one or two dots on each side, while behind them, in the middle line are two indistinct light dots, one behind the other; just above the apex are two white bars corresponding to the middle bars but narrower; the lower sides are light brown or gray, and the base is sometimes whitish. Falces, mouthparts and coxæ dark brown. Sternum black. Venter gray with two longitudinal brown bands. Palpi and legs dark brown. ♀. Cephalothorax gray with a white cross behind dorsal eyes and a white band low on each side. Clypeus covered with white hairs. Abdomen gray at base, white at apex; near the base and close together are two large black spots, in the middle of each of which is a white dot; continuous with these spots are two narrow black bands, which curve outward and then inward, enlarging into two posterior spots, which are joined in the middle by a short black band which curves forward; the central region thus enclosed is white with a dark spot in the middle; behind, in the middle line and decreasing in size as they approach the apex, are several short transverse black bands. These markings are somewhat variable but the species is easily distinguished. Palpus pale with white hairs. Legs light brown with dark rings. Otherwise like ♂.

*Habitat:* Wisconsin, Michigan.

#### ATTUS IMPERIALIS Nov. Sp.

Plate III, figures 31, 31a.

♂. Total length 4 mm. Width of abdomen 2 mm.

Cephalothorax: length 2; width 1.7; height 1.2.

Legs 4.8, 3.1, 2.8, 4.2; patella and tibia of the first, 2; patella and tibia of the third, 9; patella and tibia of the fourth, 1.6; metatarsus and tarsus of the fourth, 1.3.

Cephalothorax moderately high, slightly convex, a little dilated behind dorsal eyes, with sides nearly vertical; cephalic part slightly inclined; thoracic part slanting gradually in the first two-thirds, then abruptly. Ocular area occupying a little less than one-half cephalothorax, one-third wider than long, wider behind than in front. First row of eyes very slightly curved; middle eyes sub-touching; lateral rather more than one-half as large as middle eyes, separated from them by two-thirds their own diameter; eyes of second row very slightly nearer lateral than dorsal eyes; dorsal as large as lateral eyes, further from each other than from lateral borders, forming a row as wide as the cephalothorax at that place. Clypeus one-fourth

as high as middle eyes, vertical; falces extending to inner edges of lateral eyes, as long as face, vertical, divergent; fang short, rather stout. Maxillæ parallel, enlarged and truncated at extremity, with projection on outer corner. Labium scarcely one-half as long as maxillæ, but little longer than wide, contracted at tip. Sternum less than one-half longer than wide, truncated in front, narrow behind. Anterior coxæ separated by more than width of labium. Legs, first and second stoutest, with femoral joints enlarged and compressed. Femoral, tibial and metatarsal spines on the four pairs; femoral spines weak; tibial and metatarsal spines of the first and second in two inferior rows, on the third and fourth very weak; on the metatarsi irregularly on the body of the articulation as well as in terminal circles.

*Coloration:* Cephalothorax dark reddish brown with a white band on each upper side, and, on the face, two snowy white bands which begin on each side between the middle and lateral eye and extend obliquely downward and backward to the cephalic margin. Parallel with these are two equally wide and white bands which cover the anterior faces of the falces. These bands make the appearance of the spider from in front very striking and characteristic. Abdomen reddish brown in the middle, with a longitudinal black band on each side; on each of these bands, near the apex, is a white dot, and below, the sides and base are encircled by a white band. Palpus brown with a ring of white hairs at the distal end of the femur. Mouthparts, sternum and venter dark brown. Coxæ light brown. Legs dark brown with femoral joints nearly black.

*Habitat:* California.

#### ICIUS LINEATUS C. K.

Plate I, figure 32. Plate III, figures 32, 32 a., 32 b.

*Syn:* 1848. *MÆVIA lineata* C. K., Die Arachn., XIV, p. 77.

1883. *ATTUS quadrilineatus* Peckham, Descr. new or little known Attidæ of U. S., p. 19.

♀. Total length 5.3 mm. Width of abdomen 2 mm.

Cephalothorax: length 2; width 1.5; height 8.

Legs 3.4, 2.4, 2.2, 3.9; patella and tibia of the first, 1.6; patella and tibia of the third, 8; patellia and tibia of the fourth, 1.5; metatarsus and tarsus of the fourth, 1.2.

Cephalothorax low, flat, a very little dilated behind dorsal eyes, with sides nearly vertical in front, rounded behind; cephalic part inclined; thoracic part falling slightly in first half, then more steeply. Ocular area occupying two-fifths of cephalothorax, one-fourth wider than long, very slightly wider behind. First eyes sub-touching, in a straight

row, all small, projecting, lateral about one-half as large as middle eyes; eyes of second row a little nearer the dorsal than the lateral eyes; dorsal a little smaller than lateral eyes, further from each other than from lateral borders, in a row as wide as the cephalothorax at that place. Clypeus one-fourth as high as middle eyes, vertical. Falces but little wider than the two middle eyes, a little longer than the face, vertical, parallel; fang very weak, maxillæ parallel, a little enlarged and blunt at extremity. Labium one-third as long as maxillæ, as wide as long, truncated. Sternum pointed in front and behind, nearly as wide as long. Anterior coxæ separated by a little less than width of labium. Legs of the first pair stoutest; femoral, tibial and metatarsal spines on the four pairs, metatarsi of the third and fourth with only terminal circles.

*Coloration:* Eye region black covered with yellowish hair, thoracic region testaceous with sparse yellow hair, lower margin black; abdomen (dry) blackish, with some yellow hairs; four slender lines of white hairs begin at the base; the two middle lines start from the same point; and separating a little pass out on each side of the middle to the spinnerets; the lateral lines extend along the sides from base to apex, and are not visible from above. Clypeus covered with white hairs; falces, mouthparts, sternum and coxæ all brown; palpi pale; legs brown, first pair darkest with black hairs; venter pale with irregular, dark, longitudinal lines.

*Habitat:* Pennsylvania, Wisconsin, Georgia (Gentry Coll).

#### ICIUS PALMARUM HENTZ.

Plate I, figure 33. Plate III, figures 33, 33a.

<i>Sym.:</i>	1832.	EPIBLEMUM <i>palmarum</i>	H., Am. Jour. Sci. and Arts, art. 21, p. 108.
	1845.	“ “	id., Journal Bost. Soc. Nat. Hist., vol. V.
	1875.	“ “	id., Coll. Arachn. Writ. by N. M. Hintz, ed. by Burgess, Bost., p.71.
	1883.	“ “	Peckham, Descr. new or little known Attidæ of U. S., p. 28.

♂. Total length 5.5 mm. Width of abdomen 1.1 mm.

Cephalothorax: length 2.1; width 1.8; height 1.

Legs 6.1, 4.2, 3.5, 4.2; patella and tibia of the first, 2.9; patella and tibia of the third, 1.4; patella and tibia of the fourth, 1.7; metatarsus and tarsus of the fourth, 1.2.

♀. Total length 1.6 mm. Width of abdomen 1.2 mm.

Cephalothorax: length 1.6; width 1.4; height 8.

Legs 4.5, 2.7, 2.8, 3.5; patella and tibia of the first, 1.5; patella and tibia of the third, 1; patella and tibia of the fourth, 1.3; metatarsus and tarsus of the fourth, 1.

Cephalothorax moderately high, nearly plane, a very little dilated behind dorsal eyes, with sides nearly vertical in front and rounded behind; cephalic part very slightly inclined; thoracic part with the first half falling gradually and the second steeply. Ocular area occupying ( $\delta$ ) two fifths, ( $\varphi$ ) less than two-fifths of cephalothorax, one-third wider than long, wider behind than in front. First row of eyes straight; middle eyes sub-touching; lateral one-half as large as middle eyes, and a little separated from them; eyes of second row a little nearer lateral than dorsal eyes; dorsal a little smaller than lateral eyes, further from each other than from lateral border, forming a row which is narrower than the cephalothorax at that place. Clypeus a little more than one-fourth as high as middle eyes. Falces compressed, parallel, extending to inner edges of lateral eyes, ( $\delta$ ) three times as long as face, horizontal, ( $\varphi$ ) as long as face, vertical; fang ( $\delta$ ) as long as falx, ( $\varphi$ ) short. Maxillæ long, enlarged at extremity, ( $\delta$ ) with projection at outer corner, and excavated for labium; ( $\varphi$ ) rounded, not excavated. Labium two-thirds as long as maxillæ, nearly twice as long as wide, contracted and rounded at tip. Sternum oval, one-half longer than wide, scarcely projecting between anterior coxæ. Anterior coxæ separated by scarcely the width of the labium. Legs of the first pair much the longest and stoutest, especially in  $\delta$ , with femoral joints enlarged and compressed in both sexes; femoral, tibial and metatarsal spines on the four pairs, on metatarsi of the third and fourth, only in terminal circles.

*Coloration:*  $\delta$ . Cephalothorax bronze-brown, with short golden down, lighter in eye region; lower margin black; a wide white band passes around the clypeus and upper sides, just below the eyes, and just behind the dorsal eye, on each side, curves upward over the thorax, ending near the posterior margin; the eyes are surrounded with bright red hair. Abdomen bronze-brown, covered with golden down; there are white bands on the sides from base to apex, which do not meet at base, where there is a tuft of black hairs. Clypeus covered with long, snowy white hairs; falces dark rufus, with lines of white hairs on their outer edges; mouthparts almost black; sternum rufus; palpi and legs of the first pair (including coxæ) dark rufus; legs of the second, third and fourth (including coxæ), pale, tipped with black. Venter, rufus, edged with white.  $\varphi$ . Cephalothorax, rufus, covered with white hairs, with lower margin black; there are two dark spots in the eye region, behind the middle anterior eyes, and some long black hairs outside the lateral eyes. Abdomen pale, covered with white hairs, and having a tuft of white hairs at base; there is a central, longitudinal, branching, rufus band, made up of many dots,



spots and lines, which is indistinctly visible through the white hairs. Clypeus with white hairs; falces, dark rufus; palpus, pale with three rufus bars, mouthparts very dark, sternum and coxæ, light rufus; legs of the first pair light rufus, the others pale, tipped with black. Venter covered with white hairs.

*Habitat*: New York, North Carolina, South Carolina, Alabama, Florida.

### ICIUS MITRATUS HENTZ.

Plate I, figure 34. Plate III, figure 34a. Plate IV, figure 34.

- Syn.*: 1845. *ATTUS mitratus* ( $\delta$ ) H., Journal Bost. Soc. Nat. Hist., Vol. V.  
 1845. " *morigerus* ( $\varphi$ ) id., ibid.  
 ? 1848. *MÆVIA pallida*, C. K., Die Arachn, XIV, p. 79.  
 1875. *ATTUS mitratus* H., Coll. Arachn. Writings by N. M. Hentz  
 ed. by Burgess, Boston, p. 68.  
 1875. " *morigerus* id., ibid., p. 69.

$\delta$ . Total length 4.7 mm. Width of abdomen 1 mm.

Cephalothorax: length 1.9; width 1.3; height .7.

Legs 5.6, 3.5, 3.2, 4; patella and tibia of the first, 2.2; patella and tibia of the third, 1.2; patella and tibia of the fourth, 1.6; metatarsus and tarsus of the fourth, 1.6.

$\varphi$ . Total length 5 mm. Width of abdomen 1.5 mm.

Cephalothorax: length 2; width 1.4; height .8.

Legs 3.2, 3, 2.2, 3; patella and tibia of the first, 1.5; patella and tibia of the third, .9; patella and tibia of the fourth, 1.4; metatarsus and tarsus of the fourth, 1.4.

Cephalothorax rather low, slightly convex, a little dilated behind dorsal eyes, with sides nearly vertical in front, and rounded behind; cephalic part inclined; thoracic part falling gradually in the first half, then steeply. Ocular area occupying about two-fifths of cephalothorax, one-third wider than long, slightly wider behind than in front. First row of eyes straight; middle eyes sub-touching; lateral about one-half as large as middle eyes, separated from them by one-fourth their own diameter; eyes of second row half way between lateral and dorsal eyes; dorsal not quite so large as lateral eyes, further from each other than from lateral borders, forming a row slightly narrower than the cephalothorax at that place. Clypeus vertical, one-half as high as middle eyes. Falces a little wider than middle eyes, slightly longer than face, parallel, vertical; fang small. Maxillæ long, rounded and a little enlarged at the extremity; labium twice as long as wide, two thirds as long as maxillæ, a little rounded at tip, mouthparts longer and narrower in  $\delta$  than in  $\varphi$ . Sternum contracted in front, rounded behind, ( $\delta$ ) nearly twice as long as wide

(♀) one-half longer than wide. Anterior coxæ separated (♂) by width of labium, (♀) by scarcely so much. Legs of the first pair stoutest, and in ♂ very long. Femoral, tibial and metatarsal spines on the four pairs, on metatarsi of the third and fourth only in terminal circles.

*Coloration:* Cephalothorax reddish, covered with silvery down; eyes on black spots, a black line around margin, and (♀) two or three stout black hairs on each side below the eyes of the second row. Abdomen (♂) covered with white down with an encircling white band, and three, short, transverse dark bars on the dorsum; (♀) covered with down as in ♂, with three pairs of dark spots. Clypeus covered with white hairs which extend downward over the reddish falces. Mouth-parts and sternum reddish brown. Coxæ pale; palpi and legs pale tipped with black. Venter covered with silvery down.

*Habitat:* Wisconsin, Pennsylvania, North Carolina, Alabama, Georgia, Florida.

#### ICIUS PIRATICUS Nov. Sp.

Plate I, figure 35. Plate IV, figures 35, 35a.

♂. Total length 7 mm. Width of abdomen 2.2 mm.

Cephalothorax: length 3.9; width 2; height 1.3.

Legs 5.9, 3.5, 4.9, 5.2; patella and tibia of the first, 2.5; patella and tibia of the third, 1.8; patella and tibia of the fourth, 1.8; metatarsus and tarsus of the fourth, 1.6.

Cephalothorax low, flat, narrow in front, dilated behind dorsal eyes, with sides nearly vertical in front and rounded behind; cephalic part plane, slightly inclined; thoracic falling a very little in the first half, then more steeply. First row of eyes straight; middle eyes touching, lateral sub-touching, one-half as large, and placed plainly further back; eyes of second row a little nearer lateral than dorsal eyes, and very small; dorsal a little smaller than lateral eyes, further from each other than from lateral borders, forming a row as wide as cephalothorax at that place. Whole ocular area occupying a little more than one-third of cephalothorax, one-third wider than long, wider behind than in front. Clypeus inclined backward, one-half as high as middle eyes. Falces but little wider than the two middle eyes, one-fourth longer than face, vertical, parallel; fang very weak. Maxillæ long, parallel, a little enlarged and rounded at extremity. Labium two-thirds as long as maxillæ, twice as long as wide. Sternum not projecting between anterior coxæ, a little longer than wide, rounded. Anterior coxæ square, nearly touching. First leg with femur and tibia exceedingly stout, and metatarsus and tarsus very short; the other legs weak. Spinal armature as follows: Tibia of the

first, one short inferior spine; metatarsus of the first, two stout inferior spines; metatarsus of the second, two inferior not very stout spines; metatarsi of the third and fourth with only terminal circles.

*Coloration:* Cephalothorax with the entire upper surface covered with short white hairs, black on the sides, and white on the lower border; anterior middle eyes surrounded by reddish rings. Clypeus covered with short white and reddish hairs. Abdomen black with a wide central longitudinal white band, and the lower sides white. Falces black, with some short white hairs. Mouthparts black. Coxæ brown. Sternum black with white hairs. Venter covered with white hairs. Palpi brown with white hairs. Legs of the first pair black, and of the second, third and fourth, brown, all with white hairs which form heavy fringes on the undersides of the first legs.

*Habitat:* Texas.

ICIUS ALBOVITTATUS KEYSERLING.

Plate 1, figure 35a. Plate 4, figure 35d.

*Syn.:* 1885. WALA *albovittata* Keys., Neue Spinnen aus Amerika. VI, Verhandl. zool. bot. gesell. in Wien, p. 31 (517).

♂. Total length 5.2 mm. Width of abdomen 1.3 mm.

Cephalothorax: length 1.9; width 1.7.

Legs 6.4, 3.7, 3.5, 4.1; patella and tibia of the first, 2.7; patella and tibia of the third, 1.3; patella and tibia of the fourth 1.6; metatarsus and tarsus of the fourth, 1.3.

Cephalothorax low and flat, plainly wider in the middle, with rounded sides; cephalic part inclined forward. Quadrangle of eyes occupying almost one-half of the cephalothorax, a little more than one-third wider than long, wider behind than in front. First row of eyes a little bent. Middle eyes nearly touching; lateral one-half as large and separated from them by one-third their own diameter. Second row of eyes plainly nearer the first than the third row. Dorsal eyes as large as the lateral, further from each other than from the lateral borders, forming a row not quite so wide as cephalothorax at that place. Clypeus extremely low. Falces nearly as wide as first row of eyes, compressed from before behind, wider in middle than at base or extremity, a little inclined forward, diverging at the extremities; fang two-thirds as long as falx. Maxillæ slightly diverging, rather long, enlarged and truncated at extremity. Labium two-thirds as long as maxillæ, longer than wide, a little widest in middle, truncated. Sternum rounded, nearly as wide as long, projecting a very little between anterior coxæ. Anterior coxæ separated by less than width of labium. First legs much the longest and stoutest. Femoral and metatarsal spines on the four pairs, only in terminal circles on the third and fourth; tibial spines on the first and second.

*Coloration:* Cephalothorax red-brown covered above and on the upper sides with white hairs; lower sides brown; eyes and lower margin black; clypeus white; looked at from in front a dark line extends from each middle and from each lateral eye, backward and downward to the margin. Abdomen bronze brown encircled by a white band, below which is a dark brown band; lower sides brown; falces, mouthparts, sternum, coxæ and legs of first pair dark red-brown, excepting the proximal end of the metatarsus, and the tarsus which are yellow. The other coxæ and legs yellow tipped with black. Venter yellowish brown.

*Habitat:* North America.

PSEUDICIUS HARFORDII Nov. Sp.

Plate I, figures 36, 36a. Plate III, figure 36. Plate IV, figure 36a.

♂. Total length 6.3 mm. Width of abdomen 2.1 mm.

Cephalothorax: length 3; width 2.4; height 2.

Legs 6.1, 5.6, 5.3, 5.9; patella and tibia of the first, 2.6; patella and tibia of the third, 2.2; patella and tibia of the fourth, 2.5; metatarsus and tarsus of the fourth, 1.6.

♀. Total length 6.9 mm. Width of abdomen 2.7 mm.

Cephalothorax: length 3; width 2.4; height 1.7.

Legs 5.4, 7, 4.8, 5.6; patella and tibia of the first, 2.4; patella and tibia of the third, 2.2; patella and tibia of the fourth, 2.2; metatarsus and tarsus of the fourth, 1.8.

Cephalothorax moderately high, slightly convex, a little dilated in the middle, sides vertical in front, rounded behind; cephalic part inclined.

Ocular area occupying two-fifths of the cephalothorax, one-fourth wider than long, equally wide in front and behind. Anterior eyes all small, in a straight row; middle eyes sub-touching; lateral one-half as large as middle eyes and scarcely separated from them; eyes of second row nearer lateral than dorsal eyes; dorsal as large as lateral eyes, further from each other than from lateral borders, forming a row not so wide as the cephalothorax at that place. Clypeus one-fourth as high as middle eyes, vertical. Falces wider than the two middle eyes, a little longer than the face, vertical, parallel; fang one-half as long as falx. Maxillæ narrow at base, enlarged at extremity, (♂) with point at outer corner, (♀) rounded, parallel. Labium oval (♂) one-half (♀) nearly two-thirds as long as maxillæ. Sternum contracted in front, one-third longer than wide. Anterior coxæ separated (♂) by more, (♀) by less than width of labium. Legs of the first and second pairs stoutest; femoral, tibial and metatarsal spines on the four pairs; stout and regular in two rows on tibiae and metatarsi of the first and second, less stout and regular on third and fourth; metatarsi of the fourth spined throughout their length.

*Coloration.* ♂. Cephalothorax light brown; a band of white hairs comes up from between the middle anterior eyes and joins a white spot which is found on the posterior cephalic part; on each upper side is a wide band of white hairs which extends from the anterior lateral eye, surrounding the dorsal eye, to the posterior margin; there is a white line around the lower margin; the entire face is covered with thick snowy white hairs, which grow from the sides toward the middle, surrounding the anterior eyes and growing downward on to the upper part of the falces; just behind and below the anterior lateral eyes are some small scattering tufts of black hairs. Abdomen light golden brown, encircled by a wide band of white hairs. Falces (excepting the white hairs at the upper edge) and mouthparts dark reddish brown. Sternum, coxæ and venter light brown. Legs all light brown excepting the last three joints of the first pair which are dark reddish brown; all the legs tipped with black. ♀. Cephalothorax light brown covered with short white hairs, which are easily rubbed off, but usually show a white band coming up from between the middle anterior eyes. Abdomen covered with gray hairs and fine red dots. Venter covered with gray hairs. Mouthparts pale. Legs pale (excepting first pair which is light brown) all tipped with black. Face and other parts as in male. In some cases the male retains the coloration of the female.

This species bears a strong general resemblance to *Icius albo-vittatus* Keys.

*Habitat:* California.

#### SADALA NOV. GEN.

Cephalothorax rather low and nearly flat, contracted slightly in front and behind, one-fourth longer than wide, and a very little wider than the third row of eyes. Cephalic part occupies two-fifths of the cephalothorax; the thoracic part begins to slant near its posterior border, and is rounded behind. Quadrangle of eyes nearly twice as wide as long, and equally wide in front and behind. First row of eyes nearly straight, middle very nearly touching, and three times as large as the lateral, from which they are just separated. Second row of eyes small and plainly nearer (two-fifths) the anterior lateral. Dorsal eyes as large as lateral, and much further from each other than from the lateral borders. Clypeus very low (one-fifth to one-eighth the height of anterior middle eyes). Sternum oval, a little longer than wide, projecting between the coxæ of the first pair, which are separated by the width of the labium. Labium less than half as long as the maxillæ, and as wide as long. Falces short (as long as the face) but little longer than wide. Legs 1, 4, 2, 3. First stoutest, second next. The patella with tibia of the third shorter than patella with tibia of the

fourth. Metatarsus with tarsus of the fourth shorter than patella with tibia. Femoral, tibial and metatarsal spines on the four pairs. Metatarsi of the fourth spined to the base. Abdomen long and slender.

*Sadala* is near *Icius* E. S., but differs in having the quadrangle of eyes nearly twice as wide as long; middle eyes three times as large as the anterior lateral; quadrangle of eyes equally wide in front and behind; legs 1, 4, 2, 3; metatarsi of the third and fourth spined throughout their length.

SADALA DISTINCTA Nov. Sp.

Plate I, figure 70. Plate VI, figures 76, 76a.

- ♂. Total length 5.3 mm. Width of abdomen 1.1 mm.  
 Cephalothorax: length 2; width 1.5; height 6.  
 Legs 4.6, 3.6, 3.1, 3.9; patella and tibia of the first, 2.2; patella and tibia of the third, 1; patella and tibia of the fourth, 1.6; metatarsus and tarsus of the fourth, 1.2.  
 Cephalothorax not high, slightly convex, contracted in front and behind, with sides rounded, more widely behind than in front; cephalic part plane, not inclined; thoracic part with first three-fifths level. Ocular area occupying two-fifths of cephalothorax, one-third wider than long, very slightly wider in front than behind. First row of eyes nearly straight; middle eyes prominent, touching; lateral only one-third as large as middle eyes, and slightly separated from them; eyes of second row very small, a little nearer lateral than dorsal eyes; dorsal as large as lateral eyes, much further from each other than from lateral borders, forming a row very nearly as wide as cephalothorax at that place. Clypeus retreating, one-eighth as high as middle eyes. Falces as wide as the two middle eyes, scarcely longer than face, length and width about equal, parallel, slightly inclined backward; fang very small. Maxillæ enlarged and truncated at extremity, parallel. Labium one-half as long as maxillæ, as wide as long, rounded. Sternum oval, about twice as long as wide. Anterior coxæ separated by width of labium. Legs of the first pair stoutest, second next; these two pairs with femoral joints compressed; femoral tibial and metatarsal spines on the four pairs; metatarsi of the fourth, armed throughout their length. Palpus with a tibial apophysis.  
 Coloration: Cephalothorax clear light-reddish brown; a black band includes the first and second rows of eyes; the dorsal eyes are placed upon black spots, and there are two dark spots on the posterior cephalic part; on each side a white line extends from the lateral eyes on to the anterior thoracic part, passing below the small median and the

dorsal eye; near the termination of this line, at the point at which the thoracic part begins to slant downward, there arises a slightly oblique white line which passes downward to the border. The lower margin is dark brown. Clypeus brown. The lower anterior face of the abdomen is black; above this is a curved white band which ends, on each side, in an oblique bar. The anterior dorsum is umber brown; in front of the middle are two black spots, separated by a line of brown; a little behind these is one large black spot which is surrounded by white. There is a second pair of oblique white bars, on the sides, at this point of the abdomen. The posterior end of the abdomen is white, with one or two transverse bands of light brown. The entire dorsum is sparsely covered with long yellowish hairs. Falces black. Mouthparts, palpi, and coxæ of the first and second, brown; coxæ of the third and fourth, pale, each with a black spot. Sternum black. Legs of the first and second, dark brown; of the third, femur dark brown, other joints lighter; of the fourth, light-brown or pale; patella and tibia of the third and fourth, with black lines on both anterior and posterior faces. Venter black.

*Habitat:* Mexico.

ERIS OCTAVUS HENTZ.

Plate I, figure 37, Plate III, figure 37.

- Syn.*: 1845. *ATTUS octavus* H., Journal Bost. Soc. Nat. Hist., Vol. V.  
 1875. *ATTUS octavus* id., Coll. Arachn. Writ. by N. M. Hentz. Ed. by Burgess, Boston, p. 70.

♀. Total length 4.2 mm.

Cephalothorax: length 1.8; width 1.5; height 1.

Legs 4.2, 3, 3, 3.9; patella and tibia of the first, 1.5; patella and tibia of the third, 1.2; patella and tibia of the fourth, 1.4; metatarsus and tarsus of the fourth, 1.1.

Cephalothorax a little wider at the dorsal eyes, with sides nearly vertical in front, rounded in the thoracic part, and truncated behind. Ocular area one-fourth wider than long, wider behind than in front; anterior row of eyes straight; lateral more than one-half middle eyes, separated from them by one-half their own diameter; eyes of second row half way between lateral and dorsal eyes; dorsal eyes further from each other than from lateral borders. Clypeus one-fifth as high as middle eyes. Falces extending in width to inner edges of lateral eyes, as long as face, parallel, vertical. Maxillæ rather long, a little enlarged and rounded at tip, parallel; labium one-half as long as maxillæ, as wide as long, contracted and rounded at tip. Sternum one-half longer than wide, narrow at both ends, truncated in

front. Anterior coxæ separated by scarcely the width of the labium. First pair of legs stoutest. Femoral, tibial and metatarsal spines on the four pairs; the metatarsi of the fourth spined throughout their length.

*Coloration:* Cephalothorax and abdomen light rufus, brown, or yellowish, covered with short white hairs; cephalothorax with the eyes on black spots; abdomen with four pairs of black spots on the posterior part, in two converging longitudinal lines; all the other parts light brown with short white hairs, the legs being tipped with black.

*Habitat:* New York, Alabama, North Carolina, Georgia.

ERIS (?) BARBIPES Nov. Sp.

Plate IV, figures 38, 38a.

♀. Total length 6.8 mm. Width of abdomen 2.7 mm.

Cephalothorax: length, 2.4; width, 1.9; height 1.2.

Legs 4.8, 3.6, 4.5, 5.3; patella and tibia of the first, 2.1; patella and tibia of the third, 1.7; patella and tibia of the fourth, 2.3; metatarsus and tarsus of the fourth, 1.9.

Cephalothorax moderately high, slightly convex, very slightly dilated in the middle, with sides nearly vertical; cephalic part a little inclined; thoracic part falling gradually in the first two-thirds, then steeply. Ocular area occupying one-half cephalothorax, one-third wider than long, plainly wider behind than in front. Anterior eyes all subtouching, in a straight row; middle twice as large as lateral eyes; eyes of second row nearly twice as far from dorsal as from lateral eyes; dorsal as large as lateral eyes, further from each other than from lateral borders, forming a row as wide as cephalothorax at that place. Clypeus vertical, one-fourth as high as middle eyes. Falces nearly as wide as first row of eyes, twice as long as face, vertical, parallel; fang short. Maxillæ rather long, parallel, enlarged and rounded at extremity. Labium more than one-half as long as maxillæ, twice as long as wide, pointed at tip. Sternum about twice as long as wide, slightly contracted in front and behind. Anterior coxæ separated by less than width of labium. Legs of the first pair much stoutest; tibia especially enlarged with fringe of hairs; third and fourth slender; femoral, tibial and metatarsal spines on the four pairs; metatarsi of the fourth spined throughout their length.

*Coloration:* Cephalothorax black, with cephalic and anterior thoracic parts covered with short greenish hairs, and a white band around lower margin. Abdomen black with white basal band, covered with short scalelike slightly iridescent greenish hairs. Clypeus, falces,



mouthparts and sternum black. Coxæ dark brown. Venter covered with hairs as above. Palpi light, covered with short white hairs. Legs of the first pair black, excepting metatarsi and tarsi which are light brown; other legs brown, lighter toward extremities, with some short white hairs.

*Habitat:* Mexico.

ERIS NERVOSUS Nov. Sp.

Plate I, figure 39. Plate III, figure 39.

♀. Total length 4 mm. Width of abdomen 1.5 mm.

Cephalothorax: length 1.6; width 1.4; height .7.

Legs 4, 3.2, 2.9, 3.7; patella and tibia of the first, 1.3; patella and tibia of the third, .9; patella and tibia of the fourth, 1.3; metatarsus and tarsus of the fourth, 1.

Cephalothorax not high, nearly plane, a little dilated opposite dorsal eyes, with sides nearly vertical in front, and somewhat rounded behind; cephalic part very little inclined; thoracic part sloping from just behind dorsal eyes. Ocular area occupying nearly three-fifths of cephalothorax, one-fourth wider than long, wider behind than in front. Anterior eyes small, in a straight row, slightly separated from each other; middle scarcely twice as large as lateral; eyes of second row twice as far from dorsal as from lateral eyes; dorsal as large as lateral eyes, further from each other than from lateral borders, forming a row as wide as cephalothorax at that place. Clypeus one-half as high as middle eyes, a little inclined backwards. Falces extending to inner edges of lateral eyes, a little longer than the face, nearly square, parallel, a little inclined backward, fang weak. Maxillæ diverging a little, enlarged and rounded at extremity. Labium one-half as long as maxillæ, a little longer than wide, rounded. Sternum nearly round. Anterior coxæ separated by scarcely the width of the labium. Legs of the first pair stoutest, with femoral joints enlarged and compressed, and patella and tibia much stouter than metatarsus and tarsus; weak femoral spines on first, second and third; stout tibial and metatarsal spines on the first, and weak spines on the corresponding joints of the second.

*Coloration:* Cephalothorax black. Clypeus black with a few long white hairs. Abdomen dark reddish brown with some very short white hairs, three rather indistinct, oblique black bands on each side of dorsum, and two white chevrons at apex. Falces and mouthparts dark brown. Sternum and coxæ light brown. Venter dark reddish brown with short gray hairs. Palpi and legs light brown, the legs tipped with black.

*Habitat:* New York.

## HASARIUS HOYI PECKHAM.

Plate I, figures 40, 40a. Plate IV, figure 40, 40a.

*Syn.*: 1883. *ATTUS hoyi* ( $\delta$ ) P., *Descrip. of new or little known Attidæ*, p.7.

1883 “ *pinus* ( $\varphi$ ) *id.*, *ibid.*, p. 20.

$\delta$  Total length 5.2 mm. Width of abdomen 1.8 mm.

Cephalothorax: length 2.3; width 1.9; height 1.6.

Legs 5.2, 4, 5.2, 4.9; patella and tibia of the first, 2; patella and tibia of the third, 1.7; patella and tibia of the fourth, 1.9; metatarsus and tarsus of the fourth, 1.6.

$\varphi$  Total length 5.9 mm. Width of abdomen 2.2 mm.

Cephalothorax: length 2.5; width 2; height 1.7.

Legs 4.6, 4.2, 5, 4.8; patella and tibia of the first, 2.2; patella and tibia of the third, 1.9; patella and tibia of the fourth, 2.1; metatarsus and tarsus of the fourth, 1.9.

Cephalothorax rather high, plane, slightly dilated behind dorsal eyes, with sides nearly vertical in front, rounded behind; cephalic part inclined (more strongly in  $\delta$  than in  $\varphi$ ); thoracic part falling but little in the first two-thirds, then steeply. Ocular area occupying two-fifths of cephalothorax, one-third wider than long, and almost imperceptibly wider in front than behind. First row of eyes straight; middle eyes sub-touching; lateral more than one-half as large as middle eyes, separated from them by one-third their own diameter; eyes of second row half way between dorsal and lateral eyes; dorsal a little smaller than lateral eyes, further from each other than from lateral borders, forming a row scarcely narrower than the cephalothorax at that place. Clypeus ( $\delta$ ) vertical, one-third, ( $\varphi$ ) inclined, one-fifth as high as middle eyes. Falces extending to the inner edges of lateral eyes, but little longer than face, vertical, parallel; fang weak. Maxillæ parallel, short, slightly enlarged and rounded at extremity; labium one-half as long as maxillæ, but little longer than wide, a little contracted and blunt at tip. Sternum oval, one-half longer than wide. Anterior coxæ separated by width of labium. Legs of the first and second pairs stoutest; third longer than fourth by greater length of femur, femoral, tibial and metatarsal spines on the four pairs; on metatarsi of the fourth throughout their length.

*Coloration*:  $\delta$ . Ocular and anterior thoracic region rufus a little mixed with black; posterior thoracic region black; a white band on each side, beginning at or near the base passes forward to the anterior lateral eyes, and joining these, a white band crosses above the anterior eyes; the sides below the white bands are velvety black; the anterior eyes are surrounded by hairs which are white excepting just between the eyes, where they are red; looked at from above this

gives the appearance of three minute red tufts. Clypeus black with white hairs. Abdomen black with an encircling white band and a central, longitudinal, rufus band which varies greatly in length and breadth, upon which are some variable white marks, which usually consist of two short, oblique lines near the base, a triangle in the middle, and a series of chevrons near the apex. Falces dark testaceous with sparse short white hairs; maxillæ and labium brown; sternum dark with black and white hairs; venter black with rufus hairs, palpi and legs barred with black and rufus excepting the proximal ends of the femoral joints which are pale. ♀. Cephalothorax covered with brown, black and rufus hairs, with a grayish band behind dorsal eyes, which passes downward and forward on the sides to the lateral eyes; clypeus covered with white hairs. Abdomen rufus or light brown with a grayish basal band, behind which is a curved black band; there are several other curved black bands near the apex, and a central, longitudinal black line. Falces, mouthparts and sternum brown; palpus pale with hair which is light brown excepting at the extremity, where it is white; legs, first pair dark; the others brown with black hairs.

*Habitat:* Pennsylvania, New York, Wisconsin.

Since describing *hoji* and *pinus* as two species (1883) we have satisfied ourselves that *pinus* is the female of *hoji*.

#### HABROCESTUM (E. SIMON), 1876.

Cephalothorax rather short, one-fourth to one-third longer than wide, moderately high to very high: thoracic part often convex, but slightly dilated on the sides, which are somewhat rounded, only a third the longer. Cephalic part a little convex, inclined, limited by a faint depression. Quadrangle of eyes one-third wider than long, and equally wide in front and behind, or a little wider behind. Anterior row of eyes rather unequal — middle about twice lateral — middle but little separated, lateral by not more than one-third their diameter, forming a line straight or slightly curved upward. Second row small, and nearly half way between the first and third rows. Dorsal eyes equal to or a little larger or smaller than the anterior lateral, forming a row about as wide as the cephalothorax at that place, and almost equally distant from each other and from the lateral borders. Clypeus varies from one-half to two-thirds the large middle eyes. Sternum one-half longer than wide, often truncated in front and contracted behind, produced between the anterior coxæ, which are separated by a little more or less than the width of labium at its base. Labium as wide as long<sup>1</sup> and less than one-half the maxillæ. Falces weak

<sup>1</sup> This is true at least in the American species.

and as long as the face. Maxillæ enlarged and rounded or truncated at extremity. Legs 3, 4, 1, 2, in both sexes. The posterior pairs long, both absolutely and relatively. The first and second pairs the stoutest. All the legs spined. Femur, patella and tibia of the third much longer than the same articulations in the fourth pair. Tarsus and metatarsus of the fourth nearly equal to the patella and tibia.

This genus differs from *Saitis* E. S.— to which it is closely related—in having the quadrangle of the eyes never wider in front; usually the clypeus is more than one-half the middle eyes; the third pair of legs is longer than the fourth. In *Saitis* the third and fourth pairs are equal or almost equal.

#### HABROCESTUM CORONATUM HENTZ.

*Syn.*: 1845. *ATTUS corontus* H., Journal Bost. Soc. Nat. Hist., vol. V.

1875. *ATTUS corontus*, *id.*, Coll. Arachn. Writ. by N. M. Hentz.

Ed. by Burgess, Boston, p. 64.

♂. juv. Total length 5.5 mm. Width of abdomen 2 mm.

Cephalothorax: length 2.9; width 2.

Legs, 3.8, 2.4, 5.2, 4.8.

Cephalothorax high. Ocular area equally wide in front and behind. First row of eyes straight; middle eyes subtouching; lateral a little more than one-half as large as middle eyes, separated from them by one-fourth of their own diameter; eyes of second row half way between lateral and dorsal eyes; dorsal as large as lateral eyes. Clypeus two-thirds as high as middle eyes, vertical. Anterior coxæ separated by more than width of labium.

*Coloration*: Cephalothorax black with some white hairs over the anterior eyes, and two curved longitudinal white bands on the thoracic part. Clypeus bright red, sometimes covered with white hairs. Abdomen black, with three transverse curved white bands, one at the base, the second in front of, and the third behind the middle of the dorsum, the second and third sometimes interrupted in the middle line, and having one or two white chevrons between them; behind the third curved band is a large central white spot, and on each side of the apex is a short longitudinal white band. Falces dark brown. Mouth-parts pale drab. Sternum, coxæ and venter light brown with white hairs. Palpi and legs brown with black hairs.

*Habitat*: Pennsylvania, Alabama, Iowa.

## HABROCESTUM CÆCATUM HENTZ.

Plate I, figure 42. Plate IV, figures 42, 42a, 42b.

*Syn.*: 1845. *ATTUS cæcatus* H., Journal Bost. Soc. Nat. Hist., Vol. V.  
 1875. “ “ id., Coll. Arachn. Writ. by N. M. Hentz. Ed.  
 by Burgess, Boston, p. 65.

♀. Total length 4.3 mm. Width of abdomen 1.7 mm.

Cephalothorax: length 2; width 1.8; height .9.

Legs, 3.6, 2.9, 4.4, 4.

Cephalothorax moderately high; cephalic part much inclined. Ocular area wider behind than in front. First row of eyes straight; middle eyes sub-touching; lateral less than one-half as large as middle eyes, separated from them by one-third their own diameter; eyes of second row half way between lateral and dorsal eyes; dorsal eyes a little smaller than lateral eyes. Clypeus retreating, two thirds as high as middle eyes. Anterior coxæ separated by fully the width of the labium.

*Coloration*: Cephalothorax black, with gray hairs above anterior eyes. Clypeus bright red. Abdomen black, more or less covered with whitish hairs, with a curved transverse white band, behind which are a white, diamond-shaped spot, two short, longitudinal, white bands on the sides, and two white dots near the apex. Falces, mouthparts, sternum, coxæ and venter brown, all with white hairs excepting the mouthparts. Femur of the first leg black, with a short brush of black hairs at distal end; patella and tibia covered with white hairs; metatarsus and tarsus brown; other legs dark brown with some white hairs; patella of the third with an elevation on the upper surface at the distal end; tibia of the third with a short projection which extends over the metatarsus.

Distinguished from *H. cornatum* by the projection on the tibia of the third leg.

*Habitat*: Pennsylvania, New York, Alabama.

## HABROCESTUM VIRIDIPES HENTZ.

Plate I, figure 43. Plate IV, figures 43, 43a.

*Syn.*: 1845. *ATTUS viridipes* H. Jour. Bost. Soc. of Nat. Hist., Vol. V.  
 1875. “ “ id., Coll. Arachn. Writ. by N. M. Hentz.  
 Ed. by Burgess, Boston, p. 66.

♂. Total length 4.8 mm. Width of abdomen 1.8 mm.

Cephalothorax: length 2.3; width 1.8; height 1.4.

Legs 3.5, 3.3, 5.2, 4.6; patella and tibia of the first, 1.8; patella and tibia of third, 2; patella and tibia of the fourth, 1.7; metatarsus and tarsus of the fourth, 1.9.

♀ Total length 5.8 mm. Width of abdomen 3 mm.

Cephalothorax: length 2.3; width 2; height 1.6.

Legs 3.9, 3.7, 4.8, 4.2; patella and tibia of the first, 1.6; patella and tibia of the third, 2; patella and tibia of the fourth, 1.8; metatarsus and tarsus of the fourth, 1.8.

Cephalothorax moderately high. Ocular area equally wide in front and behind. First row straight, all the eyes sub-touching; lateral less than one-half as large as middle eyes; eyes of second row half way between lateral and dorsal eyes; dorsal as large as lateral eyes. Clypeus nearly two-thirds as high as middle eyes, vertical. Anterior coxæ separated by width of labium.

*Coloration:* Cephalothorax black with two wide longitudinal bands of grayish hairs which arise on the posterior thoracic region and extending forward, surround the dorsal eyes, and meet just in front of them, thus occupying nearly the whole of the cephalic part. Clypeus covered with white hairs. Abdomen blackish with a basal band, a scalloped band which encircles the posterior two-thirds of the dorsum, and a central spot of a yellowish white color. The spot and the inner side of the encircling band are edged with deep black. The other parts are of a lighter or darker brown color, the sternum being sometimes much darker than the coxæ.

*Habitat:* Texas, South Carolina.

#### HABROCESTUM PEREGRINUM PECKHAM.

Plate I, figure 44. Plate IV, figure 44, 44a, 44b.

*Syn.:* 1883. *ATTUS peregrinum* P., Descri. new or little known Attidæ of U. S., p. 17.

♂. Total length 5.3 mm. Width of abdomen 1.9 mm.

Cephalothorax: length 2.9; width 2; height 1.2.

Legs 5.3, 4.5, 6.4, 5.6; patella and tibia of the first, 2.6; patella and tibia of the third, 2.4; patella and tibia of the fourth, 1.7; metatarsus and tarsus of the fourth, 1.9.

Cephalothorax high, especially behind; cephalic part much inclined. Ocular area a little wider behind than in front. Anterior eyes all small, in a straight row; middle eyes sub-touching; lateral a little more than one-half as wide as middle eyes, separated from them by one-third their own diameter; eyes of second row slightly nearer lateral than dorsal eyes; dorsal a little larger than lateral eyes. Clypeus two-thirds

as high as middle eyes, retreating. Two unusually stout spines on tibia of the first pair; patella of the third widening toward distal end where it projects over tibia; this widened portion bears a short pale spine which projects over tibia, just behind which, on the anterior face is a small black dot. Anterior coxæ separated by width of labium.

*Coloration:* Ground color of cephalothorax dark brown or black; upper surface of cephalic part covered with short fawn-colored hairs, bordered behind by a scalloped white band; thorax with two wide white bands which extend from dorsal eyes to posterior border; a wide white band extends entirely around the lower border, and below this is a narrow black line. Abdomen snowy white on sides and middle of dorsum, with two velvety black longitudinal bands extending throughout its length. Clypeus covered with thick, long, white hairs. Underparts and legs lighter or darker brown, well covered with white hairs.

This species is close to *H. Copardum* Hentz, but is distinguished from it by the apophysis on the third leg; this apophysis and the spines on the tibia of the first leg vary considerably in stoutness.

*Habitat:* New York, Connecticut.

#### HABROCESTUM CRISTATUM HENTZ.

Plate I, figure 45. Plate IV, figure 45.

*Syn.:* 1845. *ATTUS cristatum* H., Journal Bost. Soc. Nat. Hist., Vol. V.  
1875. " " id., Coll. Arachn. Writ. by N. M. Hentz. Ed.  
by Burgess, Boston, p. 67.

♀. Total length 6.6 mm. Width of abdomen 2.2 mm.

Cephalothorax: length 3.4; width 2.4; height 1.2.

Legs 4.8, 4.5, 6.8, 6.1; patella and tibia of the first, 2; patella and tibia of the third, 2.8; patella and tibia of the fourth, 2.2; metatarsus and tarsus of the fourth, 2.2.

Cephalothorax moderately high. Ocular area wider behind than in front. First row of eyes slightly covered; middle eyes sub-touching; lateral a little less than one-half as large as middle eyes, separated from them by one-third their own diameter; eyes of second row a little nearer dorsal than lateral eyes; dorsal as large as lateral eyes. Clypeus nearly two-thirds as high as middle eyes, retreating. Anterior coxæ separated by less than width of labium.

*Coloration:* Cephalothorax dark, nearly covered with grayish hair. Clypeus covered with white hairs. Abdomen covered with grayish rufus hair with two spots on the anterior part, a slender band which curves upward from the sides over the middle part, and a small ring

on the posterior region black. Falces and mouthparts dark brown. Sternum and coxæ light brown. Legs brownish rufus. Venter covered with grayish hair.

*Habitat:* New York, Connecticut, Alabama.

### HABROCESTUM AURATUM HENTZ.

Plate I, figure 46a. Plate IV, figures 46, 46a, 46b.

*Syn:* 1845. *Attus auratum* H., Jour. Bost. Soc. Nat. Hist., Vol. V.  
1875. " " Coll. Arachn. Writ. by N. M. Hentz, Ed. by Burgess, Boston, p. 66.

♂. Total length 5 mm. Width of abdomen 1.9 mm.

Cephalothorax: length 2.8; width 1.8; height 1.

Legs 4, 3.8, 5.8, 4.2; patella and tibia of the first, 1.8; patella and tibia of the third, 2.1; patella and tibia of the fourth, 1.6; metatarsus and tarsus of the fourth, 1.6.

♀. Total length 6.4 mm. Width of abdomen 3 mm.

Cephalothorax: length 3.2; width 2.2; height 1.1.

Legs 4.5, 4.3, 6.2, 4.8; patella and tibia of the first, 3; patella and tibia of the third, 2.4; patella and tibia of the fourth, 1.9; metatarsus and tarsus of the fourth, 1.9.

Cephalothorax moderately high, ♀ less convex than ♂; cephalic part inclined more in ♂ than in ♀. Ocular area equally wide in front and behind. First row of eyes straight, middle eyes sub-touching; lateral a little less than one-half middle eyes, separated from them by (♀) one-third their own diameter, (♂) scarcely so much; eyes of second row very slightly nearer lateral than dorsal eyes, dorsal as large as lateral-eyes. Clypeus two-thirds as high as middle eyes, retreating. Anterior coxæ separated by scarcely the width of the labium.

*Coloration:* ♂. Cephalothorax covered with short black hairs which are intermingled with others of a yellowish brown color, these latter being by far the most numerous in the eye region and giving to that part its predominating tint. Three white bands come up on to the caput from the interspaces in the first row of eyes; the central one of these terminates behind the middle of the eye region; the lateral ones pass just above the small median eyes, surround the dorsal eyes and on the thoracic part curve first toward, and then away from each other, terminating at the posterior border. Around the lower margin is a black line, and just above this a band of white. Abdomen black encircled by a wide white band and having a central longitudinal white band which ends a little in front of the spinnerets. Clypeus and falces blackish brown, clypeus sparsely covered with



short, and falces with long white hairs. Sternum black, and coxæ light yellowish brown, both being covered, not very thickly, with white hairs. Venter gray, covered thickly with a mixture of black and white hairs. Legs and palpi medium brown with many white scales and some black hairs. Femur of the first with a distinct tuft of stiff black hair on the under side. Patella of the first with a small, and tibia of the first with a much larger tuft of stiff black hairs on the upper surface. ♀. Cephalothorax covered with gray hairs. Abdomen covered with gray hairs, with a basal band, two oblique bands on each side, two spots near the apex, and a central line of chevrons white. Falces reddish brown. Underparts, legs and palpi covered with short white hairs.

This species is close to *H. peregrinum* but the two species are distinguished from each other by the differences in the first and third pairs of legs. *Habitat*: New York, South Carolina, Georgia.

#### HABROCESTUM HIRSUTUM. Nov. Sp.

Plate IV, figures 47, 47a.

♂. Total length 5.8 mm. Width of abdomen 2 mm.

Cephalothorax: length 3; width 1.7; height 1.4.

Legs 4.9, 3.9, 5.8, 5.4; patella and tibia of the first, 1.7; patella and tibia of the third, 2; patella and tibia of the fourth, 1.7; metatarsus and tarsus of the fourth, 1.9.

Cephalothorax high, slightly convex behind, dilated in the middle, with sides rounded more widely behind than in front; cephalic part plane, not inclined; thoracic sloping slightly in the first half, then more steeply. Ocular area occupying two-fifths of cephalothorax, not quite one-third wider than long, wider behind than in front. First row of eyes straight; middle eyes sub-touching; lateral less than one-half as large as middle eyes and a little separated from them; eyes of second row half way between lateral and dorsal eyes; dorsal as large as lateral eyes, further from each other than from lateral borders, forming a row as wide as cephalothorax at that place. Clypeus inclined backward, nearly as high as middle eyes. Falces as wide as the two middle eyes, a little shorter than face, parallel, inclined backward; fang rather long. Maxillæ parallel, short, square, truncated. Labium as wide as long, very short, rounded. Sternum oblong oval, nearly twice as long as wide, narrow. Anterior coxæ separated by width of labium; coxæ of the fourth touching. Legs of the first pair stoutest; femoral, tibial and metatarsal spines on the four pairs, and patellary spines on first and fourth; metatarsi of the fourth spined throughout their length.

*Coloration:* Cephalothorax black, probably originally covered with short white and red hairs, with a band of white hairs and some long black hairs above the anterior eyes. Clypeus covered with red hairs. Abdomen and venter covered with short whitish brown hairs. Falces reddish brown. Mouthparts, sternum, coxæ and palpi brown. Legs brown with light hairs, first pair darkest with a fringe of stout black hairs on the tibia.

*Habitat:* Oregon.

HABROCESTUM SPLENDENS PECKHAM.

Plate I, figure 48. Plate V, figures 48, 48a.

*Syn.*: 1883. *ATTUS splendens* P., Descr. new or little known Attidæ of U. S., p. 4.

1885. *PELLENES nigroceps* Keyserling, Neue Spinnen aus Amerika, VI, Verhandlungen zoologisch-botanischen Gesellschaft., p. 26 (512).

♂. Total length 6.5 mm. Width of abdomen 2.2 mm.

Cephalothorax: length 3; width 2.2; height 1.6.

Legs 3.9, 3.7, 4.9, 4.5; patella and tibia of the first, 1.9; patella and tibia of the third, 1.9; patella and tibia of the fourth, 1.8; metatarsus and tarsus of the fourth, 1.5.

♀. Total length 7.7 mm. Width of abdomen 2.9 mm.

Cephalothorax: length 3.1; width 2.5; height 1.3.

Legs 5.7, 4.5, 7.2, 5.8; patella and tibia of the first, 2; patella and tibia of the third, 3; patella and tibia of the fourth, 1.8; metatarsus and tarsus of the fourth, 1.9.

Cephalothorax high and convex, a little dilated opposite dorsal eyes, sides nearly vertical in front, rounded behind; posterior margin truncated; Ocular area occupying two-fifths of cephalothorax, one-third wider than long, a little wider behind than in front; anterior row of eyes straight; middle eyes slightly separated; lateral less than one-half as large as middle eyes, separated from them by one-third their own diameter; eyes of second row half way between dorsal and lateral eyes; dorsal as large as lateral eyes, further from each other than from lateral borders, forming a row a little narrower than the cephalothorax at that place. Clypeus (♂) nearly as high, (♀) one-half as high as middle eyes. Falces extending to inner edges of lateral eyes, but little longer than the face, vertical, parallel; fang short. Maxillæ parallel, widely separated, enlarged and blunt at extremity; labium as wide as long, a little less than one-half as long as maxillæ, blunt. Sternum narrowed at both ends, truncated in front, rounded behind; (♂) twice as long as wide, (♀) relatively shorter. Anterior

coxæ separated ( $\delta$ ) by scarcely width of labium, ( $\varphi$ ) by more than width of labium. Legs of the first and second pairs stoutest; femoral, patellary, tibial and metatarsal spines on the four pairs;  $\delta$  with spines on trochanters; metatarsi of the fourth spined throughout their length.

*Coloration:*  $\delta$ . Cephalothorax covered with dark but highly iridescent scales; under alcohol two whitish testaceous spots appear just behind dorsal eyes; lower margin black; some upright black hairs on anterior part of eye region. Abdomen bright iridescent red, lighter around margin, purplish on dorsum, four indented dots near base, and sometimes a whitish basal band; whole abdomen covered with sparse black hairs; spinnerets black; under alcohol the base and a curved oblique band on each side appear black, and the dorsum dark iridescent green with a short longitudinal red band, narrowest in the middle. Clypeus iridescent; falces dark reddish brown with long white hairs on their inner edges; maxillæ white at extremities and on inner edges, otherwise reddish; labium reddish tipped with white; sternum testaceous, darker than coxæ, with white hairs; coxæ covered with white hairs; palpi and legs almost black; venter iridescent red with two indistinct darker longitudinal bands.  $\varphi$ . Cephalothorax rufus, or more rarely black in the eye region, with a transverse black band between the dorsal eyes; posterior to this is a scalloped white or rufus band which curves forward in the middle; behind the scalloped band the thoracic part is black; the sides are black above, and white below; the margin has a narrow black line between two white lines. Abdomen velvety black, with basal, central, and lateral white bands, which are sometimes tinted with salmon-color. Clypeus covered with white hairs; falces reddish, with white hairs on anterior face; maxillæ and labium brown; palpi and legs varied with rufus and black, with white hairs; venter covered with whitish and rufus hairs.

Count Keyserling has kindly sent us a specimen of his *Pellenes nigroiceps* which we find to be identical with *H. splendens*. The female of this species is extremely variable, especially in the abdominal markings.

*Habitat:* Wisconsin, Massachusetts.

#### HABROCESTUM OREGONENSE Nov. Sp.

Plate V, figures 49, 49a.

$\delta$ . Total length 5.8 mm. Width of abdomen 1.9 mm.

Cephalothorax: length 2.5; width 1.6; height 1.

Legs 5, 3.8, 6, 5.5; patella and tibia of the first, 2.3; patella and tibia of the third, 2.5; patella and tibia of the fourth, 2; metatarsus and tarsus of the fourth, 2.

Cephalothorax high, convex, a little dilated behind dorsal eyes, with sides slightly concave in front and a little rounded (nearly vertical) behind; cephalic part inclined; thoracic falling abruptly from a little way behind dorsal eyes. Ocular area occupying more than two-fifths of cephalothorax, one-third wider than long, equally wide in front and behind. Anterior eyes rather small, in a very slightly curved row; middle eyes sub-touching, scarcely twice as large as the lateral, which are scarcely separated from them; eyes of second row a little nearer dorsal than lateral eyes; dorsal a little smaller than lateral eyes, further from each other than from lateral borders, forming a row as wide as cephalothorax at that place. Clypeus retreating, one-half as high as middle eyes. Falces but little wider than the two middle eyes, square, not long, parallel, a little inclined backward; fang extremely small. Maxillæ parallel, very small, wider and rounded at extremity. Labium small, a little more than one-third as long as maxillæ, as wide as long, rounded. Sternum nearly round. Anterior coxæ separated by more than width of labium at base. Legs of the first pair much the stoutest, with tibia nearly as wide as long, much enlarged in all directions, with fringes of stout hairs; patella and tibia also enlarged with some stout hairs; long and slender femoral, tibial and metatarsal spines on the four pairs, and patellar spines on the third and fourth; metatarsi of the fourth spined throughout their length.

*Coloration:* Cephalothorax dark colored, nearly covered with bright iridescent red hairs, with which, on the cephalic part, some long black hairs are intermixed; lower border with a black line between two white lines; anterior eyes surrounded by white rings. Abdomen, venter, clypeus, falces, palpus and legs all covered with iridescent red hair. Mouthparts, sternum and coxæ very dark brown, with some short, white hairs.

*Habitat:* Oregon.

SAITIS PULEX HENTZ.

Plate I, figures 50, 50a. Plate V, figures 50, 50a.

- Syn.:* 1845. *ATTUS pulex* H., Journal Bost. Soc. Nat. Hist., Vol. V.  
 1846.? *EUOPHRYS offuscata* C. K., Die Arachn., XIII, p. 218.  
 1875. *ATTUS pulex* id., Coll. Arachn. Writ. by N. M. Hentz. Ed. by Burgess, Boston, 65.  
 1885. *CYRBA pulex* Keyserling, Neue Spinnen aus Amerika, VI, Verhandlungen zoologisch-botanischen Gesellschaft, p. 23 (509).

♂. Total length 4 mm. Width of abdomen 1.4 mm.

Cephalothorax: length 2.5; width 1.1; height 1.2.

Legs 2.5, 2.5, 4, 4; patella and tibia of the first, 1.3; patella and tibia of the third, 1.5; patella and tibia of the fourth, 1.5; metatarsus and tarsus of the fourth, 1.5.

♀. Total length 4.5 mm. Width of abdomen 2.2 mm.

Cephalothorax: length 2.5; width 1.4; height 1.3.

Legs 3, 3, 4.4, 4.5; patella and tibia of the first, 1.3; patella and tibia of the third, 1.6; patella and tibia of the fourth, 1.6; metatarsus and tarsus of the fourth, 1.6.

Cephalothorax high and convex, a little dilated behind dorsal eyes, sides nearly vertical in front, and rounded behind, more widely in ♂ than in ♀; cephalic part inclined; thoracic part slanting a little from dorsal eyes, and dropping abruptly near posterior border. Ocular area occupying two-fifths of cephalothorax, one-fourth wider than long, slightly wider in front than behind. Anterior eyes on a projecting ridge, all sub-touching, in a slightly curved row; lateral about one-half as large as middle eyes; eyes of second row half way between lateral and dorsal eyes; dorsal a little smaller than lateral eyes, further from each other than from lateral borders, forming a row narrower than the cephalothorax at that place. Clypeus retreating, one-third as high as middle eyes. Falces but little wider than the two middle eyes, about as long as face, inclined backward, parallel; fang extremely weak. Maxillæ parallel, but little enlarged at extremity, (♂) almost truncated, (♀) blunt, inner edge vertical. Labium one-half as long as maxillæ, narrow and hollowed at base, enlarged in middle, contracted at tip (♂) nearly twice as long as wide, (♀) but little longer than wide. Sternum one-half longer than wide, truncated in front, narrow and rounded behind. Anterior coxæ separated by more than the width of the labium. Legs all slender; femoral, tibial and metatarsal spines on all the legs, and patellary spines on the third and the fourth; metatarsi of the fourth spined throughout their length. Femoral joints of the first and second not enlarged, but compressed, especially in ♂.

*Coloration:* Cephalothorax dark brown; eye region black; central thoracic region covered with gray and rufus hairs; lower margin black; reddish rings around anterior eyes. Abdomen dark brown or black; a white central band arises at base, and enlarging and then again narrowing, reaches the central point of the dorsum; posterior to this two short, oblique, white bands form a chevron whose apex, pointing forward, touches the extremity of the central band; near the apex are several small white chevrons; there is a white band on each side. The white dorsal markings in the ♀ are sometimes broken up as in figure 50; usually they resemble those of the ♂. Clypeus, falces, mouthparts, sternum and venter brown, glabrous. Palpi and legs

sometimes dark brown, sometimes pale with brown rings. Coxæ pale.

*Habitat:* New York, Pennsylvania, Wisconsin, Iowa, Tennessee, and Alabama.

PROSTHECLINA CAMBRIDGII Nov. Sp.

Plate I, figure 51. Plate V, figures 51, 51a.

♂. Total length 5.2 mm. Width of abdomen 2 mm.

Cephalothorax: length 2.7; width 2; height 1.9.

Legs 6.4, 5, 6, 6; patella and tibia of the first, 2.5; patella and tibia of the third, 2.1; patella and tibia of the fourth, 2; metatarsus and tarsus 2.

♀. Total length 5.8; width of abdomen 2.5.

Cephalothorax: length 2.5; width 1.8; height 1.7.

Legs 4.8, 4.5, 5.3, 5.7; patella and tibia of the first, 2; patella and tibia of the third, 2; patella and tibia of the fourth, 2; metatarsus and tarsus of the fourth, 1.9.

Cephalothorax rather high, convex, slightly dilated behind dorsal eyes, sides vertical; cephalic part inclined; ocular area occupying a little less than one-half cephalothorax, less than one-fourth wider than long, a little wider in front than behind. Anterior row of eyes a little curved; the four eyes sub-touching; lateral more than one-half as large as middle eyes; eyes of second row halfway between lateral and dorsal eyes; dorsal smaller than lateral eyes, nearer to each other than to lateral borders, in a row scarcely narrower than the cephalothorax at that place. Clypeus vertical, one-third as high as middle eyes. Falces extending to inner edges of lateral eyes, but little longer than face, vertical, parallel, fang short, weak. Maxillæ parallel, enlarged and rounded at tip; labium nearly as wide as long, a little more than one-half as long as maxillæ, rounded. Sternum nearly round, truncated in front. Anterior coxæ separated by a little more than the width of labium. Legs of the first stoutest, of the second next; femoral, tibial and metatarsal spines on the four pairs, throughout the length of the articulation on metatarsi of the fourth.

*Coloration:* Cephalothorax black, with some gray hairs above the anterior eyes, a white parenthesis on the anterior part of the thoracic region, and white bands on the lower sides; abdomen greyish rufus with four black spots; clypeus, falces, and sternum black with short white hairs; mouthparts and coxæ rufus; legs of the first, dark, nearly black, of the second, third, and fourth, varied with black, white and rufus, palpi rufus with black tarsi; venter covered with gray hairs.

This species agrees with the genus *Prostheclina* Keys., excepting that the relative length of the legs in the ♂ is 1, 3, 4, 2; not 1, 4, 3, 2.

*Habitat:* Florida.

## ASTIA VITTATA HENTZ.

Plate I, figure 52, 52a. Plate V, figure 52, 52a.

- Syn.*: 1845. *ATTUS vittatus* H., Jour. Bost. Soc. Nat. Hist., Vol. V.  
 1845. " *niger* ( $\delta$ ) id., *ibid.*  
 1846. *PLEXIPPUS undatus* C. K., Die Arachn., XIII, p. 123.  
 1848. *MAEVIA pencillata* ( $\delta$ ) C. K., Die Arachn., XIV, p. 69.  
 1875. *ATTUS vittatus* H., Coll. Arachn. Writ. by N. M. Hentz. Ed.  
 by Burgess, Boston, p. 64.  
 1875. " *niger* ( $\delta$ ) id., *ibid.*, p. 63.

$\delta$ . Total length 7 mm. Width of abdomen 2.1 mm.

Cephalothorax: length 3; width 1.9; height 1.7.

Legs 5.4, 5, 5.1, 6.3; patella and tibia of the first, 2.8; patella and tibia of the third, 2.3; patella and tibia of the fourth, 2.8; metatarsus and tarsus of the fourth, 2.8.

$\delta$ . Total length 8 mm. Width of abdomen 2.8.

Cephalothorax: length 3.4; width 2.4; height 2.

Legs 5.7, 5.6, 6.3, 6.9; patella and tibia of the first, 3.6; patella and tibia of the third, 2.9; patella and tibia of the fourth, 3.2; metatarsus and tarsus of the fourth, 3.

Cephalothorax moderately high, nearly plane, dilated behind dorsal eyes, with sides nearly vertical in front, and rounded behind; cephalic part a little inclined forward; thoracic part slanting but little in the first half, steeply in the second. Ocular area occupying two-fifths of the cephalothorax, one-third wider than long, a little wider in front than behind; anterior eyes projecting forward, in a straight row; middle eyes touching; lateral one half as large as middle eyes, and slightly separated from them; eyes of second row half way between lateral and dorsal eyes; dorsal a little smaller than lateral eyes, further from each other than from the lateral borders, forming a row not quite so wide as the cephalothorax at that place. Clypeus ( $\delta$ ) one-half, ( $\varphi$ ) one-third as high as middle eyes, slightly inclined. Falces ( $\varphi$ ) but little wider than middle eyes, one-half longer than face, vertical, parallel;  $\delta$  weaker and shorter than in  $\varphi$ ; fang weak. Maxillæ parallel, enlarged and rounded at extremity; labium a little longer than wide, one-half as long as maxillæ, contracted and blunt at tip. Sternum nearly twice as long as wide, scarcely projecting between anterior coxæ; anterior coxæ almost touching. ( $\varphi$ ) first legs stoutest with femur, patella and tibia enlarged; ( $\delta$   $\varphi$ ) with spines on trochanters, femora, patellæ, tibiæ and metatarsi of the four pairs, those on the femora numerous at the distal ends; ( $\delta$ ) legs and spines weaker than in  $\varphi$ .

*Coloration.*  $\delta$ . Presenting two distinct varieties; the first has the thoracic part of the cephalothorax light brown and glabrous with a cen-

tral, longitudinal, black line, while the eye region is black with some short white hairs; the abdomen is mottled with black, red and white, sometimes with alternate white and red chevrons on the central region; clypeus white; falces, mouthparts, sternum and coxæ pale; venter covered with short white hairs; legs white with black spots and spines, and underneath on the femoral joints, characteristic, oblique, black bars; the second variety (*niger*) has the cephalothorax black, with a pale spot, divided by a longitudinal, black line, in the central thoracic region, and, on the posterior part of the eye region, forming a transverse row, three long tufts of black hairs; abdomen black; clypeus, palpi, falces, sternum, mouthparts, venter and sometimes coxæ very dark or black; legs pale, with a yellowish tint in comparison with the white legs of the first variety, tipped with black. Intermediate between these varieties is one which is nearly as dark as *niger*, with pale legs, but without the cephalic tufts. So unlike in general appearance are the extreme forms that they were placed by C. Koch in two different genera (*Plexippus undatus*, Die Arachniden, xiii, fig. 1183, and *Maevia pencillata*, Die Arachniden, xiv, fig. 1325). As this is an extremely common species we have compared large numbers of them, but have never found the tufts present in the first variety, which most resembles the ♀. ♀. Cephalothorax light brown in thoracic part, black in eye region, with short white and red hairs; abdomen white on sides and central dorsum, with two longitudinal bright red bands; in rubbed specimens the central region and sides are pale flecked and striped with reddish, and the bands are dark red; clypeus, falces, mouthparts, sternum, coxæ, palpi and legs pale; venter covered with short white hairs.

*Habitat*: United States.

ASTIA (?) MOROSA Nov. Sp.

Plate I, figure 53. Plate V, figures 53, 53a.

- ♂. Total length 5 mm. Width of abdomen 2.1 mm.  
 Cephalothorax: length 2.4; width 1.8; height 1.3.  
 Legs 5.4, 4, 5.1, 5.3; patella and tibia of the first, 2.5; patella and tibia of the third, 2.2; patella and tibia of the fourth, 2.2; metatarsus and tarsus of the fourth, 1.9.
- ♀. Total length 6 mm. Width of abdomen 3.2 mm.  
 Cephalothorax: length 2.9; width 2; height 1.7.  
 Legs 5.8, 4.9, 6.3, 6.8; patella and tibia of the first, 2.4; patella and tibia of the third, 2.3; patella and tibia of the fourth, 2.6; metatarsus and tarsus of the fourth, 2.4.



Cephalothorax high, especially behind, convex, a little dilated in the middle, with sides vertical in front and a little rounded behind; cephalic part plainly inclined; thoracic part slanting quite abruptly from a little behind dorsal eyes, the cephalothorax being evidently highest in the middle. Ocular area occupying a little more than one-third of cephalothorax, one-third wider than long, a little wider in front than behind. First row of eyes straight; middle eyes touching, lateral more than one-half as large as middle eyes, (♀) touching them, (♂) separated from them by one-fourth their own diameter; eyes of second row half way between dorsal and lateral eyes; dorsal as large as lateral eyes, (♂) equally distant from each other and lateral borders, (♀) a little nearer each other. Clypeus (♂) one-fourth, (♀) one-fifth as high as middle eyes, (♂) retreating, (♀) vertical. Falces as wide as the two middle eyes, (♂) a little longer than face, (♀) as long as face, parallel, inclined backward; fang weak, maxillæ parallel, narrow at base, enlarged at extremity, and truncated. Labium as wide as long, less than one-half as long as maxillæ, contracted at tip. Sternum nearly twice as long as wide, rounded in front, pointed behind. Anterior coxæ separated (♀) by width of labium, (♂) more widely. Legs (♂) of the first very slightly stouter than the others, (♀) equally stout; femoral, tibial and metatarsal spines on the four pairs; (♂) with patellary spines; metatarsi of the fourth spined throughout their length.

*Coloration:* ♂. Cephalothorax pale in thoracic part, much darker in eye region, probably originally covered with short white hairs; marginal line black; middle anterior eyes surrounded by rings of white hairs. Clypeus reddish brown. Abdomen with a black central longitudinal line over the anterior part of the dorsum, which bifurcates posteriorly, thus bounding a large triangular pale spot; this spot is limited behind by some irregular black marks; the sides are pale with black dots and spots. Falces, mouthparts, sternum and coxæ all light brown. Venter pale with black dots. Legs brown with black rings and tips, the color being considerably darker on the last three joints of the first leg. ♀. Cephalothorax and abdomen black, almost covered with mixed red and gray hairs; on the abdomen these hairs are thick at the base, and form three wide longitudinal bands, one central and two lateral, over the dorsum, and a large triangular spot behind the middle point; near the apex, on each side, are two white dots, the anterior larger and a little external to the posterior. Clypeus covered with short white hairs. Falces dark brown. Mouthparts, sternum and coxæ light brown. Legs and palpi brown with darker rings. Venter pale with irregular black dots.

*Habitat:* California.

MÆVIA CALIFORNICA Nov. Sp.

Plate V, figures 54, 54a.

♂. Total length 6 mm.

Cephalothorax: length 2.1; width 1.5; height 1.2.

Legs 5.7, 4.5, 4.5, 5.5; patella and tibia of the first, 2.3; patella and tibia of the third 1.9; patella and tibia of the fourth, 2.1; metatarsus and tarsus of the fourth, 2.

Cephalothorax high, convex; sides nearly parallel, almost vertical in front, and rounded behind; cephalic part very slightly inclined; thoracic slanting from just behind dorsal eyes. Ocular area occupying two-fifths of cephalothorax, one-third wider than long, equally wide in front and behind. Anterior eyes small, sub-touching, in a slightly curved row; middle scarcely twice as large as lateral eyes; eyes of second row a little nearer lateral than dorsal eyes; dorsal as large as lateral eyes, nearer to each other than to lateral borders, forming a row about as wide as cephalothorax at that place. Clypeus one-half as high as middle eyes, slightly inclined backward. Falces nearly as wide as first row of eyes, one and one-half times as long as face, parallel, slightly inclined backward; fang moderately long. Maxillæ parallel, enlarged at the extremity, with projection at outer corner. Labium less than one-half as long as maxillæ, as wide as long, rounded. Sternum plane, a little longer than wide, truncated in front, rounded behind. Anterior coxæ separated by width of labium. Legs of the first and second pairs stoutest with femoral joints compressed; tibial and metatarsal spines (stoutest on first and second), on the four pairs; metatarsi of the fourth spined throughout their length.

*Coloration:* Entire spider black, excepting the tarsi and sometimes the distal ends of the metatarsi, which are pale.

*Habitat:* California.

CYTÆA (?) MINUTA Nov. Sp.

Plate I, figure 55. Plate V, figures 55, 55a.

♂. Total length 4.8 mm. Width of abdomen 1.6 mm.

Cephalothorax: length 2.1; width 1.6; height 1.1.

Legs 4, 3, 3, 6, 3; cephalothorax much longer than patella and tibia of the first; patella and tibia of the third longer than patella and tibia of the fourth; patella and tibia of the fourth and metatarsus and tarsus of the fourth equal.

♀. Total length 5 mm. Width of abdomen 1.6 mm.

Cephalothorax: length 2.3; width 1.5; height 1.1.

Legs 3.8, 3.5, 4.1, 4.8; cephalothorax much longer than patella and tibia of the first; patella and tibia of the third shorter than patella and tibia of the fourth; patella and tibia of the fourth and metatarsus and tarsus of the fourth equal.

Cephalothorax low, flat, a little contracted behind, with sides nearly vertical in front, and slightly rounded posteriorly; cephalic part not inclined; thoracic part level in the first half, then falling steeply. Ocular area occupying a little less than two-fifths of cephalothorax, one-fourth wider than long, equally wide in front and behind. Anterior eyes sub-touching, in a straight row; middle scarcely twice as large as lateral eyes; eyes of second row halfway between lateral and dorsal eyes; dorsal as large as lateral eyes, further from each other, nearly as wide as cephalothorax at that place. Clypeus scarcely perceptible. Falces as wide as first row of eyes, a little longer than face, vertical, parallel; fang short and weak. Maxillæ parallel, enlarged at extremity, ( $\delta$ ) with small projection at outer corner. Labium more than one-half as long as maxillæ, longer than wide, contracted and rounded at tip. Sternum one-fourth longer than wide, truncated in front. Anterior coxæ separated by width of labium. Legs nearly equally stout; femoral, tibial and metatarsal spines on the four pairs; on tibiæ and metatarsi of the third and fourth more above than below; metatarsi of the fourth spined throughout their length.

*Coloration.*  $\delta$ . Cephalothorax with thoracic part dark brown, and cephalic part with short rufus and long black hairs, three reddish tufts appearing between the anterior eyes, which are surrounded by red rings; there are three longitudinal white bands, one central, running from the anterior eyes to the posterior border, and one on each lower side above the black marginal line. Clypeus covered with yellowish white hairs. Abdomen dark brown or blackish with a central longitudinal abbreviated white line not reaching the middle, and, on each side, a longitudinal white line which reaches beyond the middle, posterior to which are three transverse curved white marks, one behind the other. Falces and mouthparts dark brown. Palpi covered with thick white hairs above, and sparse black hairs below. Sternum, coxæ and legs light brown, the legs with darker rings, and tipped with black. Venter covered with white hairs.

$\delta$ . Cephalothorax resembling that of  $\delta$  but with a greater tendency to reddish color in the eye region, with the white of the bands not so clear, and with the central band extending only from the dorsal eyes to the posterior border. Abdomen dark brown or blackish, with a wide, notched, central, longitudinal white band extending nearly to the apex, just behind which, on each side, is a short, oblique, white line; there is a white transverse band at the apex, and, on each side of the dorsum, a longitudinal row of four or

five white spots. Palpi pale with white hairs. Other parts like ♂ excepting that the legs are paler.

*Habitat*: California.

## CYRBA TÆNIOLA HENTZ.

Plate I, figure 56. Plate IV, figure 56a. Plate V, figures 56, 56b.

*Syn.*: 1845. *ATTUS tæniola* H., Journal Bost. Soc. Nat. Hist. Vol. V.  
1875. " " id., Coll. Arachn. Writ. by N. M. Hentz.  
Ed. by Burgess, Boston, p. 56.

♂. Total length 4 mm. Width of abdomen 1.8 mm.

Cephalothorax: length 2.2; width 1.8; height 1.2.

Legs 4.8, 3.6, 3.6, 5.1; patella and tibia of the first, 2; patella and tibia of the third, 1.3; patella and tibia of the fourth, 2.2; metatarsus and tarsus of the fourth, 1.7.

♀. Total length 6.7 mm. Width of abdomen 2.2 mm.

Cephalothorax: length 2.7; width 2.1; height 1.2.

Legs 4.4, 3.6, 3.7, 4.9; patella and tibia of the first, 2; patella and tibia of third, 1.6; patella and tibia of the fourth, 2.3; metatarsus and tarsus of the fourth, 1.7.

Cephalothorax low, flat, sides nearly parallel, and almost vertical in front, rounded behind; cephalic part a little inclined; thoracic part almost level in anterior three-fourths, then falling abruptly. Ocular area occupying a little less than one-half cephalothorax, one-third wider than long, equally wide in front and behind. Anterior eyes projecting, in a straight row; middle eyes touching; lateral one-half as large, and scarcely separated from middle eyes; eyes of second row nearer lateral than dorsal eyes; dorsal not so large as lateral eyes, further from each other than from lateral borders, forming a row nearly as wide as cephalothorax at that place. Clypeus vertical, one-fifth as high as middle eyes. Falces but little wider than the two middle eyes, one-half longer than face, vertical, parallel; fang weak and short. Maxillæ widely separated, parallel, long, a little enlarged and rounded at extremity. Labium one-half as long as maxillæ, a little longer than wide. (♂) truncated, narrower than in ♀, (♀) blunt. Sternum not projecting between anterior coxæ, rounded in front and behind, (♂) one-fourth longer than wide, (♀) twice as long as wide. Anterior coxæ nearly touching. Legs of the first much the stoutest, with femoral joints compressed; tibial and metatarsal spines on the four pairs; metatarsi of the fourth spined throughout their length.

*Coloration*: Cephalothorax black, with lower margin white. Abdomen black with two longitudinal rows of white dots or abbreviated lines. Clypeus, falces, mouthparts, sternum, coxæ, palpi and venter black.

Legs of the first and second pairs black, excepting metatarsi and tarsi which are light rufus; third and fourth light rufus, excepting femoral joints which are black.

*Habitat*: Pennsylvania, South Carolina, Alabama, Georgia, Florida, Wisconsin.

## EPIBLEMUM SCENICUM CLERCK.

Plate 1, figure 57. Plate IV, figure 57.

- Syn.*: 1757. *ARANEUS scenicus* Cl., Sv. Spindl., p. 117 (saltem ad. part.)  
 1758. *ARANEA scenica* Linn., Syst. Nat., Ed. 10, I, p. 623, (saltem ad part.)  
 1778. “ *albo-fasciata* De Geer, Mem., vii, p. 287 (saltem ad part.)  
 1805. *ATTUS scenicus* Walck. Tabl. d. Aran., p. 24 (ad part.)  
 1806. *SALTICUS scenicus* Latr., Gen. Crust. et Ins., I, p. 123 (saltem ad part.)  
 1825. *ATTUS scenicus*, Walck., Faune Franc., Arachn., p. 44 (ad part.)  
 1827. “ “ Hahn. Monogr. Aran., 4, Pl. I, figs. A, B.  
 1831. *SALTICUS* “ *id.*, Die Arachn., I, p. 57 (saltem ad part.)  
 1832. *EPIBLEMUM faustum* Hentz, Am. Jour. Science and Arts, xxi, p. 108.  
 1833. *ATTUS scenicus* Sund., Sv. Spindl. Beskrifn., in Vet.-Akad. Handl. f. 1832, p. 202.  
 1837. *CALLIETHERA scenica* C. Koch, Uebers. d. Arachn-Syst., I, p. 31.  
 1837. “ *histrionica* id., ibid.  
 1846. “ “ *id.*, Die Arachn., xiii, p. 42.  
 1846. “ *scenica* id., ibid, p. 37.  
 1846. “ *anlica* id., ibid, p. 51.  
 1846. *SALTICUS propinquus* Lucus, Expl. Alg., Ar., p. 162.  
 1846. “ *albovittatus* id., ibid, p. 164.  
 1846. *EPIBLEMUM faustum* Hentz, Journal Bost. Soc. Nat. Hist., v, p. 367.  
 1856. *CALLIETHERA histrionica* Thorell; Rec. crit. Aran., p. 68.  
 1856. “ *scenica* id., ibid (ad part.)  
 1861. *SALTICUS scenicus* Blackw., Spid. of Gr. Brit., I, p. 47.  
 1869. *CALLIETHERUS histrionicus* Sim., Monogr. d. Att. d’Eur., p. 650 (184).  
 1870. *EPIBLEMUM histrionicum* Thorcel. on Eur. Spid., p. 211.  
 1872. *EPIBLEMUM scenicum* id., ibid, II, p. 360.  
 1876. *CALLIETHERA sceinca* Sim, Arachnides de France, III, p. 64.

1880. *EPIBLEMUM scenicum* Workman, Irish Spid., Belfast Nat. Hist. Soc., p. 16.  
 1883.       "       "       Campbell, Spid. of Hoddesdon, Hertfordshire Nat. Hist. Soc., p. 276.  
 1884. *CALLIETHERA scenica* Sim., Arachnides de Miranda de Ebro, Soc. Esp. de Hist. Nat., xiii, 114 (2).  
 1885.       "       "       *id.*, Arachnides de Tunisie, p. 3.

♂. Total length 4.9 mm. Width of abdomen 1.8 mm.

Cephalothorax: length 2.5; width 1.9; height 1.1.

Legs 3.9, 2.7, 2.7, 3.2.

♀. Total length 5.5 mm. Width of abdomen 1.8 mm.

Cephalothorax: length 2.2; width 1.3; height 1.2.

Legs 3.8, 2.5, 3.2, 4.

Cephalothorax moderately high, slightly convex, a little dilated behind dorsal eyes, with sides almost vertical in front, and rounded behind; cephalic part slightly inclined; thoracic part falling gradually until the last one-third and then steeply. Ocular area occupying a little more than one-third of the cephalothorax, one-third wider than long, equally wide in front and behind. First row of eyes straight; middle eyes touching; lateral one-half as large as middle eyes, and scarcely separated from them; eyes of second row halfway between lateral and dorsal eyes; dorsal nearly as large as lateral eyes, further from each other than from lateral border, forming a row scarcely narrower than the cephalothorax at that place. Clypeus vertical, one-fourth as high as middle eyes. Falces not quite so wide as first row of eyes, (♂) four times as long as face, horizontal, diverging, with two teeth on distal third; fang long; (♀) one and one-half as long as face, vertical, parallel, fang short. Maxillæ long, (♂) truncated at tip, slightly diverging; (♀) rounded; parallel. Labium a little longer than wide, slightly contracted at tip, (♂) less than one-half, (♀) more than one-half maxillæ. Sternum rounded behind, truncated in front, about twice as long as wide, relatively wider in ♂ than in ♀. Anterior coxæ separated by width of labium. Legs of the first pair a little the stoutest; metatarsal spines on the third and fourth in terminal circles; (♀) femoral and tibial spines as well.

*Coloration:* Cephalothorax dark brown, with clypeus and lower border white, and two white spots in the anterior thoracic region. Abdomen rufus, with a basal band and two slightly oblique bands on each side of dorsum white. Falces dark brown, mouthparts and sternum blackish, with white hairs; coxæ brown. Palpi and legs light brown, with darker rings. Venter blackish, with white hairs.

*Habitat:* North America, Europe, North Africa.

## ADMESTINA NOV. GEN.

Cephalothorax low and plane, a *little* widest opposite the middle of thoracic part, more contracted in front than behind, less than twice as long as wide, the cephalic and thoracic parts not separated. The thoracic part is twice as long as the cephalic part, and is truncated behind. In front the sides are nearly vertical while behind they are rounded. Quadrangle of eyes much wider — nearly twice — than long, and very little wider behind. Anterior row a little curved upward, the middle twice the lateral and near together; the lateral separated from the middle by almost one-half their own diameter. Second row small and placed two-fifths from the anterior lateral. Dorsal eyes slightly larger than lateral and as wide as the cephalothorax at that place; plainly further from each other than from the lateral borders. Clypeus one-half as high as the large middle eyes. Sternum nearly oval, not produced between the coxæ of the first pair, which are nearly touching. Maxillæ enlarged and blunt at the extremity. Labium as wide as long, and less than half of the maxillæ. Falces weak, wide as middle eyes, and a little longer than the face, vertical, parallel. Legs 4, 1, 3, 2; first pair stoutest; the tibia and patella of the first much shorter than the cephalothorax. Tibia and patella of the third shorter than tibia and patella of the fourth, the latter longer than the tarsus and metatarsus of the fourth. Legs without spines except on metatarsus of the first pair. Abdomen rather long and narrow. Nearest *Hyctia* Simon, but differs in the much greater width of the quadrangle of the eyes, in the quadrangle being wider behind, not parallel; and the relative length of the legs. The sternum is not narrow.

## ADMESTINA WHEELERII NOV. SP.

Plate I, figure 58. Plate V, figure 58.

- ♂. Total length 3.7 mm. Width of abdomen 1.2 mm.  
 Cephalothorax: length 1.6; width 1; height 6.  
 Legs 2.3, 1.9, 2.1, 2.7; patella and tibia of the first, 1; patella and tibia of the third, 8; patella and tibia of the fourth, 1; metatarsus and tarsus of the fourth, 8.  
*Coloration:* Cephalothorax and clypeus black. Abdomen pale, with a central longitudinal branching dark band. Falces and mouthparts dark brown. Sternum black. Coxæ dark brown, excepting those of the fourth pair which are pale. Venter pale with a wide, central dark band. Palpus brown. Legs pale with dark rings.  
*Habitat:* Wisconsin.

## HYCTIA PIKEI Nov. Sp.

Plate I, figure 59. Plate IV, figure 59a. Plate V, figure 59.

♂. Total length 8.2 mm. Width of abdomen 1.1 mm.

Cephalothorax: length 2.9; width 1.8; height .9.

Legs 7.1, 4, 3.6, 4.6; patella and tibia of the first, 3.1; patella and tibia of the third, 1.5; patella and tibia of the fourth, 1.9; metatarsus and tarsus of the fourth, 1.4.

♀. Total length 8.5 mm. Width of abdomen 1.1.

Cephalothorax: length 2.9; width 1.8; height .9.

Legs 6.3, 3.3, 3, 5; patella and tibia of the first, 2.8; patella and tibia of the third, 1.3; patella and tibia of the fourth, 2; metatarsus and tarsus of the fourth, 1.4.

Cephalothorax very low, flat, long and slender, being nearly twice as long as wide, contracted in front, the dilation beginning just in front of the dorsal eyes and increasing in the thoracic part; cephalic part plane, not inclined, sides vertical; thoracic part with sides a little rounded, sloping gradually from dorsal eyes to posterior margin. Ocular area occupying about one-third of cephalothorax, very little wider than long, equally wide in front and behind; anterior row of eyes distinctly visible from above, straight; lateral about one-third as large as middle eyes, scarcely separated from them; middle eyes touching; eyes of second row very small, halfway between lateral and dorsal eyes; dorsal smaller than lateral eyes, much farther from each other than from lateral borders, forming a row which is as wide as the cephalothorax at that place. Clypeus only a line. Falces extending in width to inner edges of lateral eyes, but little longer than face, vertical, parallel. Maxillæ parallel, long, narrow, truncated. Labium more than one-half as long as maxillæ, longer than wide, pointed. Sternum very long and narrow. Anterior coxæ (♂) very close together but separated by anterior end of sternum; (♀) separated by width of labium. Coxæ of fourth pair touching; second and third pairs of coxæ separated from each other by a considerable interval. First pair of legs much the longest and stoutest, with trochanters visible from above, and tibiæ enlarged. Femoral, tibial and metatarsal spines on the four pairs, and one small patellary spine on the first; spines on the tibiæ and metatarsi of the first very long and stout, on the third and fourth exceedingly weak and far apart. Abdomen, very long, slender and low.

*Coloration:* ♂. Cephalothorax very dark brown, blackish on eye region with some black hairs, and yellowish on the sides, with a black marginal line; abdomen with a wide, central, longitudinal, black band from base to apex, and some stiff black hairs at base; on each side below the black band, a band of whitish hairs; falces dark brown;



mouthparts light brown; sternum, coxæ and venter yellowish, first pair of legs dark brown, the others yellowish tipped with black. ♀. Much like ♂ but lighter in color; cephalothorax showing a slender, central, longitudinal black line from the middle of the cephalic to nearly the middle of the thoracic part; the central band on abdomen dark brown, the sides lighter, but not white; first legs darker than the others but lighter than in ♂.

Easily distinguished, as the abdomen is more than three times as long as wide.

*Habitat*: New York, South Carolina, Georgia, Florida.

#### MARPTUSA FAMILIARIS HENTZ.

Plate I, figure 60. Plate IV, figure 60a. Plate V, figure 60.

- Syn.*: 1845. *ATTUS familiaris*, H., Journal Bost. Soc. Nat. Hist., Vol. V.  
 1846. *MARPISSA undata*, C. K., Die Arachn. XIII, p. 60.  
 1846. “ *conspersa* (♂) id., ibid., XIII, p. 61.  
 1846. “ *varia*, id., ibid., XIII, p. 69.  
 1875. *ATTUS familiaris*, H., Coll. Arachn. Writ. by N. M. Hentz,  
 Ed. by Burgess, Boston, p. 56.

♂. Total length 9.5 mm. Width of abdomen 2.9 mm.

Cephalothorax: length 4.4; width 3.2; height 2.1.

Legs 10.6, 8.4, 8.2, 10; patella and tibia of the first, 4.4; patella and tibia of the third, 2.9; patella and tibia of the fourth, 3.3; metatarsus and tarsus of the fourth, 2.9.

♀. Total length 10.5 mm. Width of abdomen 3.5 mm.

Cephalothorax: length 4.5; width 3.5; height 1.8.

Legs 9, 7.7, 7.7, 9.1; patella and tibia of the first, 3.8; patella and tibia of the third, 3; patella and tibia of the fourth, 4; metatarsus and tarsus of the fourth, 2.9.

Ocular area occupying less than one-third of cephalothorax, nearly twice as wide as long, and equally wide in front and behind. Anterior eyes in a scarcely curved row, the lateral less than one-half as large as the middle eyes, and separated from them by one-half their own diameter, while the middle eyes are slightly separated from each other; eyes of the second row halfway between lateral and dorsal eyes; dorsal a little smaller than lateral eyes, placed (♂) a little, (♀) plainly further from each other than from the lateral borders, forming a row much narrower than the cephalothorax at that place. Clypeus nearly vertical, rather less than one-half as high as middle eyes. Falces extending, in width, to the inner edges of the lateral eyes; one-half longer than face, parallel, vertical; fang short. Maxillæ parallel, enlarged and rounded at extremity. Labium a little

more than one-half as long as maxillæ, as wide as long; contracted and blunt at tip. Sternum one-half longer than wide, a little narrower in front than behind. Anterior coxæ separated by scarcely the width of the labium. Femoral, tibial and metatarsal joints of the first and second pairs enlarged. Metatarsi and tarsi slender; femoral, tibial and metatarsal spines on the four pairs; metatarsi of the fourth spined throughout their length.

*Coloration:* Cephalothorax rufus, darkest in the eye region, with short dense gray hairs, and a few long black hairs on each side in front; lower borders black; abdomen dark brown with the central region occupied by a wide, light gray, scalloped, longitudinal band; clypeus covered with long white hairs; falces dark reddish brown; sternum brown; palpus with a short brush of black hairs; legs dark brownish red, covered with adpressed white and upright black hairs. Venter pale gray, with a central longitudinal brown band which tapers to a point near the apex.

*Habitat:* United States, Mexico.

#### MARPTUSA CALIFORNICA Nov. Sp.

Plate I, figure 61. Plate V, figure 61. Plate VI, figure 61 a.

- ♂. Total length 9.2 mm. Width of abdomen 2.4 mm.  
Cephalothorax: length 3.8; width 2.9; height 1.8.  
Legs 8.4, 7.4, 7.5, 8; patella and tibia, 3.6; patella and tibia of the third, 3; patella and tibia of the fourth, 3.5; metatarsus and tarsus of the fourth, 2.5.
- ♀. Total length 9 mm. Width of abdomen 2.4 mm.  
Cephalothorax: length 3.8; width 2.9; height 1.5; relative length of legs, 4, 1,  $\frac{2}{3}$ .
- Ocular area occupying a little more than one-third of cephalothorax, one-third wider than long, equally wide in front and behind. Anterior eyes in a slightly curved row; lateral one-half as large as middle eyes, separated from them by one-half their diameter; middle eyes sub-touching; eyes of second row very slightly nearer lateral than dorsal eyes; dorsal not quite so large as lateral eyes, (♂) slightly nearer each other than lateral borders, (♀) further from each other, forming a line narrower than cephalothorax at that place. Clypeus vertical, one-half as high as middle eyes. Falces rather short and weak, vertical, parallel. Maxillæ parallel, enlarged and rounded at extremity. Labium more than one-half as long as maxillæ, as wide as long, rounded at tip. Sternum nearly plane, one-third longer than wide, widest in middle. Anterior coxæ separated by a little less than the width of labium. Femoral, patellary and tibial joints of the first

and second pairs, enlarged; femoral, tibial and metatarsal spines on the four pairs; those on the metatarsus of the fourth, throughout their length.

*Coloration:* Cephalothorax very dark brown covered with gray hairs, with whitish hairs around the eyes; central upper surface of abdomen occupied by a wide, angular gray band; sides black with mixed gray and tawny hairs; clypeus with white hairs; sternum, coxae and mouthparts brown; sternum with some white hairs; falces brown; venter black; legs, excepting the tarsi, which are light in color, blackish with much gray and tawny hair.

*Habitat:* California.

MENEMERUS MELANOGNATHUS H. LUCAS.

Plate I, figures 62, 62a. Plate VI, figures 62, 62a.

- Syn.*: 1839. (?). *SALTICUS melanognathus* H. Lucas, Webb and Berthelot's Hist. Nat. des Iles Canaries, Tom. II, p. 29, pl. VII, fig. 4.
1846. *MARPISSA dissimilis* C. L. Koch, Die Arachn., XIII, p. 70, Tab. CCCCLIV, figs. 1135 and 1136.
1846. " *incerta* id.. *ibid.*, p. 73, Tab. CCCCLIV, fig. 1138.
1859. *SALTICUS convergens* Doleschall, Tweede Bijdr. Arachn. Indischen Archipel, p. 15, Tab. IX, fig. 4.
1863. *ATTUS muscivorus* A. Vinson, Araneides des Iles de la Reunion, etc., p. 47, Pl. X, fig. 1.
1867. *ATTUS foliatus* L. Koch, Arach., etc., Verhandl. zool. and bot. Ges., in Wien, 1867, p. 226.
1870. *SALTICUS nigro-limbatus* Cambridge, Proceed. Zool. Soc. of London, 1869, p. 542, Pl. XLII, fig. 10.
1873. " *nigro-limbatus*, id., Transact. of the Linn. Soc. of London, XXVII, p. 527.
1874. *MARPISSA nigro-limbatus*, id., Syst. list of Spiders of Gr. Britain and Ireland, *ibid.*, XXX, p. 333.
1876. " *nigro-limbatus*, E. Simon, Arachnides de France, T. III, p. 29.
1878. *ICIUS* (?) *convergens* Thorell, Studi, etc., II, Ragni di Amboina, pp. 232, 309.
1879. *MARPTUSA marita* Karsch, West-Afrik. Arachn. in Zeitschr. f. die gesamt. Naturwissensch, LII, p. 338.
1879. *MENEMERUS foliatus* L. Koch, Arachn. Australiens, p. 1123, T. XCVIII, figg. 1, 2.
1881. *ICIUS* (?) *dissimilis* Thorell, Studi, etc., III, Ragni Malesi e. Papuani, p. 461.
1883. *ATTUS manni* Peckham, New or little known spiders of the family Attidæ, p. 27, Pl. III, fig. 21.
1883. *MENEMERUS melanognathus* E. Simon, Arachn. de l'Ocean Atlantique, Soc. Entom., France, pp. 284, 306.

We have *Attus muscivorus* Vinson from both Madagascar and Reunion, and find it to be identical with *M. melanognathus*.

♂. Total length 8 mm. Width of abdomen 2.7 mm.

Cephalothorax: length 3.3; width 2; height 1.3.

Legs 7.8, 7.2, 5.9, 7.9; patella and tibia of the first, 3.6; patella and tibia of the third, 2.2; patella and tibia of the fourth, 3; metatarsus and tarsus of the fourth, 2.3.

♀. Total length 9.5 mm. Width of abdomen 3.6 mm.

Cephalothorax: length 3.8; width 3; height 1.5.

Legs 6.8, 6.5, 7.4, 8.5; patella and tibia of the first, 2.8; patella and tibia of the third, 2.5; patella and tibia of the fourth, 3.3; metatarsus and tarsus of the fourth, 3.

Cephalothorax low and flat, dilated behind dorsal eyes, with sides almost vertical in front and rounded widely behind; cephalic part scarcely inclined; thoracic part slanting very gradually until near the posterior border. Ocular area occupying less than two-fifths of cephalothorax, one-fourth wider than long, equally wide in front and behind. First row of eyes straight; middle eyes sub-touching; lateral rather more than one-half as large as middle eyes, and slightly separated from them; eyes of second row half way between lateral and dorsal eyes; dorsal as large as lateral eyes, further from each other than from lateral borders, forming a row narrower than the cephalothorax at that place. Clypeus scarcely one-fifth as high as middle eyes, vertical. Falces nearly as wide as the first row of eyes, more than twice as long as face, vertical, diverging a little at the extremities. Maxillæ parallel, long, narrow at base, rounded. Labium two-thirds as long as maxillæ, twice as long as wide, a little shorter in ♀ than in ♂, rounded at tip. Sternum deep set, nearly twice as long as wide, contracted in front, rounded behind. Anterior coxæ separated (♂) by about the width of the labium, (♀) a little less. Legs of the first pair a little stoutest. Femoral, tibial and metatarsal spines on the four pairs; metatarsi of the fourth spined throughout their length.

*Coloration:* Cephalothorax dark brown, with rufus hairs over anterior eyes, a wide white band low on each side, and a large patch of white hairs on the central thoracic region. Clypeus dark in the middle, with an oblique line of white hair on each side, these lines beginning below the anterior lateral eyes and extending over the clypeus and along the inner edges of the dark brown falces. Abdomen dark rufus with two wide longitudinal white bands composed of both short and long white hairs, and two black chevrons at the apex. Palpus with femur covered with white hairs, and tarsus black. Legs rufus with dark rings and a good many white hairs. Mouthparts, sternum and coxæ very dark, with white hairs. Venter gray with a wide central rufus band.

*Habitat:* Cosmopolitan. Florida, Mexico, Guatemala, Brazil, Islands of the Atlantic, England, France, Africa, Madagascar, Australia, Malay Archipelago.

## MENEMERUS PAYKULLII AUD.

Plate I, 63. Plate VI, figures 63, 63a.

- Syn.*: 1825-27. *ATTUS paykullii* Aud. in Sav. Descr. de l' Egypte, 2. Edit., XXII, p. 172.
1837. " " Walck., Hist. Nat. des Insectes Aptères, I, p. 426.
1837. " *ligo* id., ibid., p. 426.
1845. " *binus* Hentz, Journal Bost. Soc. Nat. Hist., Vol. V.
1846. *PLEXIPPUS ligo* C. K., Die Arachn., XIII, p. 107.
1849. *SALTICUS vaillantii* Lucas, Expl. de l' Algerie Zool., I, p. 136.
1863. *ATTUS africanus* Vinson, Aran. des iles de 'la Réunion, Maurice et Madagascar, p. 52.
1865. *EUOPHRYS delibuta* L. Koch, Verhandl. d. zool. bot. Ges. in Wien, p. 874.
1875. *ATTUS binus* Hentz, Coll. Arachn. Writ. by N. M. Hentz, ed. by Burgess, Boston, p. 54.
1876. *HASARIUS paykullii* Sim., Arachnides de France, III, p. 81.
1881. *MENEMERUS* (?) " Thorell. Studi Sui Ragni Mal. et Pap., III, p. 501.
1881. " " Keyserling, Koch and Keyserling's, Die Arachn. Austral., p. 1461.
1885. " " Sim., Faune Archnologique de l' Asie Mérid., Bull. de la Soc. Zool. de France, p. 7.

We have *Attus africanus* Vinson from Madagascar and find it identical with *M. paykullii*.

♂. Total length 9 mm. Width of abdomen 2.7 mm.

Cephalothorax: length 4.5; width 3.1; height .2.

Legs 11, 9.2, 9.5, 10.5; patella and tibia of the first, 5; patella and tibia of the third, 3.5; patella and tibia of the fourth, 4; metatarsus and tarsus of the fourth, 4.

Cephalothorax high, convex, a little dilated behind dorsal eyes, with sides nearly vertical in front, and rounded behind; cephalic part inclined; thoracic part falling gradually from a little way behind dorsal eyes nearly to posterior border, then abruptly. Ocular area occupying two-fifths of cephalothorax, one-fourth wider than long, slightly wider in front than behind. Anterior eyes all projecting, in a curved row; middle eyes subtouching; lateral rather more than one-half as large as middle eyes, separated from them by one-third their own diameter; eyes of second row a little nearer lateral than dorsal eyes; dorsal smaller than lateral eyes, equally distant from each other and the lateral borders, forming a row narrower than the cephalothorax

at that place. Clypeus retreating, one-half as high as middle eyes. Falces not much wider than the two middle eyes, three times as long as face, vertical, parallel; fang not long. Maxillæ parallel, enlarged and rounded at extremity. Labium one-half as long as maxillæ, a little longer than wide, contracted and blunt at tip. Sternum nearly twice as long as wide, rounded behind, slightly contracted in front. Anterior coxæ separated by nearly the width of the labium. Legs of the first and second pairs stoutest; with femoral joints enlarged and compressed; femoral, patellary, tibial and metatarsal spines on the four pairs, those on third and fourth especially stout; metatarsi of the fourth spined throughout their length. There are some stout femoral spines on the palpus.

*Coloration:* Cephalothorax and abdomen white, with two wide longitudinal black bands extending from anterior eyes to spinnerets, and two white dots, one on each band, on the posterior part of the abdomen. Clypeus covered with white and rufus hairs; a reddish band extending from each anterior lateral eye downward to the lower border. Falces brown with fringes of white hairs on the inner borders. Mouthparts dark brown. Sternum and coxæ light brown. Venter black with a white band on each side. Palpi and legs light brown (legs of the first pair darkest) with white hairs and black spines.

*Habitat:* Florida, Guatemala, New Grenada (from collection of Count Keyserling), Europe, North Africa, India, Malay Archipelago, Australia, Madagascar.

#### HOMALATTUS (WHITE) 1841.

Cephalothorax rather low, as wide as long, flat above, a little contracted in front, the contraction beginning opposite the dorsal eyes, and truncated in front and behind, where it is hollowed to receive the anterior margin of the abdomen. Sides gently rounded. Cephalic part occupying about two-thirds of cephalothorax, not separated from thoracic part. Thoracic part level in the first half and then falling abruptly; this slanting portion being concealed by the overlapping abdomen gives the cephalic part, when looked at from above, an appearance of exaggerated length. Quadrangle of eyes much wider behind than in front, and, behind, one-third wider than long. First row of eyes straight or slightly curved; middle eyes near together; lateral one-half as large, and separated from the middle eyes, sometimes by more than one-half their own diameter. Eyes of second row at least twice as far from dorsal as from lateral eyes. Dorsal eyes as large as lateral, much further from each other than from lateral borders (often twice as far), forming a row as wide as cephalothorax at that place. Clypeus from one-fourth to one-half as high

as middle eyes. Maxillæ enlarged at extremity. Labium one-half as long, sometimes as wide as long, sometimes longer than wide. Sternum longer than wide, sometimes truncated in front, projecting between anterior coxæ. Anterior coxæ separated sometimes by more, sometimes by less, than width of labium.

The genus *Homalattus* is nearest *Ballus* from which it is not readily distinguished. The greater length of the cephalic part (two-thirds of cephalothorax instead of one-half as in *Ballus*) and the shape of the thoracic part enable one to decide. *Ballus* has the thoracic part contracted and the dorsum falling gently from the dorsal eyes; in *Homalattus* the sides are not contracted, and the fall, which does not begin at the dorsal eyes, is very abrupt. In *Zygoballus* the cephalothorax is very high and the thoracic part falls steeply from the dorsal eyes. *Rhanis* C. K., *Rhene* Thorell, and *Rhene* Tacz. are identical with *Homalattus* W.

#### HOMALATTUS CYANEUS HENTZ.

Plate I, figure 64. Plate VI, figures 64, 64a.

- Syn.*: 1845. *ATTUS cyaneus* Hentz, Journal Bost. Soc. Nat. Hist., Vol. V.  
 1848. *MAEVIA chrysea* C. Koch, Die Arachn., XIV, p. 83.  
 1875. *ATTUS cyaneus* Hentz, Coll. Arachn. Writ. by N. M. Hentz ed. by Burgess, Boston, p. 69.  
 1885. *HOMALATTUS septentrionalis* Keys., Neue Spinnen aus Amerika, VI, Verhandl. zool. bot. Gesel. in Wien, p. 29 (515).

♂. Total length 4.8 mm. Width of abdomen 1.2 mm.

Cephalothorax: length 1.8; width 1.5; height .7.

Legs 3.1, 2.2, 2, 2.5; patella and tibia of the first, 1.4; patella and tibia of the third, 8; patella and tibia of the fourth, 1; metatarsus and tarsus of the fourth, 1.

♀. Total length 4.6 mm. Width of abdomen 2.3 mm.

Cephalothorax: length 1.8; width 1.7.

Legs 3, 2.2, 2.4, 3.2; patella and tibia of the first, 1.2; patella and tibia of the third, 8; patella and tibia of the fourth, 1.1; metatarsus and tarsus of the fourth, 1.

Quadrangle of eyes barely one-third wider than long. First row of eyes straight. Anterior lateral separated from middle eyes by one-half their own diameter. Eyes of second row very small, and placed fully twice as far from dorsal as from lateral eyes. Clypeus one-half as high as middle eyes. Falces as wide as first row of eyes, one and one-half times as long as face, vertical, parallel, anterior surface plane. Maxillæ truncated. Labium one-half as long as maxillæ, about as wide as long, contracted and rounded at tip. Sternum oval, nearly

twice as long as wide. Anterior coxæ separated by about the width of the labium. First leg with femur, patella and tibia enlarged. Femoral, tibial and metatarsal spines on the four pairs.

*Coloration.* Our specimens are somewhat damaged: the ♂ has the scales all rubbed off and appears entirely black excepting some yellowish hairs on the clypeus, and pale rings on the metatarsi of the second, third and fourth legs. On the cephalothorax and abdomen of the ♀ there are left a few yellowish white, somewhat metallic scales; otherwise it is like the ♂. Hentz describes this species as brassy-green.

Count Keyserling has kindly sent us a specimen of his *H. septentrionalis* and we find it identical with *cyaneus*.

*Habitat:* Iowa, New York, Pennsylvania, Massachusetts, North Carolina, Alabama, Georgia, Nebraska.

#### BALLUS YOUNGII Nov. Sp.

Plate I, figure 66. Plate VI, figures 66, 66a, 66b.

♂. ♀. Total length 2.8 mm. Width of abdomen 1.4 mm.

Cephalothorax: length 1.5; width 1.2; height .6.

Legs 1.9, 1.7, 1.6, 2.1. Cephalothorax a little longer than patella and tibia of the first; patella and tibia of the third shorter than patella and tibia of the fourth; patella and tibia of the fourth longer than metatarsus and tarsus of the fourth.

Cephalothorax low, plane, a very little dilated behind middle, with sides vertical in front and slightly rounded behind; cephalic part not inclined; thoracic part not slanting until it reaches the posterior border, where it is truncated and a little hollowed. Ocular area occupying nearly one-half cephalothorax, one-third wider than long, slightly wider behind than in front. Anterior eyes touching, in a straight row; middle twice as large as lateral eyes; eyes of second row half-way between lateral and dorsal eyes; dorsal as large as lateral eyes, further from each other than from lateral borders, forming a row as wide as cephalothorax at that place. Clypeus much inclined backward, two-thirds as high as middle eyes. Falces very weak, about as long as face, parallel, inclined backward; fang very weak. Maxillæ parallel, short, wider and truncated at extremity. Labium short, twice as wide as long, rounded. Sternum oval, rather short. Anterior coxæ separated by width of labium; coxæ of the fourth touching. Legs of the first and second pairs stoutest, with femoral joints compressed; inferior rows of spines on the tibiæ and metatarsi of the four pairs. Anterior end of abdomen fitting into excavation at posterior end of cephalothorax.



*Coloration:* Cephalothorax, clypeus, abdomen and venter black, thinly covered with short yellow hairs; on the abdomen the thickening of these hairs forms two yellow spots on the anterior part, and three transverse yellow bands. Falces, mouthparts, sternum and coxæ light brown. Palpi and legs brown with some short yellow hairs.

The following remarks are from a letter written by Col. John J. Young, of Allegheny, Pa., to whom we are indebted for this species:

"These spiders are found at this season (November) under the bark of trees, usually hickory and sycamore. You will note that the general color of the spider corresponds with the rusty brown of the under side of the bark of the shag-bark hickory when first pulled off. In that hibernating locality it covers itself with a thin bluish envelope. The spider is so nearly of the bark color, and so small that we would often overlook the speck in the centre of the envelope, supposing it to be merely the empty tube or cell of some young spider."

*Habitat:* Pennsylvania.

#### NEON NELLII NOV. SP.

Plate I, figure 65. Plate VI, figure 65.

♂. Total length 2.5 mm. Width of abdomen 1.2 mm.

Cephalothorax: length 1.3; width .9; height .5.

Legs —, 1.8, 2.1, 2.9.

♀. Juv. legs 4, 3, 1, 2.

Cephalothorax not high, convex, a little contracted behind dorsal eyes, sides nearly vertical in front, rounded behind; cephalic part much inclined; thoracic part sloping from just behind dorsal eyes. Ocular area occupying more than one-half cephalothorax, less than one-fifth wider than long, equally wide in front and behind. First row of eyes straight, all four touching; lateral one-half as large as middle eyes; eyes of second row a little nearer lateral than dorsal eyes; dorsal larger than lateral eyes, further from each other than from lateral borders, forming a row as wide as cephalothorax at that place. Clypeus slightly inclined, about one-fourth as high at middle eyes. Falces not as wide as two middle eyes, short, parallel, vertical; fang very weak. Maxillæ nearly parallel, rather long, rounded; labium wider than long, about one-third as long as maxillæ. Sternum convex, triangular, truncated in front. Anterior coxæ separated by more than width of labium. First legs stoutest; femoral, tibial and metatarsal spines on the four pairs; metatarsi of the fourth spined throughout their length.

*Coloration:* Cephalothorax brown, darkest in eye region. Abdomen brown with pale spots and chevrons. Palpi and legs pale with black rings; first legs darkest; remaining parts dark brown or black.

This species agrees with the genus *Neon* as defined by Simon, excepting that all the legs are spined.

*Habitat:* Pennsylvania, Canada (Collection of J. B. Tyrrell.)

#### ZYGOBALLUS SEX-PUNCTATUS HENTZ.

Plate I, figure 67. Plate VI, figures 67, 67a.

*Syn.:* 1844. *ATTUS sex-punctatus* H., Journal Bost. Soc. Nat. Hist., Vol. IV.  
1875. " " id., Coll. Arachn. Writ. by N. M. Hentz.  
Ed. by Burgess, p. 54.

Total length 3 mm. Width of abdomen .8 mm.

Cephalothorax: length 1.8; width 1.6; height .8.

Legs 3.7, 2.2, 2, 3.

Cephalic part growing wider to the dorsal eyes; general appearance from above quadrangular, with projecting corners behind dorsal eyes; dorsal eyes placed on sides, below dorsum, forming a row wider by the amount of their projection than the cephalothorax at that place. Middle anterior eyes touching, lateral sub-touching; dorsal as large as lateral eyes. Labium two-fifths as long as maxillæ, as wide as long. Metatarsi of the third and fourth legs with only terminal circles of spines.

*Coloration:* Cephalothorax black with a spot of white hairs in front of each dorsal eye, and one between the dorsal eyes. Clypeus black, thinly covered with white hairs. Abdomen black with a white basal band and six white spots, two on each side near the middle of the dorsum, and two near the apex. Palpi and falces brown. Legs reddish or brown, first and fourth pairs darker than second and third. Under side black, with some white hairs on sternum and venter.

*Habitat:* North Carolina, Georgia, Florida.

#### ZYGOBALLUS BETTINI Nov. Sp.

Plate I, figures 68, 68a. Plate VI, figures 68, 68a, 68b.

♂. Total length 4.2 mm. Width of abdomen 1.7 mm.

Cephalothorax: length 1.8; width 1.3; height 1.3.

Legs 4.9, 3.3, 3, 4.4.

♀. Total length 4.4 mm. Width of abdomen 2 mm.

Cephalothorax: length 1.8; width 1.4; height 1.1.

Legs 4.4, 3.2, 3, 4.5.

Clypeus inclined backward. Falces ( $\delta$ ) nearly as wide as first row of eyes, twice as long as face, inclined forward, diverging; fang long; ( $\varphi$ ) extending only to inner edges of lateral eyes; one and one-half times as long as face, vertical, parallel; fang small. Maxillæ ( $\delta$ ) widest in middle, blunt at tip, cut obliquely on inner side; ( $\varphi$ ) a little widest at extremity, rounded. Labium one-half as long as maxillæ, ( $\delta$ ) longer than wide, ( $\varphi$ ) as wide as long. Legs without patellary spines, excepting one on the first leg, ( $\delta$ ) coxæ and trochanter of the first elongated.

*Coloration:*  $\delta$ . Cephalothorax bronze brown; eye region covered with reddish gold metallic scales; anterior faces of falces, clypeus and sides of cephalothorax as far back as second row of eyes, covered with white scale-like hairs. Abdomen bronze, with a silvery white band passing around base and downward onto the sides; a second white band, on each side, curves over the side from the upper to the under surface, and on the posterior dorsum are two more short curved white bands, these last being semi-circular in form. Mouth-parts, sternum and venter brown. First leg with elongated coxa and trochanter, as well as the femur, dark mahogany color; the other joints and all the other legs yellowish white.

$\varphi$ . Cephalothorax bronze brown with metallic scales on eye region as in  $\delta$ . Anterior eyes surrounded by rings of reddish yellow hair. Abdomen brown; a white band passes around the base and extends on to the sides; beyond the termination of this are two short white bars on each side; on the anterior half of the dorsum is a wide longitudinal band composed of reddish golden scales; the posterior edge of this band is notched. Behind the band are two chevrons of the same scales, and two short bands, one on each side of the spinnerets; two black spots are found in front of the first, and two more behind the second chevron. Femur of the first leg mahogany color; other joints and all the other legs white with some dark rings and spots.

*Habitat:* Wisconsin, Missouri, Georgia, Florida

#### AGOBARDUS ANORMALIS KEYSERLING.

Plate I, figure 69. Plate VI, figure 74.

1885. AGOBARDUS *anormalis* Keys., Neue Spinnen aus Amerika, VI, Verhandl. zool. bot. Gesel. in Wien, p. 33 (519).

$\delta$ . Total length 4.7 mm. Width of abdomen 1.4 mm.

Cephalothorax: length 2.6; width 2.

Legs 6.7, 4.9, 5.5, 5.6; patella and tibia of the first, 2.3; patella and tibia of the third, 1.9; patella and tibia of the fourth, 1.9; metatarsus and tarsus of the fourth, 2.

$\varphi$ . Total length 4.6 mm. Width of abdomen 1.7 mm.

Cephalothorax: length 2.1; width 1.6.

Legs 3.8, 3.3, 4.6, 4.8; patella and tibia of the first, 1.4; patella and tibia of the third, 1.6; patella and tibia of the fourth, 1.8; metatarsus and tarsus, 1.7.

Cephalothorax very high at dorsal eyes but, in front, not higher than clypeus and lateral eye, on account of the steep inclination of the cephalic part. Sides nearly parallel, a very little dilated in the middle, vertical in front, rounded behind; thoracic part falling steeply from dorsal eyes. Quadrangle of eyes occupying one-half of cephalothorax, twice as wide as long, equally wide in front and behind. First row of eyes much bent; middle eyes sub-touching; lateral a little more than one-half as large, separated from them by one-half their own diameter. Eyes of second row a very little nearer lateral than dorsal eyes. Dorsal as large as lateral eyes, equally distant from each other and the lateral borders, forming a row as wide as cephalothorax at that place. Clypeus one-fifth as high as middle eyes. Falces extending to inner edges of lateral eyes, one and one-half times as long as face, inclined backward, a little diverging; fang weak. Maxillæ slightly diverging, enlarged and rounded at extremity. Labium one-half as long as maxillæ, as wide as long. Sternum nearly as wide as long, oval, projecting between anterior coxæ. Anterior coxæ separated by nearly the width of the labium. Legs of the first pair a little stoutest. Femoral, patellary, tibial and metatarsal spines on the four pairs; those on metatarsi of the fourth extending to base.

*Coloration:* Cephalothorax brown with a lighter central longitudinal band in thoracic part, in the midst of which is a spot of white hairs; the eyes are placed in black spots; the anterior part of the cephalic plate, the lower sides, and the clypeus are covered with white hairs; the lower margin is black. Abdomen brown, with a curved white basal band and a central wide white longitudinal band which is often indistinct in the anterior part, and is interrupted behind by a slender brown transverse curved band; this middle band gives off on either side two short white spots which are longer than wide, one in the middle of the first half, the other, oblique, just in front of the spinnerets. Venter dark brown or black with a white band behind and on the sides. Palpi yellowish brown excepting the last two joints which are black, with black hairs. Falces, mouthparts, sternum coxæ and legs reddish brown.

*Habitat:* United States.

## ATTUS CAUTUS NOV SP.

♂ Juv. Total length 4.5 mm. Width of abdomen 1.6 mm.

Cephalothorax: length 2, width 1.5; height 9.

Legs 3, 3.2, 3.7, 4. Cephalothorax much longer than patella and tibia of the first; patella and tibia of the third shorter than patella and tibia of the fourth; patella and tibia of the fourth and metatarsus and tarsus of the fourth equal.

Cephalothorax moderately high, slightly convex, a little contracted behind, with sides vertical in front and rounded behind; cephalic part slightly inclined; thoracic falling gradually in the first two-fifths, then steeply. Ocular area occupying nearly one-half cephalothorax, one-third wider than long, equally wide in front and behind. Anterior eyes sub-touching, in a slightly curved row, the middle twice as large as the lateral eyes; eyes of second row halfway between lateral and dorsal eyes; dorsal as large as lateral eyes, a little further from each other than from lateral borders, forming a row as wide as cephalothorax at that place. Clypeus inclined backward, one-third as high as middle eyes. Falces as wide as the two middle eyes, as long as face, vertical, parallel. Maxillæ enlarged and blunt at extremity, parallel. Labium two-thirds as long as maxillæ, perhaps a little longer than wide, contracted and rounded at tip. Sternum one-fourth longer than wide, truncated in front. Anterior coxæ separated by more than width of labium. Legs of the first and second pairs slightly stoutest; femoral, tibial and metatarsal spines on the four pairs; metatarsi of the fourth spined throughout their length.

*Coloration:* Cephalothorax black with lower sides white, a white band above anterior eyes, another behind dorsal eyes, and a white spot in the middle of the cephalic part. Clypeus and falces covered with white hairs. Abdomen with the anterior third and the apex black, while the remaining portion is covered with bright yellowish brown hairs; there are four transverse white bands; two cross the anterior black region, one the brown region, and one separates the brown from the black region at the apex. Palpi light brown with thin white hairs. Mouthparts and coxæ light brown or pale. Sternum dark brown. Venter brown with a whitish longitudinal band on each side. Legs brown with blackish bands and some short white hairs.

Not wishing to found a new genus upon an immature specimen we put this species in the genus *Attus* Walck.

*Habitat:* Mexico.

## SYNEMOSYNA (HENTZ) 1832.

Cephalothorax low, twice as long as wide, rounded and narrower behind; thoracic and cephalic part not separated; thoracic part plainly divided by two transverse constrictions and much longer than cephalic—sometimes twice as long. Quadrangle of eyes but little wider than long and a little wider behind than in front. First row of eyes a little curved; middle eyes touching, and three times as large as lateral eyes, from which they are slightly separated. Eyes of second row small and a little nearer lateral than dorsal eyes. Dorsal eyes larger than lateral and further from each other, than from lateral borders, forming a row as wide as cephalothorax at that place. Clypeus about one-fourth as high as middle eyes. Falces short, rather weak, vertical, parallel; fang weak. Maxillæ slightly enlarged and truncated at extremity, about twice as long as labium. Labium as wide as long, rounded. Sternum long, rather narrow, truncated in front, contracted behind, projecting between anterior coxæ. Anterior coxæ separated by at least the width of the labium at its base. Legs (♂) 4, 1, 3, 2, (♀) 4, 3, 1, 2, all slender; tibiæ and metatarsi of the first and the second, with two rows of inferior spines. Abdomen long, rounded, slender, with a marked constriction; pedicle of abdomen visible from above. *Synemosyna* differs from the other genera of ant-like Attidæ, in the following respects: *Synageles* Sim., *Leptorchestes* (Thorell) Sim., *Damoetas* Peckham, all have the quadrangle of the eyes longer than wide, and the constriction of the cephalothorax wanting, or, if present, very slight, and separating the cephalic and thoracic parts. *Agorius* Thorell has the patella of the first leg much elongated. *Paradamoetas* Peckham has no constriction of the cephalothorax. The last two genera resemble *Synemosyna* in having the quadrangle a little wider than long. It is nearest *Salticus* (Latr.) Sim.; *Salticus*, however, has the cephalic part on a higher plane than the thoracic, and the greater length of the maxillæ, and the labium being much longer than wide also distinguish it from *Synemosyna*.

## SYNEMOSYNA FORMICA HENTZ.

Plate VI, figures 70, 70a.

- Syn.*: 1845. *SYNEMOSYNA formica* H., Journal Bost. Soc. Nat. Hist., Vol. V.  
 1846. *JANUS gibberosus* C. K., Die Arachniden, XIII, p. 21.  
 1875. *SYNEMOSYNA formica* H., Coll. Arachn. Writ. by N. M. Hentz. ed. by Burgess, Boston, p. 73.  
 1883. *SYNEMOSYNA formica* Peckham, Descr. new or little known Attidæ of U. S., p. 30.

♂. Total length 3.9 mm. Width of abdomen 7mm.

Cephalothorax: length 1.8; width .8; height .7.

Legs 3, 2.2, 2.5, 3.2; patella and tibia of the first, 1; patella and tibia of the third, .9; patella and tibia of the fourth, 1.3; metatarsus and tarsus of the fourth, 1.2.

♀ Total length 5.4 mm. Width of abdomen 1.8 mm.

Cephalothorax: length 2.2; width .7; height .8.

Legs 2.7, 2.2, 2.8, 3.5; patella and tibia of the first, 1; patella and tibia of the third, 1.1; patella and tibia of the fourth, 1.7; metatarsus and tarsus of the fourth, 1.5.

Cephalothorax with one constriction a little way behind the dorsal eyes, and another just in front of the juncture of the thoracic part with the abdominal pedicle; abdomen with a deep constriction before the middle, posterior to which it is enlarged and rounded.

*Coloration:* Cephalothorax brown, lighter on the upper surface, sometimes blackish on the sides, smooth, glabrous, with a few short white hairs in the eye region; abdomen in front of the constriction pale rufus, with a darker longitudinal band on the upper surface; behind the constriction black with a pale band, which is narrow in the ♂, but in the ♀ is wider, occupying the anterior sides and curving downward under the venter; clypeus blackish; falces black with pale edges; maxillæ and labium black, edged with white; sternum pale anteriorly, blackish behind; venter pale in front, black toward apex. Legs of the first pair pale with an internal and external black line on the femur, patella and tibia; second all pale; third pale, excepting femur, which is light rufus; fourth femur rufus, patella pale at proximal, blackish at distal end, tibia proximal end blackish, shading into pale toward metatarsus, metatarsus and tarsus pale.

*Habitat:* United States.

#### SYNAGELES PICATA HENTZ.

Plate VI, figure 71.

*Syn.*: 1845. *SYNEMOSYNA picata* H., Journal Bost. Soc. Nat. Hist. Vol. V. 1875. " " id., coll. Arachn. Writ by N. M. Hentz, ed. by Burgess, Boston, p. 75.

♀. Total length 4.2 mm. Width of abdomen 1.5 mm.

Cephalothorax: length 2; width .9; height .7.

Relative length of legs 4, 3, 1, 2.

Ocular area occupying a little more than one-half of cephalothorax, plainly longer than wide, and a little wider behind than in front. Anterior row of eyes very slightly curved; lateral less than one-half as large

as middle eyes, and slightly separated from them; eyes of second row twice as far from dorsal as from lateral eyes; dorsal eyes further from each other than from lateral borders. Clypeus fully one-half as high as middle eyes, vertical. Falces extending in width to inner edges of lateral eyes, a little longer than face, vertical, parallel. Maxillæ enlarged and blunt at extremity; labium semi-circular. Sternum twice as long as wide, contracted in front and behind. Anterior coxæ separated by scarcely the width of the labium. Abdomen with a constriction in front of the middle.

*Coloration:* Eye-region black with violet reflections; thoracic part reddish-brown with a short, transverse white band behind dorsal eyes. Anterior segment of abdomen reddish-brown; posterior segment glistening black with two white bands which begin at the constriction and curve downward over the sides. Venter with a semi-circular greenish-yellow spot behind the epigynum.

*Habitat:* North Carolina, Alabama, Wisconsin.

#### SYNAGELES SCORPIONA HENTZ.

Plate VI, figures 72, 72a.

*Syn:* 1845. SYNEMOSYNA *scorpionia* H., Journal Bost. Soc. Nat. Hist.,  
Vol. V.  
1875. " " id., Coll. Arachn. Writ. by N. M.  
Hentz, ed. by Burgess, Boston,  
p. 74.

♂. Total length 2.4 mm. Width of abdomen 5 mm.

Cephalothorax: length 1; width, 8; height, 4.

Legs 2, 1.5, 1.5, 2.6.

♀. Total length 3.5 mm. Width of abdomen 1.2 mm.

Cephalothorax: length, 1.4; width, 8; height, 5.

Patella and tibia of the first, 1; patella and tibia of the third, 8; patella and tibia of the fourth, 1.1; metatarsus and tarsus of the fourth, 8.

Ocular area occupying nearly two-thirds of the cephalothorax, a little more than one-third longer than wide, and wider behind than in front. Anterior row of eyes very slightly curved, lateral about one-half as large as middle eyes and separated from them by one-fourth their own diameter; eyes of second row not quite twice as far from dorsal as from lateral eyes; dorsal eyes further from each other than from lateral borders. Clypeus, (♂) less than one-half, (♀) one-half as high as middle eyes, vertical. Falces as wide as the two middle eyes, about as long as the face, vertical, parallel. Maxillæ rather long, a little enlarged at extremity, (♂) truncated, (♀) rounded; anterior coxæ separated by more than the width of labium. First legs a little the stoutest, dark.



*Coloration:* ♂. Cephalothorax brown; abdomen brown anteriorly, encircled by a white line in front of middle, behind which it is blackish; other parts brown excepting a pale spot on the anterior part of the venter. ♀. Cephalothorax brownish with the eyes on black spots; abdomen pale with two short, curved, dark bands near the spinnerets; falces brownish, venter pale with a dark region near the spinnerets; legs brown above, pale beneath; other parts all pale.

*Habitat:* New York, Ohio, North Carolina.

### SALPICUS EPHIPPIATUS HENTZ.

Plate VI, figure 73.

- Syn.:* 1845. *SYNEMOSYNA ephippiata* H., Journal Boston Soc. Nat. Hist. Vol. V.  
 1846. *SALPICUS albocinctus* C. K., Die Arachniden, XIII, p. 36.  
 1875. *SYNEMOSYNA ephippiata* H., Coll. Arachn. Writ. by N. M. Hentz. Ed. by Burgess, Boston, p. 74.

- ♂. Total length 5.2 mm. Width of abdomen 1.4 mm.  
 Cephalothorax: length 2.4; width 1.4; height 1.2.  
 Legs 5.3, 4.1, 4.5, 6.1; patella and tibia of the first, 2.4; patella and tibia of the third, 1.8; patella and tibia of the fourth, 2.6; metatarsus and tarsus of the fourth, 2.  
 Cephalothorax moderately high and slightly convex; sides almost parallel; ocular area very slightly wider than long, and equally wide in front and behind; anterior eyes small, in a straight row; lateral about one-half as large as middle eyes, separated from them by one-fourth their own diameter; eyes of second row halfway between lateral and dorsal eyes; dorsal nearly as large as lateral eyes, and a little nearer each other than lateral borders. Clypeus less than one-fourth as high as middle eyes. Falces wider than first row of eyes, more than three times as long as face, inclined forward, diverging; fang as long as falx. Maxillæ long, slender, blunt at tip, about twice as long as wide, parallel. Labium less than one-half as long as maxillæ, about as wide as long, blunt. Sternum narrow, and more than twice as long as wide. Anterior coxæ separated by width of labium. Legs all slender and long; tibial and metatarsal spines on the four pairs; the metatarsi of the fourth spined throughout their length. Abdomen with a constriction in front of middle.  
 ♀ Total length 5 mm. Width of abdomen 1.2 mm.  
 Cephalothorax: length 2.2; width 1.2; height 1.  
 Legs 3.8, 3.1, 3.4, 5.3; patella and tibia of the first, 1.8; patella and tibia of the third, 1.3; patella and tibia of the fourth, 2; metatarsus and tarsus of the fourth, 2.

Clypeus one-fourth as high as middle eyes. Falces extending in width only to the inner edges of the lateral eyes, as long as the face, parallel, and slightly inclined forward; fang short. Maxillæ less than twice as long as wide. Labium more than one-half as long as maxillæ.

*Coloration:* Cephalothorax brownish; abdomen brown in front of constriction, black behind, encircled by a white line at the constriction; falces dark with white hairs; clypeus, mouthparts, sternum, coxæ and venter brown; legs with a tinge of yellow.

*Habitat:* Pennsylvania, New York, Alabama.

#### LYSSOMANES HENTZ.

*Syn.:* 1844. LYSSOMANES Hentz, Journal Boston Soc. Nat. Hist., Vol. IV. Cephalothorax moderately high, sloping downward behind and on the sides from the caput, about one-third longer than wide. General form oval. Caput occupying one-half or nearly one-half of cephalothorax.

Eyes arranged in four transverse rows of two each. Eyes of first row close together, from two to three times as large those of second row, occupying the entire face. Second row just behind first and about as wide (sometimes a little wider or narrower). Third row composed of two very small eyes, plainly nearer the second than the fourth row, narrower than the second and wider than the fourth. Eyes of fourth row about as large as those of second and nearer together; quadrangle formed by second and fourth rows as wide as long, or from one-fourth to one-third wider.

Sternum somewhat heartshaped; length and width about equal. Coxæ separated by the width of the labium and part or all of the maxillæ. Maxillæ slightly enlarged at extremities. Labium about as wide as long or a little longer than wide. Abdomen long, slender, tapering; spinnerets short. Legs usually long and slender; relative length variable. Long and slender femoral, tibial, metatarsal and usually patellary spines on the four pairs.

#### LYSSOMANES VIRIDIS HENTZ.

*Syn.:* 1844. LYSSOMANES *viridis* Hentz, Jour. Boston Soc. Nat. Hist., Vol. IV.

1875. " " id., Coll. Arachn. Writings. Ed. by Burgess, Boston, p. 49.

♂. Total length 6.5 mm. Width of abdomen 1.5 mm.

Cephalothorax: length 2; width 2; height 1.3.

Legs 12, 9.5, 8.5, 8; patella and tibia of the first, 4.5; patella and tibia of the third, 3; patella and tibia of the fourth, 3; metatarsus and tarsus of the fourth, 3.2. Falx 2.5.

♀. Total length 8 mm. Width of abdomen 2.4 mm.

Cephalothorax: length 3; width 2.6; height 1.8.

Legs 10.5, 9, 8.3, 8; patella and tibia of the first, 4.5; patella and tibia of the third, 3; patella and tibia of the fourth, 3; metatarsus and tarsus of the fourth, 3.4.

*Coloration:* Cephalothorax and abdomen light yellow; cephalothorax with a slender, central, dark, longitudinal line on the thoracic part; eyes of second and third rows on black tubercles. Abdomen with six black dots (sometimes wanting) arranged in two longitudinal rows. There are some orange colored hairs around the anterior eyes, and in the male the falces are reddish in front. The other parts are light yellow.

Hentz describes this species as being tender grass-green. The color probably changes in alcohol.

*Habitat:* Southern United States.

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## DESCRIPTION OF PLATES.

### PLATE I.

1. *Phidippus morsitans*, ♀; 1a, epigynum.
- 2a.     "     *rufus*, epigynum.
3.     "     *galathea*, ♀; 3a, epigynum.
5.     "     *obscurus* ♀.
6.     "     *minatus*, ♀; 6a, epigynum.
8.     "     *ranterbergii*, ♀.
10.    "     *arizonensis*, ♂.
12.    "     *insolens*, ♀.
13.    "     *albomaculatus*, ♀.
14.    "     *johnsonii*, ♀.
15.    "     *otiosus*, ♀.
16.    *Philæus farneus*, ♀.
17.    "     *fertilis*, ♀.
18.    "     *mexicanus*, ♀.
19.    "     *militaris*, ♀.
- 19a.   "     "     ♂.
20.    "     *chrysis*, ♀.
22.    "     *rimator*, ♀.
23.    *Plexippus puerperus*, ♂. (Figure blurred on plate.)
- 23a.   "     "     ♀.

25. *Dendryphantes capitatus*, ♂.  
 25a, 25b. " " ♀, two varieties.  
 27. " *flavus*, ♀.  
 30. *Attus palustris*, ♀.  
 32. *Icius lineatus*, ♀.  
 33. *Icius palmarum*, ♀.  
 34. " *mitratus*, ♀.  
 35. " *piraticus*, ♂.  
 35a. " *albovittatus*, ♂.  
 36. *Pseudicius harfordii*, ♀.  
 36a. " " ♂.  
 37. *Eris octavus*, ♀.  
 39. " *nervosus*, ♀.  
 40. *Hasarius hoyi*, ♀.  
 40a. " " ♂.  
 42. *Habrocestum cœcatum*, ♀.  
 43. " *viridipes*, ♀.  
 44. " *peregrinum*, ♂.  
 45. " *cristatum*, ♀.  
 46a. " *auratum*, ♀.  
 48. " *splendens*, ♀.  
 50. *Saitis pulex*, ♀.  
 50a. " " ♂.  
 51. *Prostheclina cambridgii*, ♀.  
 52. *Astia vittata*, ♀.  
 52a. " " ♂.  
 53. *Astia morosa*, ♀.  
 55. *Cytæa minuta*, ♀.  
 56. *Cyrba tæniola*, ♀.  
 57. *Epiblemum scenicum*, ♀.  
 58. *Admestina wheelerii*, ♂.  
 59. *Hycitia pikei*, ♂.  
 60. *Marptusa familiaris*, ♀.  
 61. " *californica*, ♀.  
 62. *Menemerus melonagnathus*, ♂.  
 62a. " " ♀.  
 63. " *paykulli*, ♀.  
 64. *Homalattus cyaneus*, ♂.  
 65. *Neon neelii*, ♂.  
 66. *Ballus youngii*, ♀.  
 67. *Zygoballus sexpunctatus*, ♂.  
 68. " *bettini*, ♀.  
 68a. " " ♂.  
 69. *Agobardus anormalis*, ♀.  
 70. *Sadala distincta*, ♂.

PLATE II.

1. *Phidippus morsitans*, ♂ palpus.
2. " *rufus*, ♂ palpus.
4. " *cardinalis*, ♂ palpus
5. " *obscurus* epigynum.
7. " *mexicanus*, ♂ palpus.
8. " *rauterbergii*, epigynum.
9. " *mc'cookii*, epigynum.
10. " *arizonensis*, ♂ palpus.
11. " *opifex*, epigynum.
12. " *insolens*, palpus of ♂; 12a epigynum.
13. " *albomaculatus*, epigynum.
14. " *johnsonii*, palpus of ♂; 14a epigynum.
15. " *octopunctatus*, ♂ palpus.
- 15a. " *otiosus*, epigynum.
16. *Philæus farneus*, epigynum.
17. *Philæus fertilis*, epigynum.
18. " *mexicanus*, epigynum.
19. " *militaris*, palpus of ♂; 19a epigynum.
20. " *chrysis*, ♂ palpus.
23. *Plexippus puerperus*, ♂ palpus; 23a, tibia of ♂ palpus. For epigynum see Plate III, fig. 23b.

PLATE III.

- 20a. *Philæus chrysis*, epigynum; —*aurecalceus* = *chrysis*.
21. " *princeps*, epigynum.
- 23b. *Plexippus puerperus*, epigynum.
24. " *putnamii*, ♂ palpus.
25. *Dendryphantes capitatus*, palpus of ♂; 25a, epigynum.
26. " *elegans*, palpus of ♂; 26a, epigynum; 26b, first leg of ♂. For mouthparts and falces of ♀ see Plate IV, fig. 26c.
27. *Dendryphantes flavus*, epigynum; 27a, mouthparts and falces of ♀.
28. *Dendryphantes multicolor*, epigynum; 28a mouthparts and falces of ♀.
29. *Dendryphantes alboimmaculatus*, epigynum.
- 29a. " *flavipedes*, ♂ palpus.
30. *Attus palustris*, palpus of ♂; 30a, epigynum.
31. " *imperialis*, ♂ palpus; 31a, mouthparts and falces of ♂.
32. *Icius lineatus*, ♂ palpus; 32a, same, from one side; 32b, epigynum.

33. *Icius palmarum*, palpus of ♂; 33a, epigynum.  
 34a. “ *mitratus* epigynum. For ♂ palpus see Plate IV, fig. 34.  
 36. *Pseudicius harfordii*, epigynum. For ♂ palpus see Plate IV, figure 36a.  
 37. *Eris octavus*, epigynum.  
 39. “ *nervosus*, epigynum.

## PLATE IV.

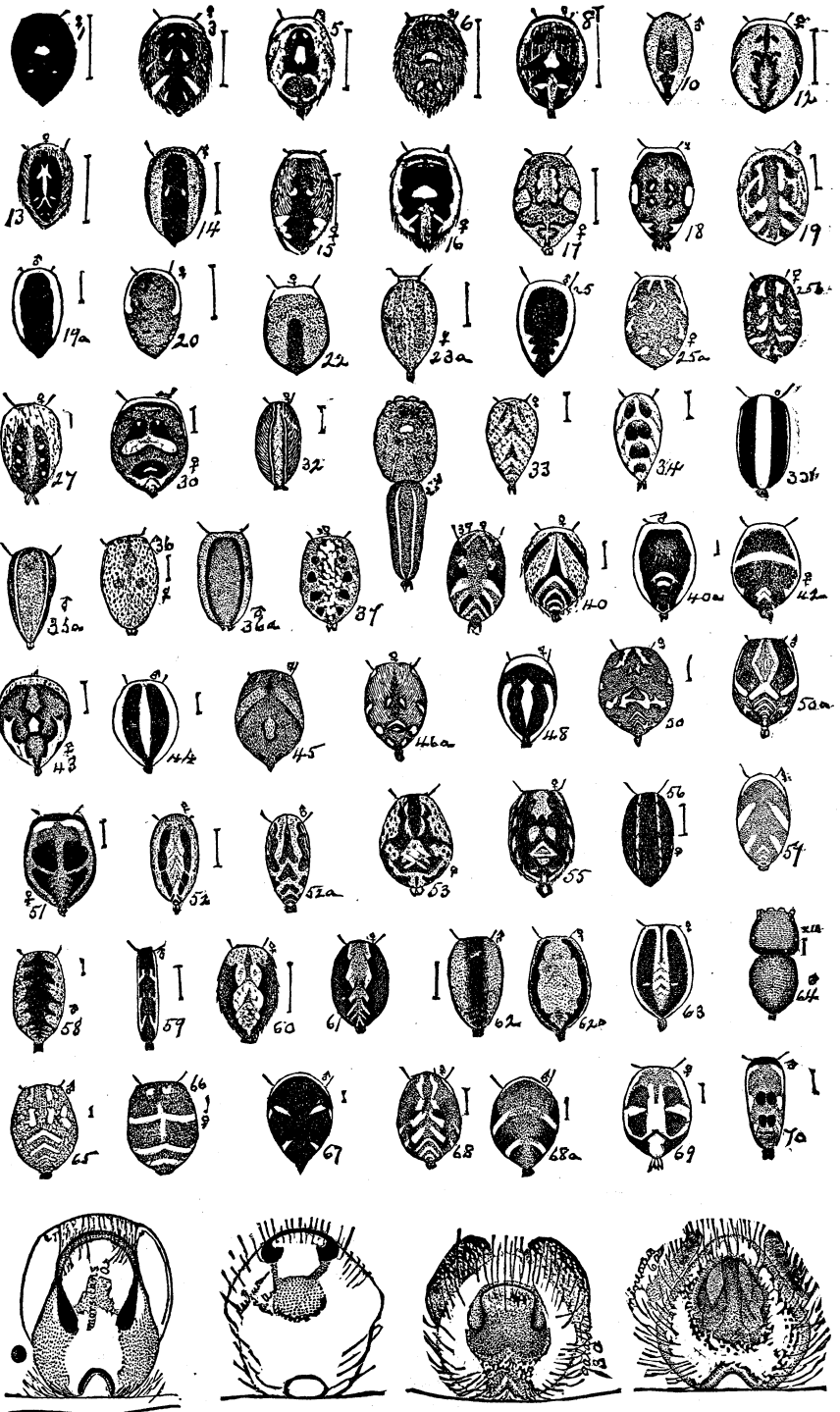
- 26c. *Dendryphantes elegans*, falces and mouthparts of ♀.  
 34. *Icius mitratus*, ♂ palpus.  
 35. “ *piraticus*, ♂ palpus; 35a, same from outer side.  
 35d. “ *albovittatus* ♂ palpus.  
 36a. *Pseudicius harfordii*, ♂ palpus.  
 38. *Eris barbipes*, epigynum; 38a, first leg of ♀.  
 40. *Hasarius hoyi* ♂ palpus; 40a, epigynum.  
 42. *Habrocestum cœcatum*, palpus of ♂; 42a, epigynum; 42b, third leg of ♂ from behind.  
 43. *Habrocestum viridipes*, ♂ palpus; 43a, epigynum.  
 44. “ *peregrinum* ♂ palpus; 44a, patella of third leg of variety 1; 44b, same of variety 2.  
 45. “ *cristatum*, epigynum.  
 46. “ *auratum*, epigynum; 46a, ♂ palpus; 46b, mouthparts and falces of ♂.  
 47. “ *hirsutum*, first leg of ♂; 47a, ♂ palpus.

## PLATE V.

48. *Habrocestum splendens*, ♂ palpus; 48a, epigynum.  
 49. “ *oregonense*, ♂ palpus; 49a, first leg of ♂.  
 50. *Saitis pulex*, epigynum; 50a, ♂ palpus.  
 51. *Prostheclina cambridgii*, ♂ palpus; 51a, epigynum.  
 52. *Astia vittata*, ♂ palpus; 52a, epigynum.  
 53. “ *morosa*, ♂ palpus; 53a, epigynum.  
 54. *Maevia californica*, ♂ palpus; 54a, mouthparts and falces.  
 55. *Cytæa minuta*, ♂ palpus; 55a, epigynum.  
 56. *Cyrba tæniola*, ♂ palpus; 56b, mouthparts and falces of ♀. For epigynum see Plate VI, fig. 56a.  
 58. *Admestina wheelerii*, ♂ palpus.  
 59. *Hycitia pikei*, ♂ palpus. For epigynum see Plate VI, fig. 59a.  
 60. *Marptusa familiaris*, ♂ palpus. For epigynum, see Plate VI, fig. 60a.  
 61. “ *californica*, ♂ palpus. For epigynum, see Plate VI, fig. 61a.

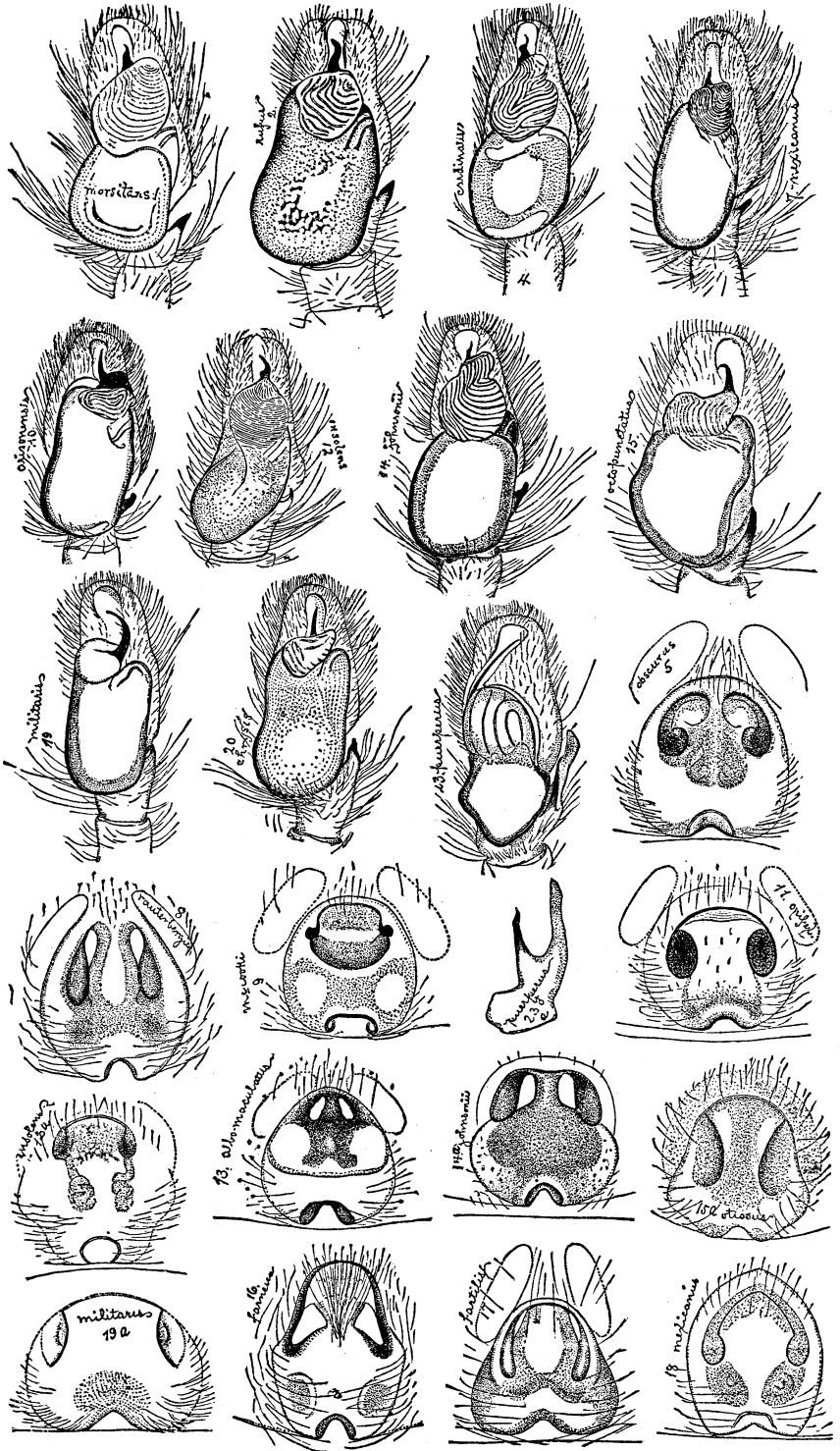
PLATE VI.

- 56a. *Cyrba tæniola*, epigynum.
- 57. *Epiblemum scenicum*, epigynum.
- 59a. *Hycitia pikei*, epigynum.
- 60a. *Marptusa familiaris*, epigynum.
- 61a. " *californica*, epigynum.
- 62. *Menemerus melanognathus*, ♂ palpus; 62a, epigynum.
- 63. " *paykullii*, ♂ palpus; 63a, epigynum.
- 64. *Homalattus cyanens*, ♂ palpus; 64a, epigynum.
- 65. *Neon nellii*, ♂ palpus.
- 66. *Ballus youngii*, ♂ palpus; 66a, same from one side; 66b, epigynum.
- 67. *Zygoballus sexpunctatus*, mouthparts and falces of ♂; 67a, ♂ palpus.
- 68. " *bettini*, ♂ palpus; 68a, epigynum; 68b, falces and mouthparts of ♂.
- 70. *Synemosyna formica*, ♂ palpus; 70a, epigynum.
- 71. *Synageles picata*, epigynum.
- 72. " *scorpionia*, epigynum; 72a, ♂ palpus.
- 73. *Salticus ephippiatus*, ♂ palpus.
- 74. *Agobardus anormalis*, ♂ palpus.
- 76. *Sadala distincta*, ♂ palpus.





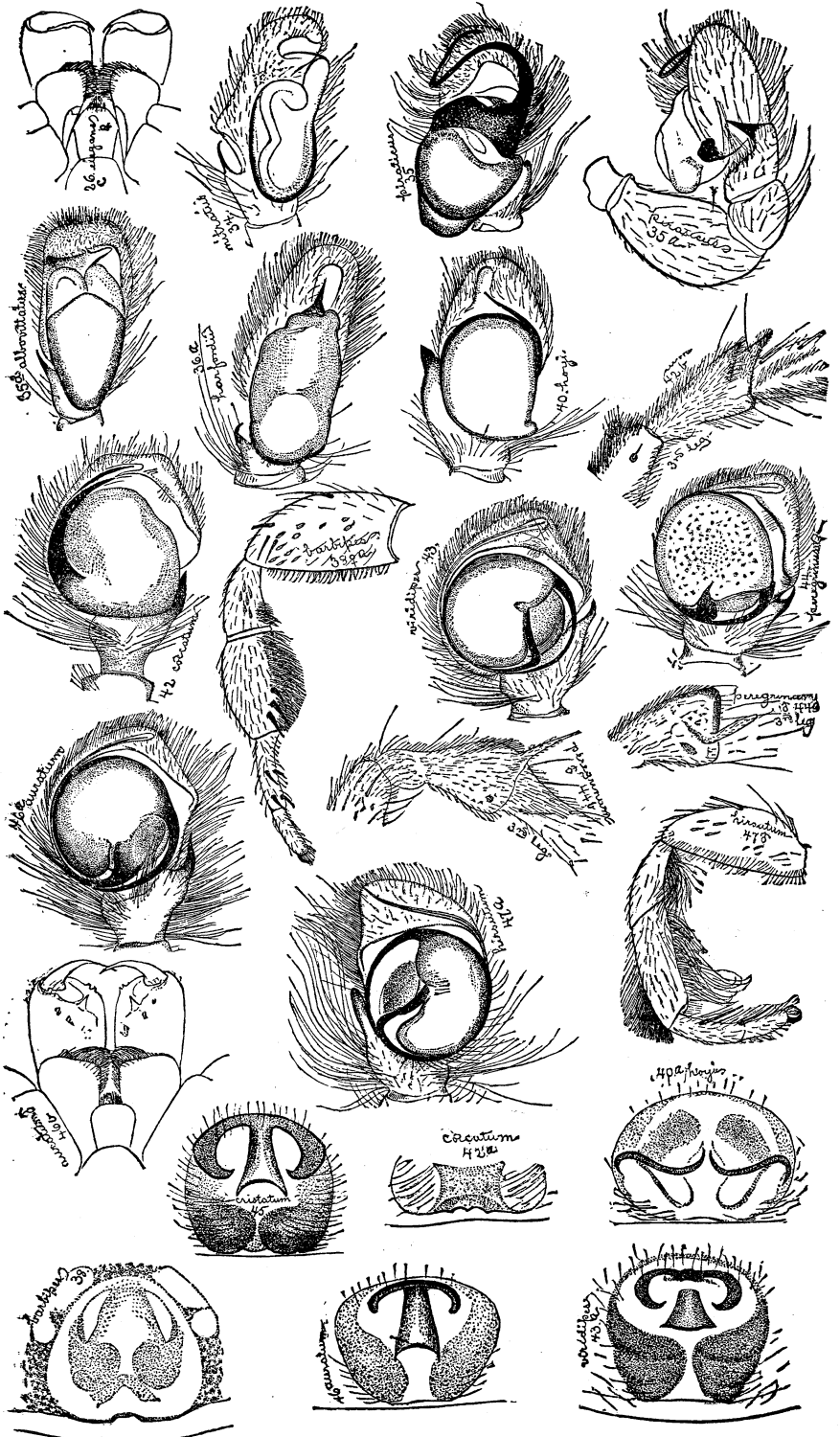




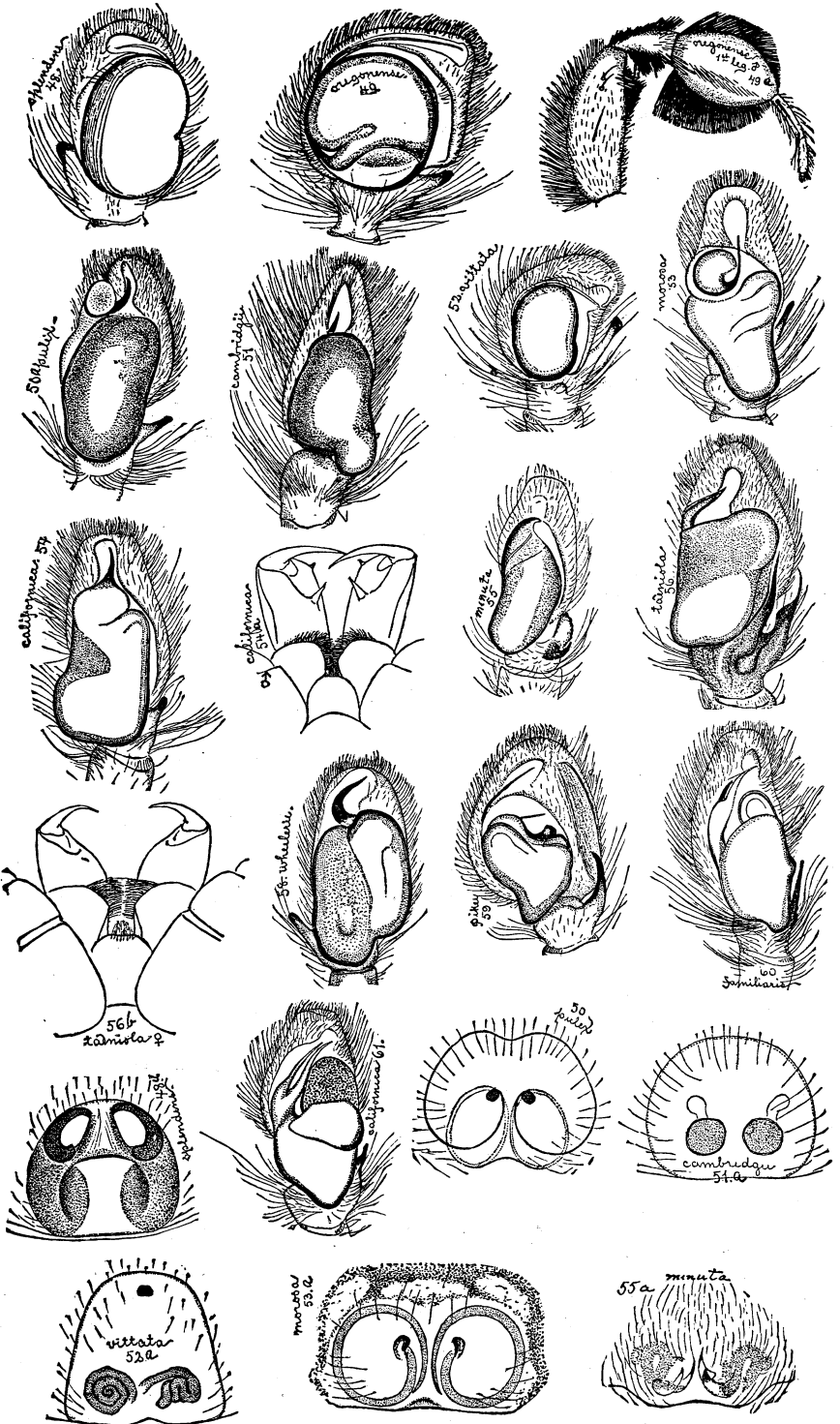






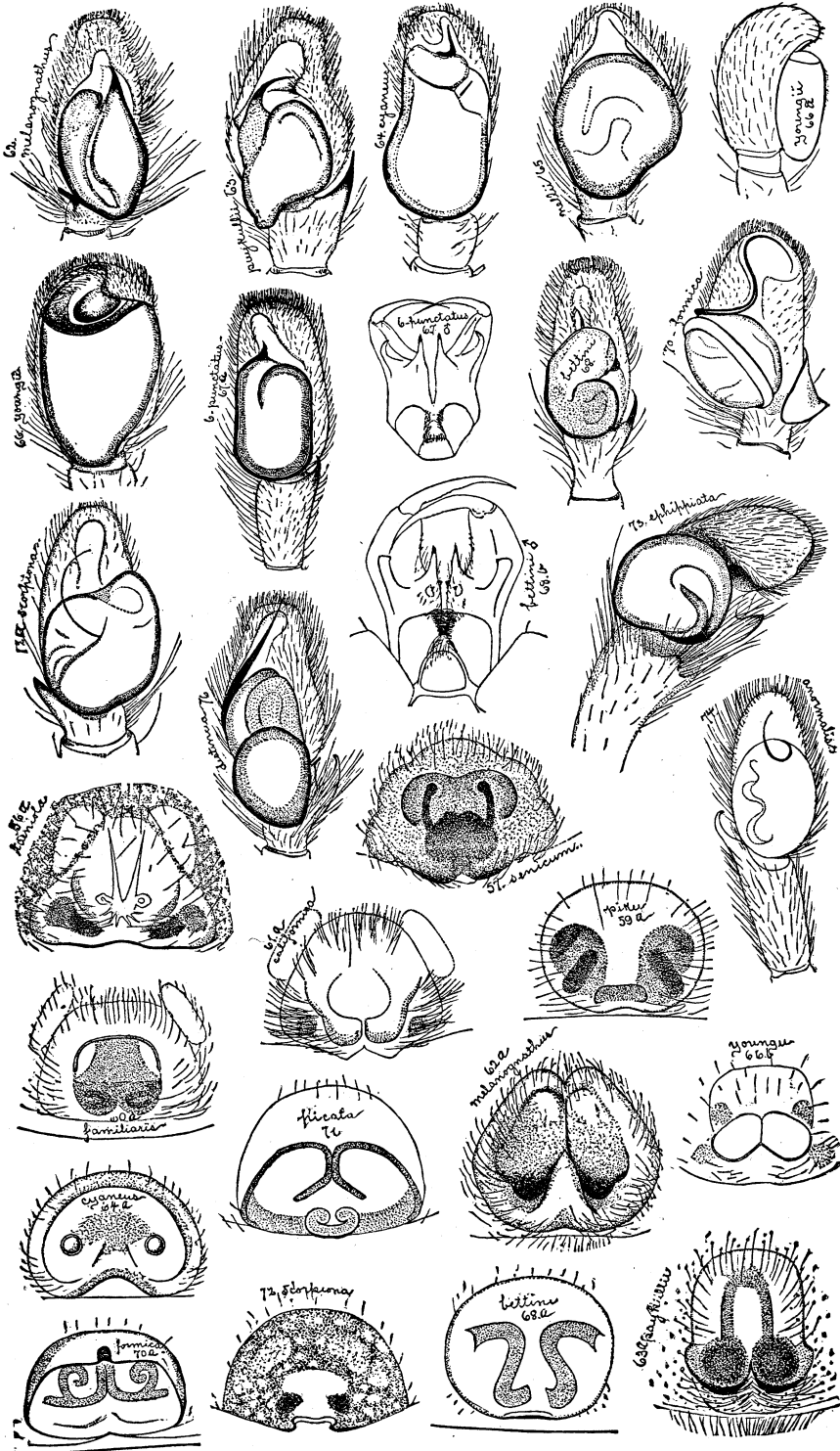


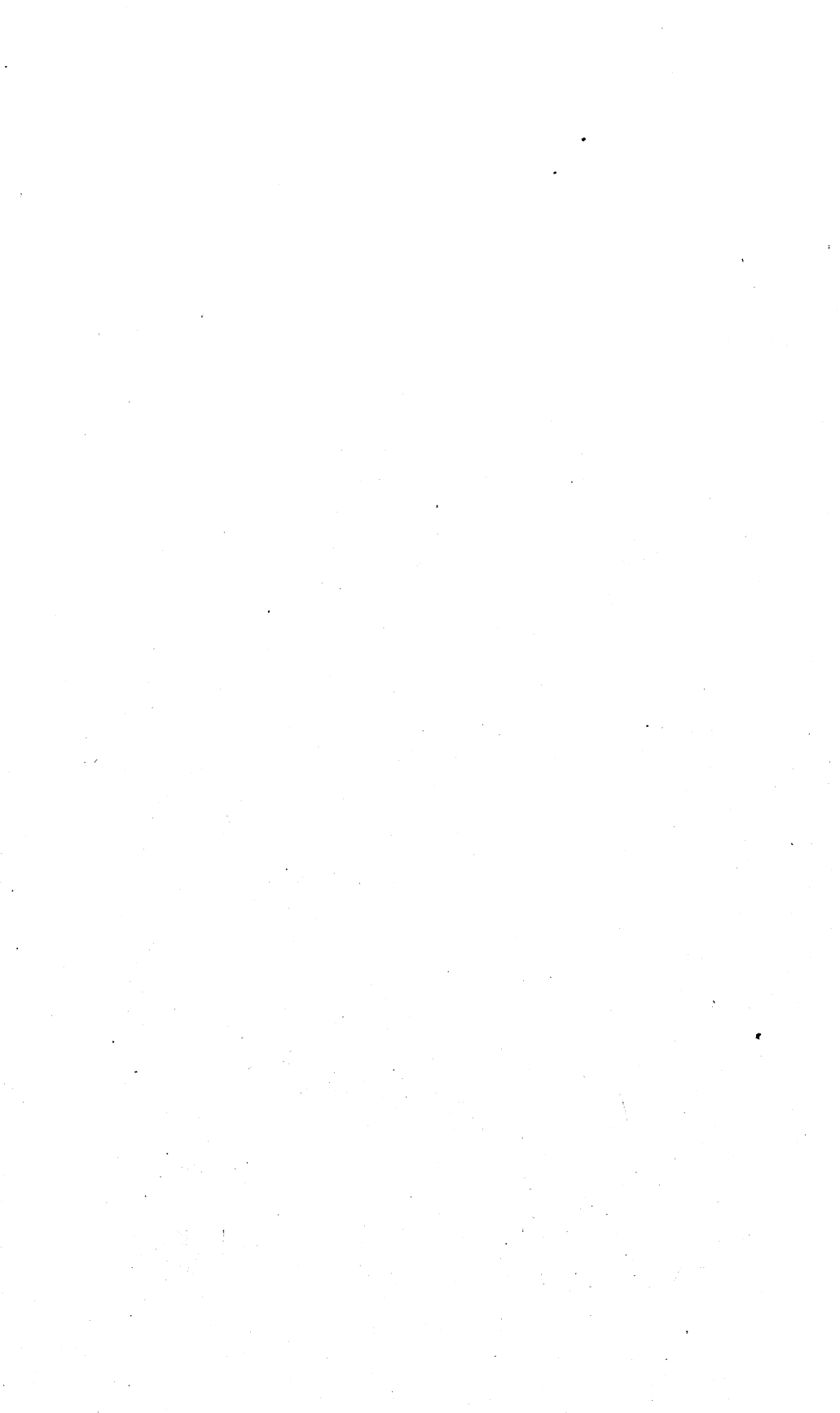












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## THE MORELS AND PUFF-BALLS OF MADISON.

BY WILLIAM TRELEASE.

To facilitate the work of collectors engaged with the cryptogamic botany of the state, a preliminary list of the parasitic fungi of Wisconsin was presented to the Academy at its meeting in the winter of 1882.<sup>1</sup> In continuation of that list, the following descriptions of non-parasitic species are offered for publication. The groups that have been selected are not closely related, as might have been inferred from their treatment in a single paper, nor do they include many species: but they possess some general interest because the majority of the species are edible, and they derive scientific interest from the fact that their discrimination is attended with considerable difficulty.

Several correspondents have favored me with their collections for study, and I am under especial obligation in this respect to Dr. J. J. Brown of Sheboygan. The names that have been adopted rest upon a comparison of our specimens with the rich collections of Professors C. H. Peck, of the New York State Museum, and W. G. Farlow, of Harvard University, the latter of which includes the Curtis herbarium, and hence contains types of the species of Berkeley and Curtis, described in Grevillea. My thanks are also due these gentlemen for the use of papers not otherwise accessible to me, and for opinions on doubtful forms. Similar opinions have also been given by the late Dr. G. Winter, of Comrewitz, Germany, Professor P. Magnus, of Berlin, and Dr. M. C. Cooke, and Mr. George Masee, of London; but for the nomenclature adopted I am personally responsible. While it is believed that the names employed are in accordance with the opinion of the best authorities on American fungi, it is by no means certain that references to the older European names are in all instances above suspicion, for many descriptions and figures are insufficient, and the paucity of authentic specimens, as well as the poor state of preservation of some of those extant, contribute to the general uncertainty.

### I. MORELS.

Order ASCOMYCETES. Sub-Order DISCOMYCETES.

The popular name of Morel corresponds to the genus *Morchella*, which comprises fleshy fungi with a rather stout hollow stem, bearing at the top a dilated round or conical head, reticulated by prominent ridges that sepa-

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<sup>1</sup>Transactions, vi, 106. Reprints of the paper were issued early in November 1884, in advance of the volume.

rate coarse depressions. This head, or pileus, is covered externally by elongated sterile bodies (paraphyses) and oblong spore-sacs (asci), both microscopic. In our species the asci contain eight ellipsoidal spores each; but others are known in which only two spores are found in each ascus.—The two species that have been collected about Madison are distinguished by the character of the pileus.

Pileus aduate to the stipe, coarsely pitted..... *M. esculenta*.  
 Pileus free, at least for its lower half, longitudinally ribbed..... *M. hybrida*.

1. MORCHELLA ESCULENTA (Mich.)—Stipe stout, somewhat mealy or furfuraceous. Pileus variable, round to conical, regularly and coarsely pitted. Spores  $10-13.5 \times 17-23\mu$ .—Mostly in white oak woods, in the spring. Reported in Bundy's list of Wisconsin fungi.<sup>1</sup>

In the commonest form the plant is two to four inches high, with the stipe and pileus of nearly equal length; the latter oblong, obtuse, and not much dilated. Another type, which is not uncommon, is rather shorter, with the pileus considerably dilated and nearly spherical. In a less frequent form it is elongated and decidedly conical. All are found in open dry woods, and are most abundant under or near white oak trees (*Quercus alba*).<sup>2</sup>

Occasionally they are found in meadows, and I once collected a number of unusually large specimens on the side of a high, gravelly railroad embankment, in company with *Equisetum arvense*, entirely removed from trees of any kind. Young specimens, with an elongated smoky pileus, the tops of the ridges only being pale, agree with var. *cylindrica* as figured by Vittadini<sup>3</sup> who recognized it as an immature state.

*Figures*.—Cooke, Mycographia, i, pl. 81, f. 312. *Exsiccatae*.—Ravenel, Fungi Carol, i, no. 36; Ellis, N. A. Fungi, no. 979.

Other similar species referred to by writers on American fungi are *M. crassipes* Fr. (Bull. Washburn Laboratory, i, 70), *M. elata* Fr. (Grevillea, iii, 149; Bull. Buffalo Soc., ii, 286), *M. deliciosa* Fr. (30 Rep. N. Y. Museum, 58), and *M. conica* P. (Mycographia, i, pl. 81, f. 315; Cat. Pac. Coast fungi, 33; Bull. Washburn Lab. i, 70.—*M. esculenta*, var. *conica* of Bull. Buffalo Soc. ii, 286 and Curtis, Catalogue, 131). The first two are large, the first, especially, with a much inflated stipe; the others are smaller and more delicate. Perhaps one or more of them occur among the Madison specimens, but I am unable to separate our plants by any constant or good characters.

2. MORCHELLA HYBRIDA (Sow.) P.—Stipe usually slender (one-fourth to one-half inch), furfuraceous or smoothish, with more or less red-brown transverse striation. Pileus short (three-fourths inch or less), conical or thimble

<sup>1</sup> Report. Geol. Surv. Wis., Vol. 1, p. 401.

<sup>2</sup> Harkness and Moore speak of *M. esculenta* as growing under oaks (Cat. Pacific Coast Fungi, 33). James finds it usually under the ash (Ohio Agric. Rep., 1881, 97). According to Peck, the commonest form about Albany is found under or in the vicinity of pines (28 Rep. N. Y. Museum, 86), and Day also finds it under conifers (Cat. Buffalo Plants, 152).

<sup>3</sup> Descrizione dei funghi mangerecci più communi dell' Italia, 105, note, pl. 13, f. 4-5.

shaped, its lower half free from the stipe, longitudinally ribbed but with few transverse ridges. Spores about  $17 \times 27 \mu$ .—Damp shady woods, in spring; less common than the first.

Two species of De Candolle are included under this name: the first, *M. semilibera*, with a smooth stem; the second, *M. rimosipes*, furfuraceous. If they are distinct, our plant belongs to the latter, though the first has usually been recognized as the American plant. Vittadini<sup>1</sup> could not separate these forms, nor am I able to do so. The character of the stipe is too inconstant to be of value, at least in herbarium specimens, for watery plants, grown in wet weather, often have their translucent stems apparently nearly or quite smooth when pressed. Both forms are represented in English specimens distributed by Broome<sup>2</sup> as *M. semilibera*. *M. patula* P., if distinct, seems to be characterized chiefly by the greater prominence of transverse ridges, making the depressions of the pileus more regularly polygonal. *M. bispora* Sow., with a free pendent pileus, which is found in New York,<sup>3</sup> may be distinguished, if it also occurs in Wisconsin, by having 2-spored asci.

*M. esculenta* is esteemed for the table by most persons, and has usually been held to be entirely free from the noxious properties resident in many fungi. Under some conditions, however, the plants may develop poisonous principles; and when eaten raw, or even if the water has not been changed while cooking them, they occasionally give rise to indigestion or symptoms of poisoning. This is especially true of specimens gathered in wet weather, and of those which are past their prime or have been kept too long before cooking, for like all fleshy fungi they are readily putrescible. But where proper care is taken in selecting and cooking the specimens, the morel forms an excellent relish and is one of the safest of edible fungi. What has been said of this species applies generally to the genus *Morchella*, but I have eaten none of the other species.<sup>4</sup>

The only fungi that are likely to be confounded with morels are certain related genera, *Helvella*<sup>5</sup> and *Gyromitra*,—which produce asco-spores on the exterior of the folded but not reticulately ribbed or pitted pileus;—and the stink-horn fungi,—species of the basidiomycetous genus *Phallus*.<sup>6</sup> Most of the former are edible. No person possessing the sense of smell is likely

<sup>1</sup> l. c. 114.

<sup>2</sup> Rabenherst's Fungi Europaei, No. 1417.

<sup>3</sup> Peck; 30 Rep. N. Y. Museum, 58.

<sup>4</sup> For an abstract of recent papers on the necessity for caution in preparing morels, see Bot. Centralblatt, xx. 243, and a paper by Böhm and Külz, in Archiv. für experiment. Pathologie und Pharmakologie, xix. Heft. 6 (Abst. in Bot. Zeitung, 1886, 643-4).—Useful recipes for the preparation of these fungi will be found in Röll: Die 24 häufigsten essbaren Pilze. Tübingen, 41-5.

<sup>5</sup> *Helvella crispa* (sometimes said to be poisonous) occurs in open woods about Madison, in late summer and fall.

<sup>6</sup> *P. duplicatus* Bosc, is common about Madison in summer and autumn, in lawns, grass by the roadside, etc.; and *P. caninus* has been collected at La Crosse by Mr. L. H. Pammel,



to entertain the thought for a moment of collecting the latter except under protest, and never of eating them, at least when mature.

## II. PUFF-BALLS.

Order BASIDIOMYCETES. Sub-Order GASTEROMYCETES.

Fungi belonging to the Family *Lycoperdaceae* are usually, spoken of as puff-balls, from the powdery character of their spores, that in most species are emitted in clouds on the slightest touch. When young the plants are rounded, colorless and fleshy, and most of the species are then edible. Immature phalloids, already referred to, may be mistaken for puff-balls, but when cut across they show a layer of translucent jelly just under the surface. When ripe, the pretty little *Lycogala epidendrum*, which is comm on about Madison on decaying wood, and the subterranean *Elaphomyces granulatus*, that we have not yet found, resemble, respectively, *Lycoperdon* and *Scleroderma* in their general appearance, but differ greatly in their development and fructification, the former belonging to the Myxomycetes, the latter to the Ascomycetes.

Our species of puff-balls may be referred to their genera by the appended key, which, it should be observed, refers only to Madison species and makes no provision for those which occur elsewhere:

- Outer peridium forming a star when mature.....*Geaster*.  
 Outer peridium not star-shaped.
- Spores mixed with a conspicuous thread-like capillitium. <sup>1</sup>  
 Entire plant filled with spores and threads, the latter dichotomous  
 from a main trunk.....*Bovista*.  
 Base usually more or less spongy and sterile: threads without a main  
 stem.....*Lycoperdon*.  
 Spores when ripe without a fleecy capillitium.  
 Plant with a solid central columella: spores brownish.....*Secotium*.  
 Without a columella; spores purplish.....*Scleroderma*.

### SYNOPSIS OF GEASTER.

- Inner peridium sessile.  
 Mouth few-toothed, not prominent, nor on a disk.....*G. hygrometricus*.  
 Mouth silky-striate, conical, on a round disk.....*G. saccatus*.  
 Inner peridium stalked.  
 Mouth protruding, deeply plicate, plant small.....*G. Rabenhorstii*.  
 Mouth not prominent or plicate, plant rather large.....*G. limbatum*.

1. GEASTER HYGROMETRICUS. P.—Outer peridium leathery, usually irregularly 8-to-10-rayed, the lobes often notched or forked at apex; with a thick waxy inner layer cracking when dry, opening and closing with changes in moisture when fresh. Inner peridium sessile, depressed, rough-scurfy, with a star-shaped or irregularly torn, scarcely protruding mouth. Capillitium somewhat anastomosing. Spores rough, 10 to 12  $\mu$ . in diameter.—Pl. 1, f. 1.—Sandy places, in summer and autumn.

<sup>1</sup>For a comparative study of the capillitium of these and other genera see Hesse: Jahrb. f. wiss. Bot. x. (4), 383, pl. 28-29; Abst. in Bot. Jahresbericht, iv. 163.

A poor specimen was once picked up on the shore of Fourth Lake. The species is also reported from Wisconsin by Bundy, and has been collected at La Crosse (*Pammel*), River Falls (*King*), and Sparta (*Miss Rose Schuster*): it ranges over the entire country, from the Atlantic to the Pacific, and is abundant in Europe.

*Figures*:—Morgan, *American Naturalist*, xviii, 969, f. 12; Trelease, *St. Nicholas*, xiii, 875, f. 2. *Exsiccatae*:—Ravenel, *Fungi Carol.*, iii, No. 75; *Fungi Amer.* No. 471; Von Thuemen, *Mycotheca Universalis*, No. 110; Ellis, *N. A. Fungi*, No. 108.

2. *GEASTER SACCATUS* Fr.—Outer peridium usually eight to ten lobed, the sinuses extending halfway to the base, the lobes reflexed; varying from cream-color to dark brown, the darker specimens occasionally white-striped on the outside from the cracking of the outermost layer. Inner peridium usually a little paler, sub-globose. Mouth prominent, conical, on a distinctly marked disk, silkystriate, sometimes darker than the rest of the peridium. Spores brown, semi-opaque, coarsely warted, 3.7 to 5  $\mu$ . Pl. 1, f. 2. Abundant in damp woods. August and September.

This species, extremely variable in size and color, has been variously referred by writers. The type (represented in the Lapham herbarium, from the Penokee Iron Range) is larger and coarser than our form, which corresponds nearly to *G. vittatus*, Kalchbr.; but the white striping of the outer peridium is exceptional, for specimens growing together differ in this respect, though evidently belonging to a single species. In size and general appearance our plant resembles *G. fimbriatus* Fr., the mouth of which, as indicated in descriptions and shown by European exsiccatae, is less prominent and not on a sharply limited disk.

*Figures*:—Morgan, *l. c.* 968, f. 9. *Exsiccatae*:—Ravenel, *Fungi Carol.*, i, no. 77.

3. *GEASTER RABENHORSTII* Kunze.—Small. Outer peridium at length papery, whitish buff, mottled with dark brown; divided into six to eight strongly reflexed lobes. Inner peridium lead-color or brown, distinctly stalked with a prominent apophysis at summit of stipe. Mouth conical or cylindrical, deeply furrowed longitudinally. Spores dark brown and opaque, irregularly globose, coarsely papillate, 4.5 to 5  $\mu$ .—Pl. 1, f. 3.—Sandy woods.

Found once in small numbers under a clump of larches on the University grounds. I have seen the same plant in the collection of Professor Peck, at Albany. It has doubtless often passed for a small form of *G. striatus* (DC.), and is referred to that species by Peck (38 Rep. N. Y. Museum, 94). It is *G. Schmideli* Vitt. of Winter's *Kryptogamen Flora*, and may really be the plant figured by Vittadini.

4. *GEASTER LIMBATUS* Fr.—Large. Outer peridium seven or eight lobed, the segments strongly reflexed but with incurved tips. Inner peridium brownish or gray, globose or somewhat depressed, raised on a short compressed slightly apophysate stipe. Mouth fimbriate, on a more or less evi-

dent disk. Spores less opaque and more finely granulated than in the last,  $4\ \mu$ .—Pl. 1, f. 4.—Open woods. Wisconsin specimens collected by Bundy, also occur in the herbarium of Professor Peck.

*Figures*:—Morgan, *l. c.* 967, f. 6. *Ersiccatae*:—Ellis, N. A. Fungi, no. 1309.

*Geaster bryantii*, B., reported by Bundy in Rep. Geol. Surv. i, 399, presumably on specimens of *G. limbatus*, is similar, but with an elongated mouth plicate as in *G. Rabenhorstii*, and with a delicate cup at base of the stipe which, in typical specimens, is also surrounded by a hanging collar-like fold below the apophysis.

*Geaster striatus* (DC.), also recorded by Bundy, perhaps a specimen of *G. saccatus*, resembles that species in its general features, but the inner peridium is more or less stalked and the mouth plicate, while the outer peridium is not saccate at base.

*Geaster triplex* Jungh., which is represented in the Lapham herbarium by a specimen without date or locality, is recognized by a lacerated cup-like intermediate layer, which surrounds the base of the inner peridium. It should be observed that a similar but inconstant and much smaller middle peridium is occasionally seen in the *vittatus* form of *G. saccatus* as it occurs about St. Louis, and is figured in *G. hygrometricus* by Corda (*Icones Fungorum*, vi, pl. 4, f. 42, nos. 16-17).

#### SYNOPSIS OF BOVISTA.

Less than 1 in. in diameter; spores obovoid, long-pedicelled—*B. plumbea*.

Over 1 in. in diameter; spores globose, short-pedicelled—*B. pita*.

1. BOVISTA PLUMBEA P.—Usually half an inch to an inch in diameter, irregularly globose or depressed when old. Peridium at first double, the outer layer dull white, flaking away, the inner white to lead-color or sometimes dark purplish gray or even nearly black when old, smooth and slightly glossy, dehiscent at the apex by a round or oblong fissure mostly with revolute margins. Capillitium deep chestnut brown, much branched, the twigs blunt. Spores brown, nearly smooth,<sup>1</sup> short obovoid,  $5-6 \times 6-7\ \mu$ , with colorless pedicels  $2 \times 17\ \mu$ .—Pl. 1, f. 5.—Very common in open hilly pastures; also sent from River Falls (*King*), and doubtless occurring everywhere.

*B. plumbea* and *B. nigrescens* are species readily confused if they are really distinct. I have as yet failed to convince myself that our larger, darker plants are more than a form of *B. plumbea*. Fries (*systema*, iii. 24) records both as American; but I have seen no specimens corresponding closely to *B. nigrescens* as figured in Berkley's *Outlines of Brit. Fungology*, pl. 20, f. 5. *Sturms Flora Heft* 18, pl. 15; *Bolton's Funguses about Halifax*, pl. 118; and *Sowerby pl.* 331. Our common form is well represented by *Micheli*, pl. 97, f. 6; *Corda, Icones*, v, pl. 6, f. 47, nos. 3-4 (the former inverted); *Vittadini, Funghi Mangerecci*, pl. 33, f. 1; *Berkeley, l. c.* pl. 20, f. 6; and *Sturm's Flora. Heft* 18, pl. 16 (copied by Winter). It is hard to see on what grounds Fries and Winter refer *Batsch. pl.* 29, f. 166 to *B. nigrescens*.

<sup>1</sup>The descriptions in this paper apply to spores that have not been much soaked in water, since the markings of many more or less completed disappear when the spores are wet, as the case of some *Ustilagineæ* and *Uredineæ*.

A small lead-colored specimen from Albany, N. Y., in the Curtis herbarium (*Peck*, no. 76), under this name has round nearly stalkless rough spores  $5 \mu$  in diameter, and is evidently a denuded plant of *B. circumseissa* B. & C., not yet found in Wisconsin.

I can corroborate the assertion of Vittadini that this is one of the most delicate of edible fungi when gathered young and properly cooked. The first sign of discoloration, as with other puff-balls, marks it as too old for the table.

2. *BOVISTA PILA* B. & C., seldom less than an inch and a half in diameter, usually two or two and a half inches, irregularly globose or somewhat pinched in at the base, which often bears remnants of a myceliæ cord. Peridium with at most a very delicate flaking outer layer, typically smooth and glistening, grayish-buff, dark gray or blackish-purple, usually dehiscing late by an irregular fissure at no fixed point. Twigs of the capillitium wavy, tapering, chestnut-brown, paler toward the tips, fading to a decided pink in old weathered specimens. Spores nearly spherical, stalkless,  $3, 5-5 \mu$ , nearly smooth, paler than in the last.—Pl. 1, f. 6.—Abundant in wood-pastures, less frequent in open fields.

This species was originally described (*Grevillea*, ii. 49) from Wisconsin specimens collected by Lapham. I have seen other specimens from Sheboygan (*Brown*), Sparta and Middleton (*Miss Schuster*), Bloomingdale and La Crosse (*Pammel*), and have collected it in abundance at Weyauwega. In its nearly single peridium and irregular dehiscence, this is decidedly unlike typical species of *Bovista*. Like the last, it is excellent eating when gathered young and properly cooked.

*Bovista ammophila*, Lév., reported (perhaps on specimens of the last) from Wisconsin by Bundy (*Rep. Geol. Surv.*, i, 399), has a similar cord-like base, but is distinguished by its spores, which, as figured by Lévillé (*Ann. Sci. Nat. Bot.* 3 ser. ix, pl. 9, f. 5-6), are prominently obovoid and long-pedicelled.

*B. subterranea*, Pk., a depressed-globose species, which matures just below the surface of the ground, bulging it up at maturity; is recognized by its firm dull-brown inner peridium, half an inch to an inch and a half in diameter, opening by a small apical pore; its fleecy outer peridium, impregnated with dirt and evanescent above; and olive-purple capillitium and spores, the former flexuous and rather sparingly branched, the latter globose, stalkless, rough,  $4-7 \mu$  in diameter. This species, described from Dakota specimens, has been collected by me in Colorado, and comes from River Falls (*King*), so that it may be looked for at Madison, in sandy soil.

*Mycenastrum spinulosum*, Pk. (*Bot. Gaz.*, iii, 170; vi, 240) a species of the Southwest which also occurs in the collection made by Dr. Brown at Sheboygan; is a gray puff-ball, irregular or kidney-shaped, measuring as much as four inches in its greatest diameter. It may be recognized by its smooth, almost woody, peridium, nearly one-sixteenth inch thick, at last breaking stellately, often with serrate edges to the lobes, and by its purple-

brown spinose capillitium and rough, opaque, paler spores 10 to 12  $\mu$  in diameter. It differs from the European *M. Corium* Desv. (also found in Arizona and Colorado) in its decided purple color when freshly broken. I have been able to test this latter species in Colorado, and find it palatable.

SYNOPSIS OF LYCOPERDON.<sup>1</sup>

- Plants large; peridium flaking away irregularly at top.
  - Sculptured and somewhat furfureaceous when young..... *L. favosum.*
  - Not sculptured, mostly glabrous; very large..... *L. Bovista.*
- Small or medium-sized; opening by a pore at apex.
  - Spores brown, yellowish, or olive, smooth or minutely roughened.
    - Shaggy or with deciduous spines.
      - Spores long-pedicelled ..... *L. pedicellatum.*
      - Spores stalkless.
        - Fleecy, sessile; old peridium not pale-areolate; growing in meadows and grass land..... *L. Wrightii.*
        - Warty, the larger spines deciduous, leaving pale round dots;growing in the woods..... *L. gemmatum.*
      - Smooth, or at most scurfy, (rarely sub-shaggy, in *L. pyriforme?*).
        - On rotting wood; gregarious; mostly stalked, with creeping white fibers..... *L. pyriforme.*
        - On the ground; not gregarious.
          - Spores ellipsoidal ..... *L. oblongisporum.*
          - Spores round or slightly obovoid.
            - Peridium not dark-dotted, often mealy-scurfy.
              - Sessile; usually under three-fourths inch..... *L. pusillum.*
              - Often stalked; larger ..... *L. molle.*
              - Peridium dark-dotted when mature; sessile..... *L. coloratum.*
  - Spores more or less red-purple, rough-warty.
    - At first spinulose or shaggy.
      - Spines very long, white, all deciduous..... *L. pulcherrimum.*
      - Spines shorter, buff or brown.
        - Mature peridium mealy-roughened, but glossy..... *L. atropurpureum.*
        - Not mealy; reticulated with small brown warts..... *L. constellatum.*
    - Not at all shaggy.
      - Reticulately furrowed; somewhat flesh-colored..... *L. rimulatum.*
      - Not furrowed; buff..... *L. glabellum.*

1. LYCOPERDON FAVOSUM (Rostk.).— Three to six inches in diameter, four to five inches high, depressed, spherical with a stout conical base, marked with coarse angular depressions, the pale fleecy outer peridium cracking so as to expose the brown inner layer, in anastomosing lines. Spores and capillitium, snuff-color or greenish-brown, liberated by the breaking away of the thick but fragile peridium. Spores slightly obovoid, nearly smooth, stalkless, 4.25 — 4.5  $\times$  4.5 — 5  $\mu$ .— Pl. 1, f. 9.— Grassy fields, late summer and autumn.

<sup>1</sup> Since the preparation of this paper, which was presented to the Academy in 1884, two important publications on Lycoperdaceæ have appeared, namely: a revision of the genus *Lycoperdon* by Masee (Trans. Roy. Microsc. Soc. 1887, 701), and the compilation of the entire group by De Toni, for the seventh volume of Saccardo's *Sylloge Fungorum*. So far as possible, these have been consulted in a final revision of the manuscript for publication. —May 10, 1888.

I have had some doubt as to whether this plant, collected but once, should be referred to *L. favosum* or *caelatum*. The latter species is reported by Bundy (Rep. Geol. Surv. Wis. i, 399) and Peck (U. S. species of Lycoperdon, 12), from Wisconsin, and I have seen unmistakable specimens of it from this state in the herbarium of Professor Peck, while it appears to be pretty frequently met with in the west.

2. LYCOPERDON BOVISTA L. (*L. giganteum* of most authors).—Seldom under ten inches in diameter, often very much larger: smooth, or at least not floccose-sculptured nor pitted like the last. Peridium less corky, flaking away in thinner more papery layers, spores and capillitium yellowish, the latter not separating from the sterile base. Spores nearly globose, almost smooth, 4 to 4.5  $\mu$ .—Grass land in late summer and autumn. Also reported from Wisconsin by Bundy (*l. c.*).

Figures:—Palmer, Mushrooms of America, pl. 8, f. 1.

*Lycoperdon cyathiforme*, Bosc., which occurs in the Curtis herbarium from Wisconsin (Sprague, 1169, Coll. Lapham), has been collected at Sheboygan (Brown), River Falls (King), and La Crosse (Pammel), and is also mentioned by Bundy (*l. c.*), is a stout pear-shaped or depressed-globose puff-ball approaching *L. callatum* in size, but easily distinguished by its smoother but areolated outer peridium, flaking away near the top as a thin papery layer, revealing the thicker fragile purple inner layer, and by its round finely granulated very purple spores, 4.5 to 6  $\mu$  in diameter. The sterile base persists for a long time, and is what Bosc's description (Mém.s. quelques espèces de champignons des parties mérid. de l' Amér. Sept., 5-6, pl. 6, f. 11) and figure were taken from. The American plant is not distinct from that which Vittadini<sup>1</sup> at first referred to *L. Bovista*, but afterward called *L. fragile*.

These three species are esteemed for food, whereas most of the smaller species of the genus have a disagreeable flavor. On this subject see Peck, U. S. Sp. of Lycoperdon, 7; 32 Rep. N. Y. Museum, 62; Country Gentleman, November 5, 1885; Palmer *l. c.*; and a note by myself in St. Nicholas, September, 1886; as well as Badham and other European writers on edible fungi.

3. LYCOPERDON PEDICELLATUM Pk.—Depressed globose to obovoid or sub-pyriform, usually one to two inches in diameter, with coarse angular or slender stellately united spines, a minutely granular darker reticulum between their bases. Denuded peridium, dull pinkish or buff, with round or polygonal depressions corresponding to the insertion of the fallen spines: base granular with more or less persistent coarse warts. Spores olive-yellow, slightly obovoid, minutely granular, 4.5  $\times$  5-6  $\mu$ , with slender nearly colorless pedicels 18 to 25  $\mu$  long.—Pl. 1, f. 7.—Found once on the ground in open woods; received from River Falls (King); and locally abundant elsewhere, often in open places.

It has frequently been asserted that the spores of *Lycoperdon* are stalkless while those of *Bovista* are pedicelled. Understanding stalkless to mean (as in this paper) with a pedicel not exceeding 1  $\mu$  in length, this generaliza-

<sup>1</sup> Funghi Mangerecci, 263-8, pl. 33, f. 2. See, also, Berkeley, Notices of N. A. Fungi, no. 332.

tion is not true. *L. cepaeforme* and *L. Hongkongense*, like the present species, have their spores permanently stalked. The sterigmata of the group with red-purple spores (nos. —) are at first very long, and they are also sometimes subsistent. On the other hand the spores of a number of species referred to *Bovista*, e. g. *P. pila*, *B. circumscissa*, and *B. tosta*, are not pedicellate.

4. LYCOPERDON WRIGHTII B & C.—Round or broadly pear-shaped, often gregarious and more or less angular from mutual pressure; three-eighths to three fourths inch in diameter; densely covered with short grouped white spines that are buff and deciduous at maturity, exposing the pubescent or nearly smooth, dirty straw colored or buff inner peridium. Spores and capillitium pale greenish buff, the former finely granular, round, stalkless 3.5 to 4.25  $\mu$ .—pl. 1, f. 8.—Very abundant at the sides of paths and on open, bare places in dry, closely cropped grass land.

Specimens have also been sent me from River Falls (*King*), Sheboygan, (*Brown*), and Sparta (*Miss Schuster*), and the species is reported by Bundy in the list already referred to.

*Lycoperdon cruciatum* Rostk. (*L. separans* Pk., *L. Wrightii*, var. *separans* Pk.), of which doubtful immature specimens have been collected about Madison, and which Miss Schuster sends from Sparta, and Professor King, from River Falls, occurs more commonly in shaded places and is distinguished by its somewhat large size (half an inch to two inches) and more clay-colored or darker spores which are often pedicellate or intermingled with fallen sterigmata 5 to 7  $\mu$  long; and especially by the (very soft and flexible often dark brown) velvety inner peridium, from which the closely united white spines flake away in a continuous layer. The American plant corresponds well with the figure of Rostkovins (*Sturm's Flora*, Heft. 18. pl 8), though its spines are more crowded than in the figure. If the last runs into this, the name of Rostkovins must have precedence.

5. LYCOPORDEN GEMMATUM Batsch.—Usually gregarious, one to two inches in diameter, sometimes as much as three inches high, commonly top shaped, the fertile pair contracting into a stout obconic stem which equals or surpasses the enlarged summit in length, white, passing into pale buff or gray; with fleshy deciduous warts and intermingled more persistent smaller ones. Spores pale brown, thin-walled and translucent, finely granulated, round, stalkless, 3.5 to 4.5  $\mu$ .—Pl. 2, f. 1. Very abundant on the ground or occasionally on decayed wood, in the woods.

The Lapham herbarium contains specimens from Milwaukee, and I have seen others from Sheboygan (*Brown*). Bundy also reports the species. The most characteristic feature of this, which is one of our commonest species, is the occurrence of solid fleshy warts, often one-sixteenth of an inch or more in length, which stud the upper part of the peridium, giving it an appearance of great beauty when young. These are easily removed, leaving round, pale spots, one-thirty-second to one-sixteenth inch in diameter, on the peridium, elsewhere covered with fine granules. Even on old weathered specimens when the latter have entirely disappeared from the top, the characteristic pale spots are to be found toward the base.

*Figures*.—Palmer, *Mushrooms of America*, pl. 8; Trelease, *St. Nicholas*, xiii, 875, f. 4. *Exsiccatæ*.—Ellis, *N. A. Fungi*, no. 1,699.

6. LYCOPERDEN PYRIFORME Schaeff.—Our most variable species, globular, pear-shaped, or clavate, sessile or stipitate, usually five-eighths inch to an inch in diameter, and half an inch to an inch and a half high (exceptionally as much as one and one-fourth by two inches). Peridium buff, covered with uniform persistent coarse dark brown granules (exceptionally with substellate 'short spines?'). Spores pale olive, smooth, round, 3.5 to 4.5  $\mu$  stalkless.—Pl. 2, f. 5. Very common in woods, on old stumps, buried sticks, etc., the plants commonly gregarious, and connected by coarse white fibers.

I have also examined specimens collected at Sheboygan (*Brown*), and River Falls (*King*), and others occur in the Lapham herbarium. Bundy also mentions the species in his list of Wisconsin fungi.

*Exiccatae*:—Ravenel, Fungi Carolin., ii. no. 72; Fungi Amer., no. 469.

7. LYCOPERDON OBLONGISPORUM B. & C.—Round to broad, pyriform, three-eighths in. to 1 in., usually narrowed below, with a mycelial cord at base. Peridium brown, at first furfureaceous, finally glassy, but with minute persistent granules. Spores greenish-brown, almost smooth, ellipsoidal, stalkless, 4 $\times$ 6  $\mu$ .—Pl. 2, f. 3.—Rather abundant on the bare ground in dense woods; August.

This pretty species, previously known only from Cuba,<sup>1</sup> is indistinguishable from the next when immature, the spores affording the only really characteristic feature. It has probably been overlooked in the past chiefly for this reason and because the mature plants, from their leaf-brown color, are not at all conspicuous. *L. Hongkongense* B. & C. (N. Pacific Expl. Exped. Fungi,—Proc. Amer. Acad. 1858,—124, no. 119), as I find from an examination of original specimens in the Gray herbarium at Cambridge, is a little more elongated than this species but with the same microscopic characters otherwise. Its spores, however, differ in being long-pedicelled. In their memoir on *Lycoperdon* and *Scleroderma* (Ann. Sci. Nat. 1842, Ser. 2, xvii, 13–14, Pl. 2, B. f. 5–7) the Tulasnes figure pedicellate oblong spores for some plants of *L. cepaeforme* Bull., which is referred to as synonymous with *L. pusillum* Fr. and *L. ericetorum* P.

8. LYCOPERDON, PUSILLUM Fr.—Microscopic characters of the preceding, but usually paler and less glistening when mature. Spores round or barely obovoid, nearly stalkless, 3.5 to 4.5  $\mu$ , evanescently minutely roughened or smooth.—Pl. 2, f. 4.—Rather frequently on the ground, in open fields; also sent from River Falls (*King*), and reported by Bundy (*l. c.*)

*Exiccatae*: Ravenel, Fungi Carol. ii, no. 73; Fungi Amer. no. 138.

9. LYCOPERDON MOLLE P.—Depressed, globose, half an inch to an inch and a quarter in diameter, sessile or on a stipe of equal length. Peridium cream-color passing into buff, mealy-furfureaceous, glistening when old. Spores olive, round, stalkless, minutely echinulate, 3.5 to 5  $\mu$ .—Pl. 2, f. 6.

On the ground in open woods and pastures; also collected at River Falls (*King*).

<sup>1</sup> Berkeley & Curtis, Fungi Cubenses (Journ. Linn., Dec., 1867), 345, no. 505.



This species superficially resembles small plants of *L. glabellum* Pk. so closely that it is difficult to distinguish them. When cut open, especially if gathered immature and allowed to ripen in the laboratory, it sometimes also presents a red-purple section; but this does not depend upon the color of the spores, which afford constant and certain means of distinguishing the two species, since in this they are about as in *L. gemmatum*, while in *L. glabellum* they are nearly as in *L. constellatum* or the related species of the purple-spored section.

10. LYCOPERDON COLORATUM Pk.—Round, and somewhat depressed and contracted at the base, three-eighths to one inch; from pure white passing into yellowish and at maturity buff; granular-mealy; finally glistening and dotted with minute dark granules that persist or often rub away from large areas. Spores and capillitium buff, the former paler, round, smooth, stalkless, 4 to 5  $\mu$ .—Pl. 2, f. 2.—On the ground in damp woods; August.

11. LYCOPERDON PULCHERRIMUM B. & C. (*L. Frostii* Pk.)—Obovoid, an inch to an inch and a half in diameter and about as high. Peridium coffee-color at maturity, covered with very deciduous slender white spines, often three-sixteenths inch long, clustered by their tips; usually smooth and glossy after their fall. Capillitium at last red-purple, spores varying from pale buff to reddish-purple, round, with very low colorless warts, nearly stalkless, 4 to 6.5  $\mu$ .—Pl. 3, f. 1.—Open grass land, not uncommon.

In this and other species of the purple-spored Proteoids the pedicels of the spores, even in mature specimens, are sometimes 2 to 4  $\mu$  long, whereas in other groups the species that have not long pedicelled spores very rarely show pedicels much over 1  $\mu$  long.

The spores of the group of species which follows are very uniform, coarsely warted and usually short-stalked. As shown by Peck (U. S. species of Lycoperdon, 18), they are intermingled with fragmentary colorless rods, to which they are not attached, but that represent the fallen remnants of long sterigmata, as may be seen by examining young specimens. In this paper (p. 22) and in 32 Rep. N. Y. Museum, p. 68, Peck states that *L. pulcherrimum* B. & C. is evidently the same as *L. pedicellatum* Pk., an opinion which I shared until, in looking through the puff-balls of the Curtis herbarium, which Dr. Farlow obligingly placed in my hands, I found the type of *L. pulcherrimum*, gathered in Pennsylvania, in 1852, and preserved under the number 3933. The description by Berkeley (Notices of N. A. Fungi, 50, No. 336,—Grevillea, ii, 51) is certainly more applicable to *L. pedicellatum* than to this species, especially as regards the size and color of the spores; but unless two entirely different things were collected under this number, so that Berkeley's description was not drawn up from a duplicate of the Curtis type, there can be little doubt that *L. Frostii* and not *L. pedicellatum* is a synonym of *L. pulcherrimum*.

12. LYCOPERDON ATROPURPUREUM Vitt.—Extremely variable in size and form, three-fourths to two and one-half inches in diameter, one and one-fourth to three inches high, obconical or pyriform to subglobose; nearly

sessile or on a long stipe. Peridium straw color or dull buff, nearly spineless or with sharp, dark spines, often united in clusters by their tips, furfuraceous with a more or less evanescent mealy coating through which the inner layer appears glossy. Spores purple-brown, coarsely granular, round, 4.5 to 6.5  $\mu$ , nearly stalkless or with pedicels 2 to 4  $\mu$  long.—Pl. 3, f. 2.—Rather frequent on the ground in bushy woods, or occasionally on decaying wood. Reported by Bundy, and occurs from Wisconsin (*Lapham*) in Hb. Curtis as *L. saccatum*. The more spinose form is var. *hirtellum* Pk.

Though easily recognized in most of its forms, this is one of the most perplexing of our species. Berkeley and Curtis as well as Dr. Winter, who examined some of our specimens, have considered the plant to be *L. saccatum* Fr. As *saccatum* is understood by Bouerden (Bot. Zeitung, 1857, 596), and Winter (Rabenhorst's Kryptogamen-Flora, i, 901), this determination is unimpeachable; but *L. saccatum* of Fries and the Flora Danica (Pl. 1139), has a flaking peridium similar to that of *L. bovista* and *L. cyathiforme*, whereas our plant possesses a persistent peridium opening by a terminal pore. Recognizing this, Winter (*l. c.*) admits that Bouerden appears not to have possessed the true species of Fries, yet does not hesitate to follow him. The real *saccatum*, which occurs in New York, is certainly very distinct.

*Figures*:—Palmer, Mushrooms of America, pl. 8, as *L. saccatum*. *Excisicatae*:—Ravenel, Fungi Carolin., iv, no. 73, in part, as *L. gemmatum*.

13. LYCOPERDON CONSTELLATUM Fr. Subglobose or more commonly in the form of an oblate spheroid, somewhat pinched-in at base, one to two inches in diameter. Peridium straw-color, gray or copper, at first with deciduous brown spines clustered by their apices, and intervening low brown warts that persist as a prominent reticulum, or, ultimately falling, leave the peridium minutely faceted, somewhat resembling "hammered work" in metal. Spores nearly as in the last, 5 to 6.5  $\mu$ . Old capillitium brown.—Pl. 3, f. 4.—On the ground in bushy woods.

Though more depressed than *L. umbrinum* of the Flora Danica (pl. 1800), which is the prototype of *L. constellatum*, our plant agrees so well with the descriptions, that I have followed Peck in referring it to that species. According to Dr. Winter, it nearly resembles *L. cupricum* Bouerd.

14. LYCOPERDON RIMULATUM Pk. in herb.—Depressed globose, pinched-in and radicate at base, slightly umbonate at apex, three-fourths to one and one-half in. in diameter. Peridium tawny flesh-color, thin, glabrous, rimulate with anastomosing furrows. Spores red-purple, rough-warty, 5 to 6.5  $\mu$ ; their pedicels 2  $\mu$  or in immature specimens, as much as 15  $\mu$  long.—Pl. 3, f. 3.—On the ground in open wood pastures; September; also collected at River Falls (*King*).

An interesting plant, related to the *constellatum* group in its spore characters, but differing from our other species of this group in the absence of a spinose or mealy coating, the outer peridium merely cracking along the grooves as in *L. caelatum*. I am indebted to Mr. Peck for the name employed, which he has applied to immature specimens in his herbarium, from Ohio (*Morgan*) and New York.

15. LYCOPERDON GLABELLUM Pk.—Depressed globose, or elongated and stipitate, more or less umbonate, three-fourths to two in. high. Peridium buff, very finely furfuraceous. Spores and capillitium purple or more or less brown, the former 5 to 6  $\mu$ , with coarse warts, and short-pedicelled.—Pl. 3, f. 5.—On the ground in woods, accompanying *L. gemmatum*; River Falls (King).

*Tulostoma fimbriatum* Fr., a small puff-ball raised on a solid cylindrical stipe about one-eighth in. in diameter and as much as an inch long, may be recognized by its subglobose more or less granulated peridium, opening by a small scarcely protruding fimbriate mouth, brick-colored, remotely spinose, round spores 4.5  $\mu$  in diameter, and pale blunt anastomosing capillitium. I have received it in quantity from Professor King, of River Falls.

## SECOTIUM.

1. SECOTIUM ACUMINATUM (Mont.) (*S. Thunii* Schulzer. *S. Warnei* Pk.)—Short stipitate, subglobose to conical ovoid, rounded or frequently more or less acuminate above.

Peridium rather leathery, dull yellowish-white, passing into buff; smooth or mostly with crenated scale-like elevations often free at their lower edge, dehiscing irregularly about the stipe, which is prolonged through the sporiferous portion as a stout columella one-fourth to one-half in. in diameter, and firmly united with the peridium at apex. Spore-bearing mass snuff-brown, extending laterally from the columella in a series of eroded friable thin gills. Spores yellow-brown, smooth, stalkless; extremely variable, spherical, ellipsoidal, or more or less regularly ovoid, 4.9  $\times$  6-14, most commonly 6  $\times$  8  $\mu$ .—Pl. 2, f. 7.—Abundant in late summer and fall in open pastures, etc. My largest specimens were obtained on the bare ground in a potato patch.

Reported from Wisconsin by Bundy (*l. c.* 399, — the specimens preserved in hb. Peck), and Peck (Bull. Torrey Club), and included in the collections of Dr. Brown, of Sheboygan, and F. H. King, of River Falls. Edible when young.

According to Schulzer von Muggenburg (Hednigia, 1883, 43), this species, described by Peck. as *Lycoperdon Warnei* (Bull. Torrey Bot. Club, vi, 77), *Podaxon Warnei* (U. S. Sp. Lycoperdon, 34), and *Secotium Warnei* (Bull. Torrey Cl. ix, 2), is identical with the European *S. Threnii* Schulzer, which is referrible to *S. Acuneinatum* (Mont.) Tul. *S. Szabolcsense* Hasl., judging from his figure and the abstract of his paper in Jost's Bot. Jahresbericht for 1876, p. 161, must be extremely closely related.

*Figures*:—Peck. Bull. Torrey Bot. Club, ix. pl. 9, f. 6-11; Revue Mycologique, iv. pl. 16. f. 13.

## SYNOPSIS OF SCLERODERMA.

Peridium thin, dark-dotted — — *S. verrucosum*. More conaceous, uniformly colored, usually furrowed or sculptured.— *S. vulgare*.

1. SCLERODERMA VERRUCOSUM (Vail.) — Flattened biscuit-shaped,  $\frac{1}{4}$  to  $1\frac{1}{2}$  in. in diameter, nearly sessile or with a short stipe, radicating at base. Peridium thin and flexible above, but tough; yellowish buff, a thin outer layer cracking during development and persisting as small angular darker scales; dehiscence irregular, apical, spores purple, roundish, stalkless, sharply echinulate, 8 to 10  $\mu$ .— Pl. 3, f. 7.— One of the earliest and commonest of our puff-balls, on the bare ground in roads. I have also collected specimens above Kilbourn City, and the species is found at River Falls (*King*) and is named in Bundy's list.

Neither this nor the following species is considered fit for food,<sup>1</sup> though greedily devoured by snails. Even the young plants emit a disagreeable pungent odor, quite different from that of other puff-balls.

This is, at least in part, *S. Bovista* of Ellis, N. A. Fungi, no. 24; and, perhaps, of Von Thuemen. Mycotheca Universalis, no. 607,— both from New Jersey, but in my own copy of the Mycotheca, and in Dr. Farlow's, the latter number appears to be a form of *S. vulgare*. Our plant is that figured by Nees (Syst. du Schwämme, pl. 11, f. 124) under the name *Bovista plumbea*, obviously an error. It is not evidently different, except in the shortness of its stipe, from *Lycoperdon verrucosum*, *sphaericum*, etc., of Vaillant (Bor. Parisiense, pl. 16, f. 7), *L. verrucosum* of Bulliard (Pl. Vénén. de la France, pl. 24), *L. defossum*. Sowerby (British Fungi, pl. 311), and *Scleroderma verrucosum*, Greville (Scot. Crypt. Flora —, pl. —). It is also quite similar to that figured by Sorokine (Ann. Sci. Nat. 6 ser. iii. pl. 6 f. 12 f.) as *S. verrucosum*, and agrees in all essentials with a French specimen in the Curtis herbarium referred to *verrucosum* by Desmazieres. The transparent border to the young spores, figured by the Tulasnes (Ann. Sci. Nat. 2 ser. xvii. pl. 1, A. f. 8) in what they doubtfully refer to this species, and which I have noticed in *S. vulgare*, f. *minor* of Saccaede's Mycotheca Veneta. no. 1412, has not been observed by me in American specimens of either species; but is held by Caspary (Sitzber. Geo. zu Königsberg, 1886, xxvii, 203) to be merely an immature character.

2. SCLERODERMA VULGARE Fr.— Depressed globose, narrowed and radicating below, three-fourths to two in. in diameter. Peridium pinkish or buff, thick, smooth or finely checked by intersecting dark furrows about one-sixteenth in. apart. Spores as in the last, nine to fifteen  $\mu$ , the spore-mass when maturing separated into small grains by bundles of pale gray hyphæ.

<sup>1</sup> *Scleroderma vulgare* is commonly held to be poisonous to man, but according to Smith (Gard. Chron. 1885, 48) and Caspary (Schrift. Physik.— Oekonom. Gesellsch zu Königsberg, xxvii, 109; Bot. Centralblatt, xxx, 34), it is collected in parts of England and Germany as a truffle and eaten after cooking, without known ill effects. But its bad name should be borne in mind by anyone desirous of experimenting with it.

— Pl. 3, f. 6.— Grass land or in mossy dry woods. Also sent me from Sparta (*Miss Schuster*) and River Falls (*King*), and reported by Bundy.

Our Western form, as I have seen it at Madison and about St. Louis, is often smooth except for the simulate areolation referred to, in this respect differing from a common Eastern and European form, which is also decidedly yellow, but it is undoubtedly a form of the same polymorphic species. The *S. verrucosum* of Bundy's list is presumably the rougher plant, which is shaggy with coarse scales, often free and recurved above.

*Scleroderma Bovista* Fr., named in Bundy's list, differs from *vulgare* in its thinner peridium, and from both of the preceding species in the more olive spore-mass with intermingled yellow flocci; otherwise it closely resembles *S. vulgare*, from which, like Caspary (*l. c.* 204), I often find it hard to separate it.

*Elaphomyces*, one of the Tuberales, developing underground, when mature resembles a *Scleroderma*; but its spores are borne in asci that are evident in young plants. We have as yet found no representative of this genus, which should be looked for in pine woods, etc.

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#### EXPLANATION OF PLATES.

The plants are represented of the natural size, and their spores uniformly enlarged 2000 diameters.

##### PLATE VII.

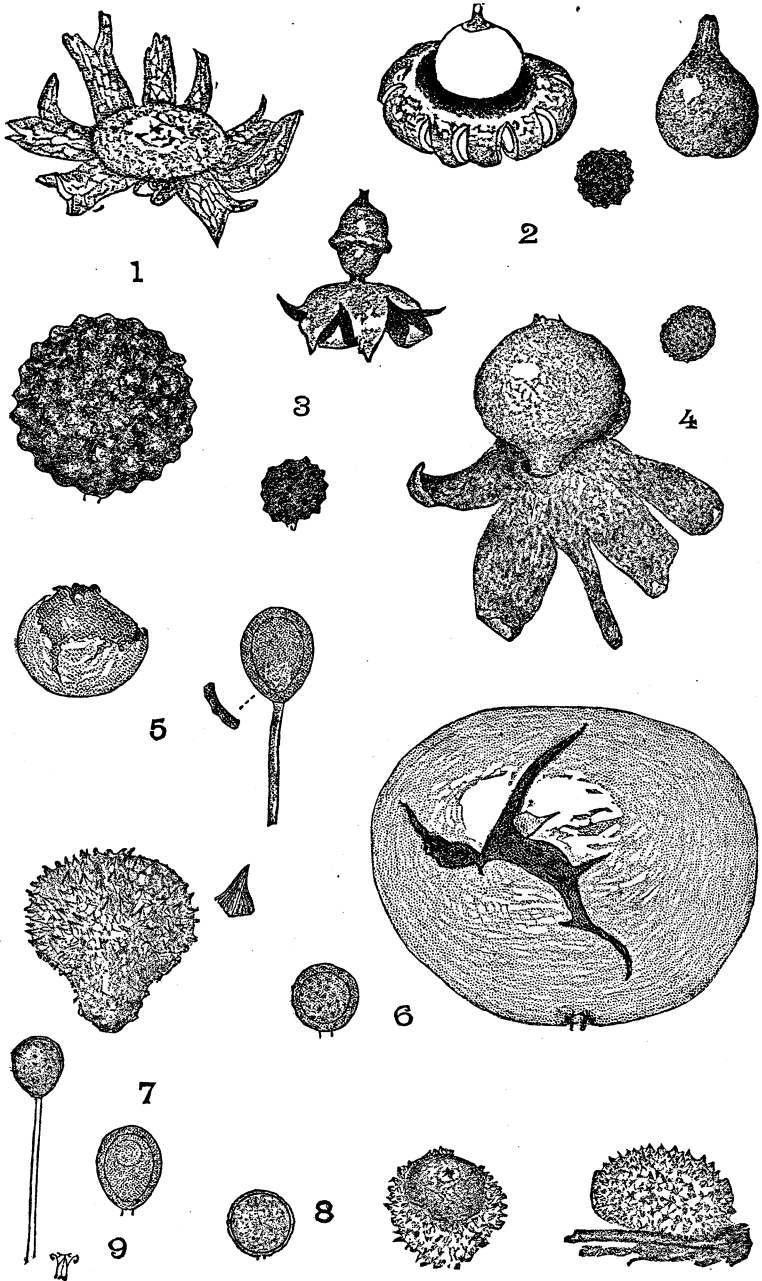
1, *Geaster hygrometricus* and spore; 2, *G. saccatus* and spore; 3, *G. Rabenhorstii* and spore; 4, *G. limbatus* and spore; 5, *Bovista plumbea* and spore; 6, *B. pila* and spore; 7, *Lycoperdon pedicellatum* (small specimen) and spore; 8, *L. Wrightii*, two plants and spore; 9, spore of *L. caelatum*.

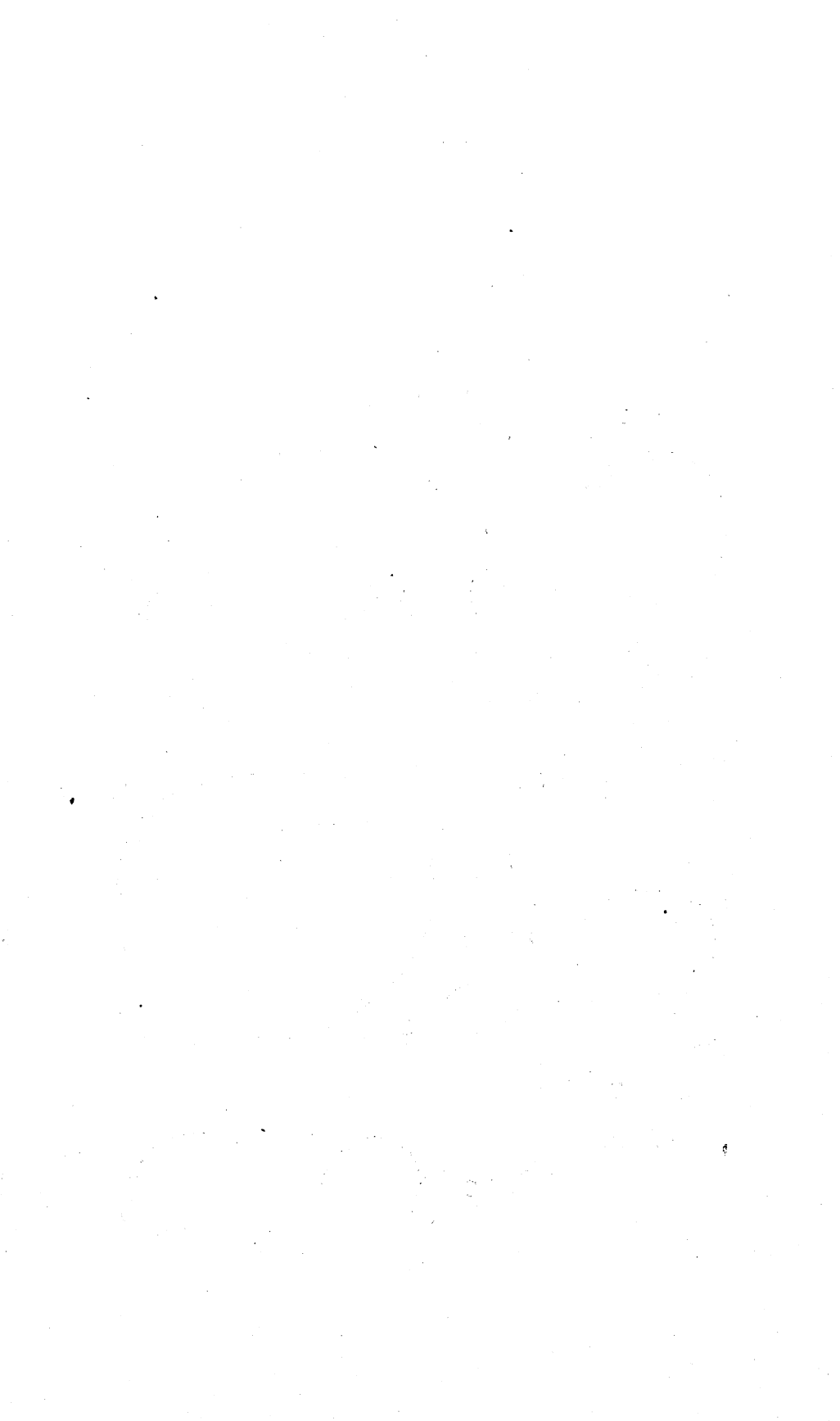
##### PLATE VIII.

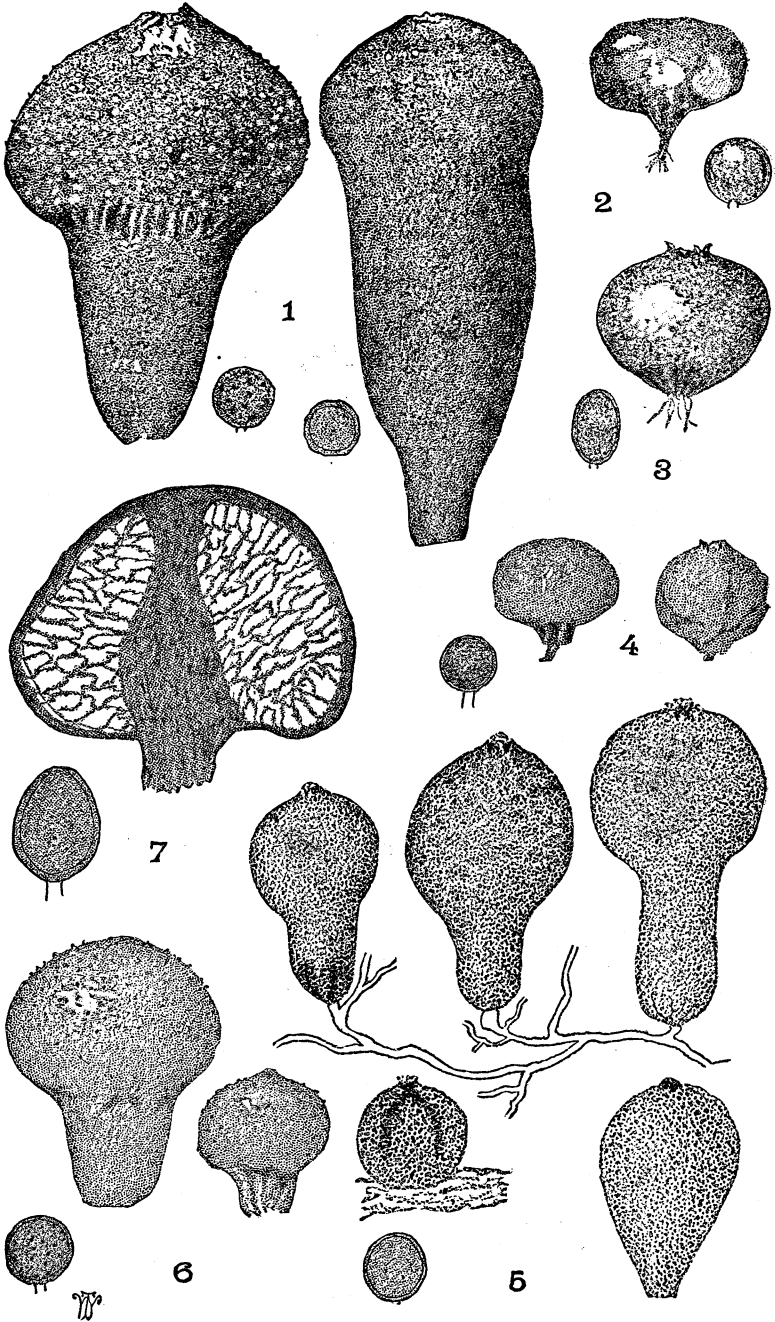
1, *Lycoperdon gemmatum* and spores; 2, *L. coloratum* and spore; 3, *L. oblongisporum* and spore; 4, *L. ericetorum* and spore; 5, *L. pyriforme* and spore; 6, *L. molle* and spore; 7, *Secotium acuminatum*, in section, and spore.

##### PLATE IX.

1, *Lycoperdon pulcherrimum* and spore; 2, *L. atropurpureum*, three plants and spore; 3, *L. rimulatum* and spore; 4, *L. constellatum* (?) and spore; 5, *L. glabellum* and spore; 6, *Scleroderma vulgare* and spore; 7, *S. verrucosum*,—subsessile and stipitate forms.

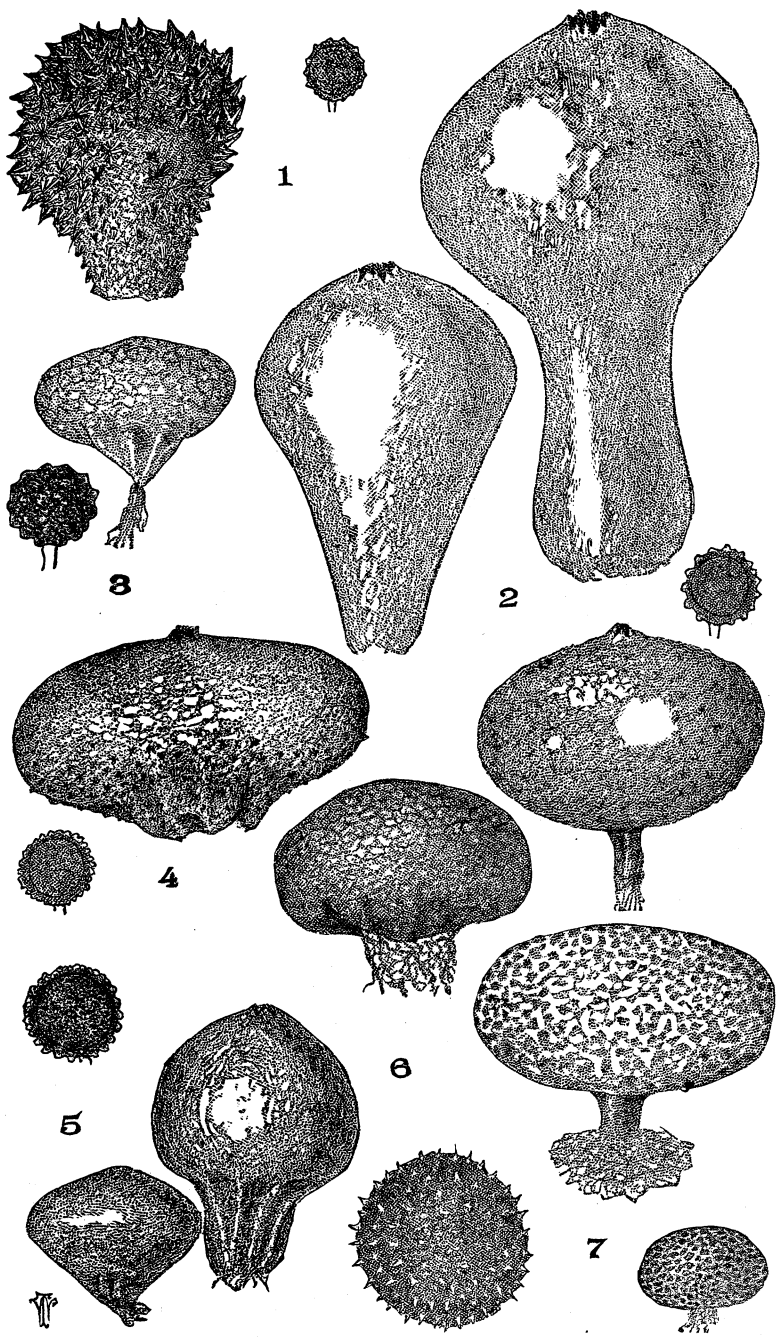


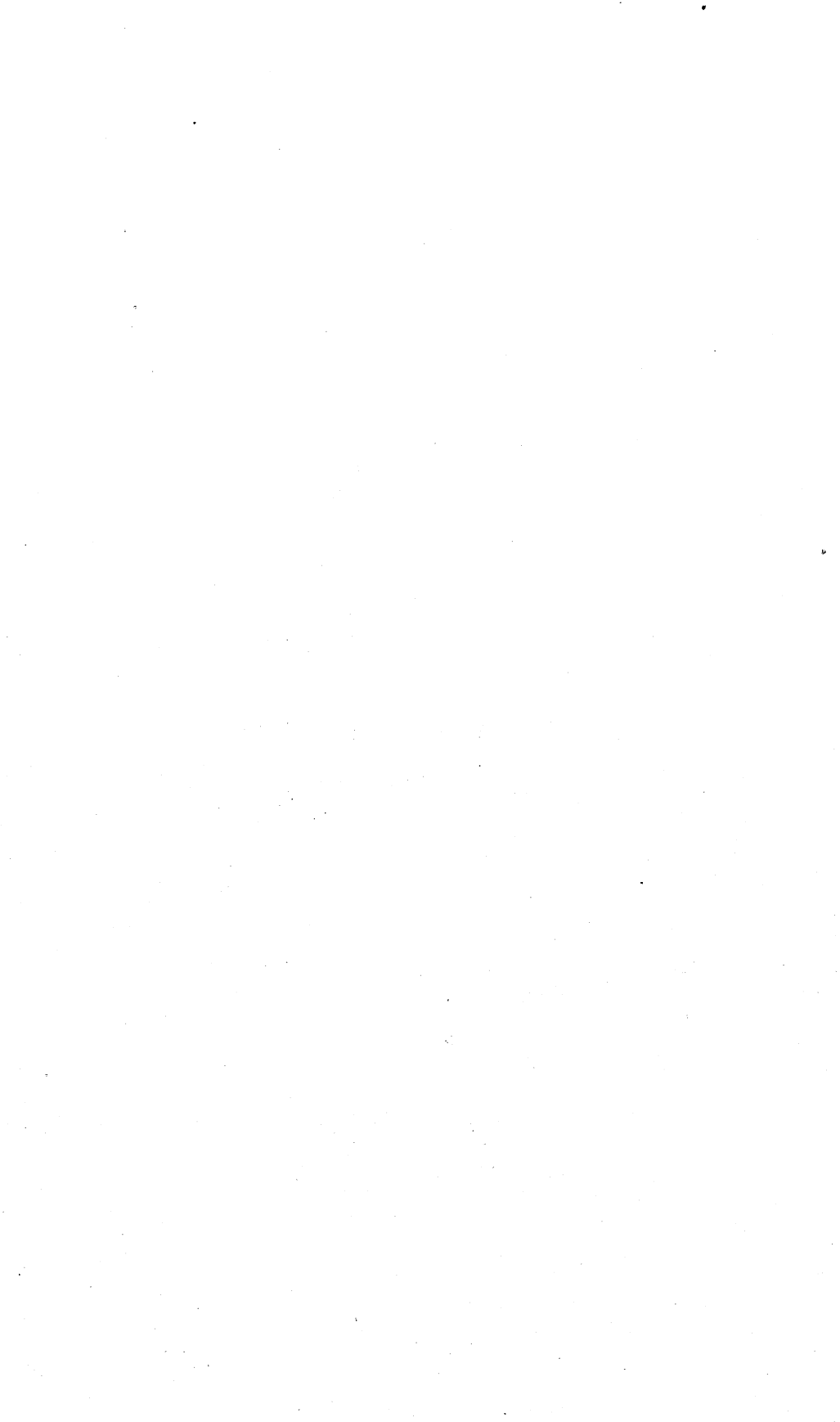












## THE "WORKING" OF THE MADISON LAKES.

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BY WILLIAM TRELEASE.

Every season a greenish-yellow scum occurs in greater or less quantity on Third and Fourth Lakes (Mendota and Monona), during the hot weather of summer, after the water has been calm for a number of days in succession. When but little of it is present, it appears as fine granules suspended in the water, often scarcely visible to the naked eye except as they reflect the light, when they call to mind the dancing motes in a beam of sunlight. Under the influence of a gentle, but continuous breeze, these particles are collected into fleecy masses, and driven ashore, so that they accumulate along the margin of the lake, forming a slimy scum which quickly putrefies, giving off a very disagreeable odor. During this change, its color changes to a decided blue-green, which stains the pebbles, sticks, etc., over which it is smeared. The appearance of this scum is sometimes spoken of as the working of the lakes, from a resemblance to the collection of a scum on cider, etc., when fermenting, or, as an American idiom expresses it, "working."

Usually the scum is seen in small quantity and only attracts attention for a day or two at a time, in midsummer, when it collects on the city side of the lake; for a change in the direction of the breeze, or a brisk wind from any quarter usually scatters it in a short time. In the summer of 1882, however, the working of the lakes was noticed early in June, and on the 17th of that month enough scum had collected along the city shore of Fourth Lake to prevent boating. The odor which it gave off was noticeable at a distance of one or two blocks from the water. After a few days a change in the wind brought relief for a time, but the trouble was renewed at frequent intervals until the middle of November. The first formation of this scum was apparently traceable to the long, shallow bay between Picnic and Second Points, in Fourth Lake, and to the bay at the west end of Third Lake, from which it was scattered by winds, and afterward increased everywhere.

In the summer, during calm weather, the water within a foot or two of the surface was everywhere filled with the minute granules already referred to. In places where counter currents met, as off Picnic Point, these were collected in a local surface film. While this appearance lasted the fish in the lake bit very little. On several occasions white bass were found in large schools

off the points, jumping under films of this nature, apparently at the glistening air-bubbles which were entangled at the surface; but though the entire range of the fly-book was tried, they persistently refused the hook. In other parts of the lake where there was little scum, the fish, especially pickerel, bit more freely.

The floating bodies, which at times are as large as pin heads, have once or twice been noticed as a cause of the dispersion of sunlight in a beautiful manner. One calm, bright morning in the fall, a student while rowing, observed a spectrum on the surface of the lake, which took the form of a parabola, with its vertex at his boat. To another person on shore, the spectrum appeared nearly straight. The appearance was of the same nature as the rainbow, and was apparently caused by refraction in the floating dots, which slightly projected from the smooth surface of the water, that covered them with a thin film. A breeze quickly ended it.

The working of the lakes at Madison corresponds to what is known in parts of Great Britain as the "breaking" of small bodies of water. On the continent, a similar scum is spoken of as water-bloom (Wasserblüthe, Fleur d' eau, Flos aquæ). In all these cases, the phenomenon depends upon the multiplication of minute algæ belonging to the group Cyanophyceæ, which usually accumulate suddenly and often disappear after a few days, either temporarily or for the balance of the season. Sometimes the bloom is said to disappear at nightfall, in quiet water, to re appear the next morning. The futility of fishing at such times is generally recognized in Europe, the common impression being that the fish are then sick. In this connection it may be said, however, that the wholesale death of fish, especially perch, in Fourth Lake, during the summer of 1884, and the death of numbers of whitefish every summer has apparently no connection with the water bloom.

Thuret divided the Cyanophyceæ into Chroococcaceæ and Nostochineæ; the former with their cells not in chains; the latter with their cells placed end to end, forming filaments. The Nostochineæ have since been separated into several groups equivalent to the Chroococcaceæ, but for our purpose the simple division into the two main groups may be retained.

Of the Chroococcaceæ, two are pre-eminent as forming water bloom:—*Clathrocystis aeruginosa* and *Coelosphaerium Kützingianum*. The principal part of the scum first collected at Madison consisted of the former species (Fig. 8), though the latter (Fig. 7) was also present.

What have usually been called *Anabaena flos aquæ* and *A. circinalis* are, in their several forms, the commonest of the Nostochineæ that occur under similar circumstances. A small part of the Madison scum of 1882 was composed of sterile plants apparently of *A. flos aquæ*, which, with a little of a smaller *Anabaena*, occurred intermingled with the *Clathrocystis* and *Coelosphaerium*. These species lasted through the summer, the scum which they formed also containing not infrequent threads of *Lyngbya nollei* (Fig. 6), a few stellate plant hairs, and scattering grains of pine pollen. As the

season advanced, the larger *Anabaena* became relatively a trifle more abundant, but for the most part remained sterile.

Examinations were not made for several weeks in August and September, but on the 26th of September, when another sample was taken for the use of a laboratory class, the bloom consisted exclusively of the smaller *Anabaena* (Fig. 5), which I have called *A. mendotae*,<sup>1</sup> a species that continued to appear on the shore at intervals until well into November.

M. Bornet, who was obliging enough to examine specimens of this alga for me, writes as follows: "The *Anabaena* you have sent me belongs to the sub-genus *Dolichospermum* Thwaites, in the sense in which it is understood by Wittroch (Wittroch and Nordstedt: *Algæ exsiccatae*, No. 496). It appears to me new, and differs from all of the species which constitute water-bloom in the tenuity of its threads, in the length of its articles and the slenderness of its spores. It is only comparable to *Limnochlide flos aquae* in the dimensions and configuration of the different vegetative and reproductive organs. That you may compare it, I send a tracing from analyses of authentic specimens of *Nostoc flos aquae* Lyngbya [Fig. 1], *Nostoc flos aquae* Agardh [Fig. 2], and *Anabaena circinalis* Rabenhorst [Fig. 3], which is the prototype of the species. Admitting that these three plants are but forms of a single species, as may be inferred from the observations of Wittroch on *Anabaena (Dolichospermum) hassallii*, your alga still differs from all of them, and is, especially, very distinct from the *Anabaena circinalis* of Rabenhorst."

As a general thing, protracted heat precedes the appearance of the water-bloom, which is most frequent in sluggish or stagnant bodies of water, especially such as are fed by the outlets of bogs, hence the phenomenon is most frequently noticed in mid-summer or later: yet the abundance of the scum in June 1883, shows that a very short period of warmth may suffice for its formation, as the early part of the spring was cold, and there had been but few hot days when it appeared.

Unlike the majority of the algæ implicated, *Limnochlide flos aquae* thrives exceptionally well in cold water, and has even been found luxuriating in the greatest abundance in ice.<sup>2</sup> *Anabaena mendotae*, which first became really abundant after the disappearance of *Clathrocystis coelosphaerium* and the larger *Anabaena*, and lasted until not only the air but the lake itself had become quite cold, appears to resemble it somewhat in this respect.

During the summers of 1883 and 1884, I was absent from the city, but I

<sup>1</sup> *Anabaena (Dolichospermum) mendotae*, n. sp. — Threads circinate. Vegetative cells slender, usually elongated, especially towards the ends of the filaments,  $3.4 \times 4.5-12 \mu$ . Heterocysts ellipsoidal or barrel-shaped,  $4.5 \times 6-7.5 \mu$ . Spores remote from the heterocysts slender, more or less curved,  $4.5-7.5 \times 20-40 \mu$ , bluish-green, like the vegetative cells (Fig. 5) Forming a copious water-bloom on Lake Mendota, at Madison, Wis., especially abundant in the fall.

<sup>2</sup> Magnus: l. c.

am informed that though some water-bloom occurred, and at times became offensive, especially in the latter summer, it was less abundant than in 1883. In 1885 but little was seen. Once or twice toward the end of July the scum accumulated in small quantity, but was quickly dispersed by a change in the wind, and it was not until nearly the middle of August that I was able to collect specimens. On the 10th of August quite a quantity was noticed floating in sheltered places along the University shore, and in the lee of Picnic Point, and more was seen off the shore toward Merrill's Springs, where it had stained the rocks somewhat. This consisted entirely of the *Anabaena* represented in figure 4, in good fruit.

After a warm spring, on my return to Madison, June 6, 1887, I observed a considerable quantity of putrid scum on the shore of Fourth Lake, but a south wind scattered it before specimens were obtained. The succeeding fortnight was hot, and after a couple of calm days, succeeding a strong wind from the northwest, the southern half of the lake was filled with suspended particles about a millimeter in diameter. These consisted exclusively of *Anabaena hassallii*, already in full fruit, the spores with the customary *Sphaerozyga* arrangement, in a collection made June 20th. Subsequently to this date very little water-bloom was seen, and during the entire summer the lake remained unusually free from it until September 7, when I left the city.

The water-bloom of 1886 was also slight. Floating specimens collected in the latter half of August consisted of fruiting plants of the larger *Anabaena*, similar to figure 4, with a small quantity of *Lyngbya nollei*.

The naming of this larger *Anabaena* has been attended with some difficulty. The first specimens collected, which were sterile, were referred to a form of *A. flos-aquae*; but the subsequent collection of material in fruit has shown that this reference was incorrect, if *A. flos-aquae* is understood to be characterized by globose or sub-globose spores,<sup>1</sup> remote from the heterocysts, and hence referable to the sub-genus *Trichormus*. It is, however, identical with the *Nostoc flos-aquae* of Lyngbya of Dr. Bornet's sketch (fig. 1), which would be referred to the sub-genus *Sphaerozyga*, and agrees essentially with the type of *A. hassallii*. I should, therefore, refer our plant to *A. hassallii*. According to Wittrock, this species varies in the relative position of spores and heterocysts as widely as the three figures furnished by Dr. Bornet. Among our Madison specimens, none have been found with the spores remote from the heterocysts, but the spores are not infrequently solitary, as noted by Rabenhorst.<sup>2</sup>

About the middle of August 1886, while rowing across Second Lake (Waubesa), south of Madison, my attention was attracted by very numerous yellowish-green spherules about 1 mm. in diameter, floating at all depths in the water. These proved to be small fronds of *Glocotrichia*

<sup>1</sup> Cf. for example, Cooke: *Fresh-Water Algæ*, p. 235, pl. 93, f. 1.

<sup>2</sup> Rabenhorst: *Flora Europæa alg. dulc. et submar.* II., 195.

*pisum*. Each consists of a mass of tapering threads arranged radially in a gelatinous matrix, from the surface of which their apices protrude more or less, often rendering the surface bristling. The base of each filament is occupied by a heterocyst, followed by a slender cylindrical spore, above which come a series of vegetative cells gradually decreasing in diameter, until they form a slender colorless point.

This species has been reported from time to time in Europe, under a number of names, and has recently been discussed at some length by Bornet and Flatau. According to Arthur, who studied a sterile form occurring in certain Minnesota lakes, it is believed to be poisonous to cattle that drink the water containing it. Usually it is found without spores, but, as I learn from M. Bornet, it can readily be kept in the aquarium for several months, during which time the sterile forms usually produce spores.

Frequenters of the seashore are familiar with a slime of a bright peach-color that is abundant in midsummer in and about stagnant pools in salt marshes. This is of the same nature as the scums already referred to, and is caused by what is generally called *Clathrocystis roseo-persicina*, a plant related to the chroococcaceae, but destitute of chlorophyll, and recently transferred to the bacteria, and placed under the genus *Beggiatoa*, by Zopf. Species of *Trichodesmium*, *Spirulina*, *Lyngbya*, *Oscillaria*<sup>1</sup> etc., which usually grow at first on the bottom, frequently break free and float in a gelatinous film of a yellowish, blue-green, violet or reddish color; and diffused threads of some of the species of these genera more rarely form a true water-bloom.<sup>2</sup> *Limnochlide flos aquæ* is also a common Nostochineous species that forms a water-bloom. In Europe, water is occasionally fouled, if not discolored, by *Leptomitus lacteus*, one of the Saproëgnicæ, and *Crenothrix Kühniana*, one of the bacteria closely related to *Beggiatoa*. *Beggiatoa alba* is also abundant in sulphur springs, hot ditches and stagnant bays, but is usually attached to the bottom, floating only exceptionally.



GLOEOTRICHIA  
PISUM Thur.—  
Fertile thread,  
(× 580.)

Certain species of *Peridinium* and *Euglena*, which have been regarded as infusoria until recently, but are now classed by Klebs with the algæ, are quite frequent on the water and mud of stagnant ditches, etc., in spring, imparting to it a bright red or green color. . A species of the

<sup>1</sup> The largest of these, *Oscillaria princeps* Vauch, with filaments 50-57  $\mu$  in diameter, is found floating in such masses every season in a brook near the city.

<sup>2</sup> I have in my herbarium a specimen of *Oscillaria* (or *Beggiatoa*), *diffusa* Farlow, the oscillating threads of which, composed of cells 4-5  $\mu$  in diameter and 2-4  $\mu$  long, gave a pronounced purple color to the water of Jamaica Pond, Mass., in the spring of 1884, as I am informed by Dr. Farlow.



former genus was so abundant in the drinking water of Baltimore as to attract attention in midwinter, a few years since.<sup>1</sup>

In closing, a word may be added concerning certain objects to some extent resembling green tomatoes, that have been noticed a number of times on the bottom of the shallower parts of Third Lake, and of the larger pools along the railroads. These are of rounded form, more or less lobed, and of a pale bluish-green color. Their texture is rather firm, so that they retain their form when taken from the water, though they may be easily crushed to a formless mass of jelly, and when exposed to the air for a few days dry down into a thin film.

These bodies are colonies of *Nostoc verrucosum* Vauch., one of the Nostochineæ, which is also found in the old world. Under the microscope they are seen to consist of numerous contorted threads of a blueish-green color, imbedded in a colorless jelly that holds them together and gives form to the frond.

The following list of papers referring to the water-bloom is confessedly incomplete, but it will serve as a nucleus for other references. Only the principal papers treating of the recurrence of bacteria in quantity have been included; other references may be obtained from them. It should be added that comparatively few of the papers referred to have much botanical value.

On the flora of ice and snow fields, in Alpine and Arctic regions, which often produces striking color effects, see Wittrock, in Nordenskiöld's Studien und Forschungen, veranl. d. meine Reisi im hohen Norden, Leipsic, 1885, where a bibliography of the subject is given.

The diatomaceous origin of the discoloration of Arctic seas is discussed by Robert Brown, in the Transactions of the Botanical Society of Edinburgh, IX, 1867-8.

Archer: An Oscillaria of Australian seas occurring in large quantities. (Quart. Journ. Mic. Sci., XVII, 214; Bot. Jahresb., VI, I, 403).

Arthur: A supposed poisonous seaweed in the lakes of Minnesota. Proc. Am. Ass. Adv. Sc., 1883, XXXII, p. 305—abstract.

Arthur: Some Algæ of Minnesota supposed to be poisonous. (Bull. Minn. Acad. Nat. Sci., XI, 3; Fourth Rep. Univ. Minnesota, suppl. i, Rept. Dept. Agr., 1887, 97.

Arthur: Second Report on some Algæ of Minnesota supposed to be poisonous. Fourth Report Univ. of Minn., suppl. i, 109.

Berkeley: Gleanings of British Algæ. (Supplement to Sowerby's English Botany, 1883).

Bornet & Flahanet: Sur la détermination des rivulaires qui forment des fleurs d'eau. (Bull. Soc. Bot. de France, 1884, 76.)

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<sup>1</sup> As this is going to press, I notice a record of the occurrence of certain zoospores in such quantity as to cause a water-bloom (De Toni, Shrovo Gion, Bot. Italiano, xx, 295), in which references are given to several other Italian papers on this subject.

Braun: Ueber Chytridium, eine Gattung einzelliger Schmarotzergewächse auf Algen und Infusorien (p. 50). Abhandl. Berlin, Akad., 1885, 21).

Cohn: Ueber zwei Folle von sogenannter wasserbüthe durch Algen veranlasst. (Sitzber. bot. sect. Schles. Ges. für Nat. Culture, Nov. 15, 1877; Hedingia, 1877, 188; Bot. Jahresb., v, 31).

Cohn: Rivularia flintaus ad int. (Hedningia, 1878, 1; Bot. Jahresb., vi., 1, 402).

Cohn: Untersuchungen über Bacterien. Verwandtschaft von Asco-coccus mit Chroococcaceen. (Beite. zur Biol. der Pflanzen, I., 3, 155 et seq.).

Cooke: (British Freshwater Algae, 235, 237, 240, 249, 278).

Cooke: Breaking of the meres. (Grevillea, X., 111; Am. Monthly Micro. Journal, III., 94; Bot. Jahresbericht, X., 1, 330).

Coppinger: Oceanic phenomena. (Nature, XXIII., 482; Bot. Jahresber. IX, 1, 370).

Dichie: Botanist's Guide to Aberdeen, 1880, 310.

Dolley: On a cilio-flagellate infusorian recently observed in Baltimore drinking water. (Johns Hopkins Univ. circulars, III., 60).

Drummond: On a new Oscillatoria, the coloring substance of Glaslough Lake, Ireland. (Ann. Nat. Hist., I., 1).

Ehrenberg: Antheil mikroskop. Organismen am Verschlämmen der Seehafen in Wisman und Pillau sowie am Schlich des Flussbettes der Elbe, und über die Mitvererbung ähnlicher Erscheinung an der Bildung des Nilbodens. (Monatsber. Berlin, Akad., 1841, 127; 201).

Farlow: On certain algæ in Hom Pond. (Proc. Boston Soc. Nat. Hist., XIX., 47; Bot. Jahresber. VII., 1, 460).

Farlow: Remarks on some algæ found in the water supplies of the city of Boston. Bull. Bussey Inst., Jan., 1877).

Farlow: Paper on some impurities of drinking water. (Rept. Mass. Board of Health, etc., I., 131.)

Farlow: Notes on fresh water algæ. Bot. Gay., VIII., 224, 246.

Farlow: Relation of certain forms of algæ to disagreeable tastes and odors. Proc. Am. Ass. Adv. Sc., XXXII., 1883, 306.—Abstract.

Farlow: On the nature of the peculiar reddening of salted codfish during the summer season. (Rept. U. S. Fish Commission, 1878, 969). See also Revue Mycologique, VI., 197, VII, 17).

Farlow: Vegetable parasites of codfish. (Bull. U. S. Fish Comm., VI., 1, 1886).

Fleischer: Über ein massenhaftes Auftreten von Protococcus roseo-persicinus Ktz. (Hedingia, II., 37).

Francis: Poisonous Australian lake. (Nature, XVIII., 11; Bot. Jahresb., VI., 1, 402).

Giard: Etude sur une bactérie chromogène des laux de rouissage du lin. Rev. Sci. Nat., V. *Fide* Zopf.

Girod Chantrans: Recherches chimiques et microscopiques sur les con-  
ferves, etc. (Paris, Ann., x.—Vide Schultz, 495).

Gobi: Mittheilungen über *Rivularia flos aquae* Gobi. (Arbeiten Ges.  
Naturf., St. Pétersb., X.; Bot. Zeitung, 1880, 478).

Gobi: Ueber eine die Erscheinung der Wasserblüthe im Meerwasser her-  
vorrufende *Rivularia*. (Hedingia, 1878, 33.—Nachtrag. l. c., 49; Bot. Jah-  
resber., VI., 1, 402).

Harz: Ueber die im verfloßenen Jahre beobachtete Trübung des Schlier-  
seewassers. Bot. Centralblatt, 1887, XXX, 286, 331.

[Hitchcock]: Water colored by Algae. (Amer. Monthly Micr. Journal,  
III., 94).

Humboldt: Bericht über die natur hist. Reisen der Herrn Ehrenberg und  
Heimpridt.—*vide* Schultz, 495.

Magnus: Das Auftreten von *Aphanizomenon flos aquae* (L.) Ralfs in Eise  
bei Berlin. (Ber. deutschen Bot. Gesellsch., I., 3, 129; Bot. Jahresb. 6,  
XI., 1, 293).

Montague: Mémoire sur le phénomène de la coloration des eaux de la  
Mer. Rouge. (Comptes rendus, July 15, 1844; Ann. Sci. Nat., Ser. 3, II.,  
332).

Montague: Note sur un nouveau fait de coloration des eaux de la mer par  
une algue microscopique. (Comptes rendus, Dec. 16, 1846; Ann. Sci. Nat.,  
Ser. 3, VI., 262).

Montague: Résumé succinct des observations faites jusqu'ici sur la rubé-  
faction des eaux. (Mém. Soc. de Biologie, I., 59).

Olivier: Recherches sur la rubéfaction naturelle de l'eau. (Bull. Soc. bot.  
de France, 1881, 216).

Pavesi: Faune pélagique des lacs de Teasin et d'Italie. (Archives des Sci.  
phys. et nat., Geneva. Ser. 3, IV., 151; Bot. Jahresb., VIII., 1, 538).

Phillips: Breaking of the meres. (Grevillea, IX., 41).

Phillips: The breaking of the Shropshire meres. (Trans. Shropshire  
Archaeol. and Nat. Hist. Soc. [1884?], 1).

Ralfs: On the *Nostochineae*. (Ann. and Mag. of Nat. Hist., Ser. 2, V.,  
321).

Ray Lankester: On a peach-colored Bacterium. (Quart. Journ. Micr.  
Sci., n. s., XIII., 408).

Ray Lankester: Further observations on a peach or red-colored Bac-  
terium. (Quart. Jour. Micr. Sci. n. s., XVI.).

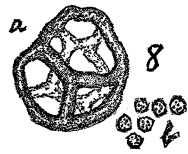
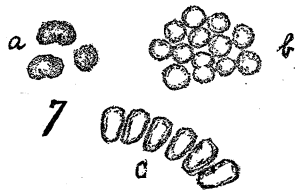
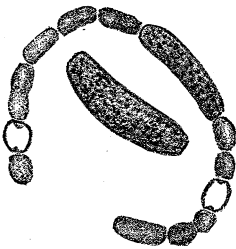
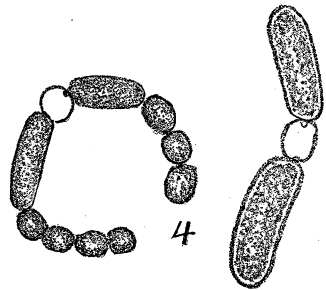
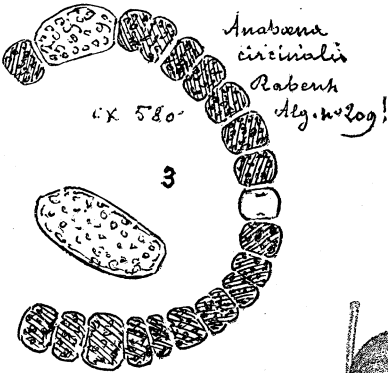
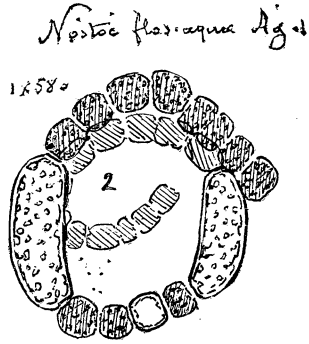
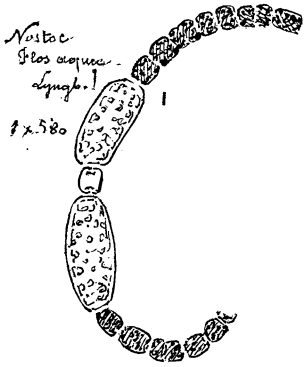
Richter: Ueber die in den Enterichelungskries von *Beggiatoa roseo-*  
*persicino* geborenden seitheirgen Algenspecies. (Hedingia, 1884, 177).

Richter: *Microcystis* Kütz., ein einzuziehendes Algengenus. (Hedingia,  
1885, 18).

Schneider: Mittheilung über die grünen und gelben Streifen in dem  
Meer von Java. (Naturk. Tydskr f. ned. Indie, 1873, XXXIII., 302; Lotos,  
1875, 63; Bot. Jahresber., III, 41).

Schnetzler: Ueber eine rothe Tärbung des Bretsees (lac de Bret), Bot.  
Centralblatt, 1887, XXXI., 219.





Schultz, C. H.: Die Fortpflanzung und Ernährung der Pflanzen, 1828, 495.

Stalher. Report on the Waterville cattle disease (see Arthur). Fourth Rep. Univ. Minnesota, Suppl. 1, Rep. Dep. Agr. St. Paul, 1887, p. 105.

Thompson: An Alga which colors Ballydrain Lake (Ann. Nat. Hist., 1840, 75).

Treichel: Ueber Polycystis aeruginosa Kütz., als Ursache von roth gefärbtem Trinkwasser, (Ber. 2 Versamml. Westpreuss. Bot. Zool. Vereins zu Marienweider, am 22 Juni 1879.—*fide* Bor. Jahresber., VII., 1, 486).

Weisse: Monas Oheini. (Bull. Phys. Math. Acad. St. Petersburg, III., 310).

Weisse: Zereite Verzeichniss St. Petersburg. Infusorien. (Bull. Phys. Math. Acad. St. Petersburg, III., 333).

Wittrock: Anabaena (Dolichospermum) Nassallii (Kütz.) Wittr. (Wittrock & Nordstedt's Algae aquae dulcis exsiccatae, No. 496; Bot. Notiser, 1882, 58; Bot. Jahresb. X. 1, 330; XI. 1, 244, 280.)

Wolle: Fresh Water Algæ. Bull. Torr. Bot. Club, VIII., 38; and Fresh Water Algæ of the United States, Bethlehem, 1887.—various places.

Wood: Contribution to the history of the fresh water algæ of North America, p. 39, etc. (Smithsonian Contributions, 1872).

Zopf: Die Spaltpilze, 1883, 74 *et. seq.*, where other references concerning Beggiatoa, etc., are given.

## DESCRIPTION OF PLATE X.

1—4. *Anabaena hassallii* (Kg.) Wittr.

1. Filament of *Nostoc flos aquae* Lyngb. (× 580). From a sketch kindly furnished by Dr. Bornet.

2. Filament of *Nostoc flos aquae* Ag. (× 580). From sketch by Dr. Bornet.

3. Filament and spore of *Anabaena circinalis* Rab. (× 580). From tracing by Dr. Bornet, from analyses of Algen Sachsens, No. 209.

4. Fertile filament and two mature spores of *Anabaena (sphaerozyga) flos aquae* (Lyngb.) (× 580). From Lake Mendota.

5. Two filaments and mature spore of *Anabaena mendotae* Trelease. (× 580). From Lake Mendota.

6. Part of filament of *Lyngbya wollei* Farlow. (× 580). From Lake Mendota.

7. *Coelosphaerium Kützingianum* Noeg. From Lake Mendota.—*a.* Fronds (× 25). *b.* Group of cells as seen from the surface (× 580). *c.* Cells as seen in radial section of frond (× 580).

8. *Clathrocystis aeruginosa* (Kütztz). From Lake Mendota.—*a.* Frond (× 25). *b.* Single cells (× 580).

## THE VILLAGE COMMUNITY AND SERFDOM IN ENGLAND.

BY PROF. WM. F. ALLEN.

The existence of village communities with collective ownership of land, in England, is a fact of comparatively recent discovery. Long after von Maurer and the writers of his school had submitted the subject to an exhaustive investigation, in relation to the Teutonic countries of the continent, it was believed that England afforded no examples of the system. The eye of the American traveler upon the continent is constantly struck by the ribbon-like strips which almost everywhere testify to a system of occupation and cultivation of land differing widely from that of his own country; while in England the fields, of irregular size and shape — although enclosed with hedges instead of stone walls and rail fences — are precisely what he is familiar with at home. It was only after the inquiry was, so to speak, completed for the continent, that a German scholar, Prof. E. Nasse, of Bonn, took it up in relation to England, and showed that here, too, the system of village communities, with an open-field system of husbandry, was the prevailing one during the middle ages.<sup>1</sup>

The line of inquiry entered upon by Prof. Nasse in the work referred to, was shortly after followed out by Sir Henry Maine in his "Village Communities," (1871); and more recently Mr. Frederick Seebohm, in his "English Village Communities," (1883), has given a description and analysis of this institution which could not be surpassed in thoroughness and lucidity. Since the publication of this work, in 1883, there has no longer been any room for difference of opinion as to the existence of village communities in England, or indeed as to their organization in almost the smallest detail. A new controversy has, however, been suggested by his work. Mr. Seebohm holds that these village communities were not, in their origin, groups of free peasant proprietors, reduced by gradual steps to a condition of serfdom, as the accepted theory maintains, but that serfdom was their original condition, there having been no essential change in this respect from the first settlement of England down through the feudal period. This view is closely connected with Mr. Seebohm's theory of the primitive aristocracy of

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<sup>1</sup> See his treatise, translated and published by the Cobden Club: *The Agricultural Community of the Middle Ages, and Inclosures of the Sixteenth Century in England.* London: Williams & Norgate, 1872.

the Germanic nations, which I discussed in a former paper.<sup>1</sup> Holding that serfdom was the original condition of the mass of the German people, he naturally holds that the same was true of the English settlers. And it must be conceded that, if his theory is true for Germany, it must perforce be true for England, while the converse does not hold. To prove the primitive democracy of the Germans does not prove a primitive democracy for the English, for the reason that their migration and conquest of a foreign land may have worked a fundamental change in their social institutions.

The question to be considered is, it will be seen, not whether the village community existed or not; that has been placed beyond controversy by Messrs. Nasse and Seeböhm. It is, whether it was a free or a serf community; and the question resolves itself at once into a larger one, as to the origin of serfdom in England. This will form the subject of the present paper.

It has generally been held that serfdom in England was in part at least the result of a gradual deterioration in the condition of an originally free peasantry — that while no doubt some serfs were in their origin emancipated slaves, and others conquered Britons, while others again were brought over as serfs by the English conquerors; nevertheless the largest portion of them were the descendants of the conquerors themselves, the rank and file of the invading armies, who had sunk by degrees to a condition not much above that of the native Britons. This view is disputed by Mr. Seeböhm. According to him there was no large body of free Germans, but the invading armies were composed of chieftains with servile followers, whom they settled at once as serfs upon their estates. The manorial system of the middle ages, therefore, existed from the first; the free Angle or Saxon was the lord of the manor, or thegn, the serfs whom he brought with him, or found already upon the soil, were the same body as the villeins of the feudal period.

His line of argument is as follows: Finding serfdom to be the condition of the peasantry in the middle ages in association with the village community, he traces both institutions back by an inductive process of remarkable ingenuity and cogency, to the reign of Alfred, at the beginning of the tenth century, at which point of time he shows that the condition of the peasantry did not differ essentially from what it was in the reign of Edward I., four hundred years later. Further back than this he is not able to go with the same thoroughness of detail, for the want of documentary evidence; he finds, however, passages in the laws of the seventh century which appear to support his view, and maintains that if we find no change in tracing the institution back six hundred years to the time of these laws, we should not be likely to find any change if we could trace it back still further for the much shorter period of two hundred years or so, to the first settlement of the Angles and Saxons in Britain. This argument is still further strengthened by the assertion that serfdom not merely existed in the

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<sup>1</sup> See Transactions of the Wisconsin Academy, Vol. VI.



tenth century (and probably in the eighth) as well as in the thirteenth but that it was more complete and harsh at the earlier date than at the latter. If these conclusions are correct, if the agricultural population of England was in a condition of serfdom uninterruptedly from the eighth century to the thirteenth, and if its early form was more severe than its later, he must be admitted to have made out his case.

As to the first point, it should be noted that he has *proved* the existence of serfdom only as far back as the tenth century; its existence at an earlier date is only an inference, partly from analogy, partly from evidence which, as will be shown further on, proves the existence of the open-field system of husbandry, but not of serfdom. The positive evidence goes no further back than the time of Alfred. Now the interval between Alfred and the original settlement of the Anglo-Saxons in Britain is just about as long (400 years) as that between Alfred and Edward I.; moreover, it is an important consideration that the years directly following the conquest would be likely to witness far more rapid and radical changes than the later period.

The second point in his argument, that serfdom is found to be more harsh in its type as we trace it further back in time, requires a careful examination, being opposed to the accepted view, and resting upon evidence of a rather doubtful character. We have numerous documents belonging to various points of time from the tenth to the thirteenth century, which contain a detailed enumeration of the duties and obligations of serfs, as well as the amount of land they held. Now the obligations, so far as they are specifically enumerated, are much more numerous and burdensome at the later period than at the earlier; but, at the earlier date, we find, in addition to the specific obligations, such general and indefinite ones as: "to work as the work requires," and "every week do what work they are bid." In such general and unlimited obligations as these, he says, consists the essence of servitude.

This argument requires that the obligations, beginning in the tenth century with unlimited liability to labor, should go on regularly lessening in amount and becoming easier through the feudal period. The contrary is, however, the case. Leaving out of account for the present the indefinite expressions just cited, to which we shall return presently, we find the precisely enumerated obligations to be less in the tenth century than in the twelfth, and in the twelfth century again to be less than in the thirteenth. That is, while there is an uninterrupted continuity through these four hundred years in the organization of the peasantry and the general character of their obligations, these obligations, as specified in detail, appear to have been steadily increasing during this period. Even the example given by Mr. Seebohm (p. 157), of the manor of Tidenham at the two periods, sustains this view, except for the phrase, "work as the work requires," at the earlier period; and a comparison of the duties specified in the *Rectitudines singularum personarum* with the numerous descriptions in the *Rotuli*

*hundredorum* or the Cartularies in the reign of Edward I., shows a much larger amount of required labor at the later period.<sup>1</sup>

In one instance we have positive evidence in detail of this increase in burdens. The residents of Weston, in Bedfordshire, made a complaint to the officers of Edward I. that, in the reign of his grandfather, King John, they were accustomed to labor in autumn only for three harvest days, on which days they were provided with food at their lord's table, one day of fish and two of meat. But William de Bokland, to whom King John granted the estate, increased the aforesaid service by one additional day, at the lord's table. Afterwards the aforesaid manor came to John Tregoz, who augmented the service to such a degree that now they perform ten days' work in autumn at their own providing, and one day besides.<sup>2</sup> Here we have on record an actual example of an abuse of power by the feudal lord, in increasing the burdens of his serfs, such as we must suppose to have been common in those evil days. It is a significant point that the extortions here described were not the work of one man, but of three successive proprietors.

As to the phrase in question—to do “every week what work they are bid”—it is best explained as a general authority to call upon them when there was need, with an understanding that no unreasonable demands should be imposed upon them. In this respect this obligation resembles the feudal aids and tallages, which also were levied at discretion, but were understood to be only occasional, and implied nothing servile in the relation. Feudal aids and tallages were nevertheless liable to abuses and extortion by reason of their indefiniteness, and were at last defined by law. So in like manner the indefinite obligations in question gave opportunity for arbitrary exactions, like those in the manor of Weston, described above. It may have been the case, too, that such obligations as these were not universal, but peculiar to such and such an estate. The tenth century document, *Rectitudines singularum personarum*, says distinctly that the obligations vary, being lighter here and heavier there; but what it describes as the usual ones are much less in amount than what was common in the

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<sup>1</sup> Compare, for the earlier period, the *Rectitudines singularum personarum*, the Codex Diplomaticus, No. 977, and the illustration given by Mr. Seebohm, p. 157: for the twelfth century, the Domesday of St. Paul, and the Abingdon Cartulary, Vol. II, p. 301; for the close of the thirteenth century the documents are very abundant, the most numerous examples being in the *Rotuli Hundredorum* and the Gloucester Cartulary, Vol. III.

<sup>2</sup> In tempore Regum Henrici et Johannis dicti homines non consueverunt operari in autumno nisi tantum tres messes in quibus diebus debebant exhiberi in cibis et potibus ad mensam domini una die in esu piscium et aliis duabus in esu carnum. Postmodum Willelmus de Bocland augmentavit dictum servicium et per ipsum crevit per unam diem messis ad mensam domini. Postmodum Hamo le Crevequer tenuit dictum manerium in eodem statu toto tempore. . . Item deinde venit dictum manerium ad manus Johannis Tregoz qui praedictum servicium augmentavit in tantum quod modo fiunt decem operationes in autumno ad mensam suam. Item praeter istam operationem exigitur ab hominibus praedictis una water-bederipe et fit. Et tunc bibunt aquam, et hoc crevit primo per dictum Hamon, etc. *Rotuli Hundredorum*, i. 6.

thirteenth century. It should be noted also that the *Rectitudines* speaks distinctly of the tenants in question as freemen.<sup>1</sup>

I cannot, therefore, concede to this part of Mr. Seebohm's argument the weight which he claims for it. He does not seem to me to have proved that the obligations were less in the thirteenth century than in the tenth; on the other hand the evidence seems to me to lean strongly the other way. But he has proved, and it is a fact of great importance, that the character of the obligations, and the status of the peasantry, did not, so far as our information goes, differ essentially in the tenth century from what we find in the thirteenth. It is, therefore, perfectly legitimate on his part to infer that this condition of the peasantry, found alike in the thirteenth and in the tenth century, probably existed in the earlier centuries also. The inference is, however, only a probable one, in the absence of direct evidence, and direct evidence is wanting. For the period before the time of Alfred, he is obliged to have recourse to indirect evidence, in the assumption that serfdom and the "open-field husbandry" went together.

Up to this point he has traced the open-field system and serfdom step by step, accompanying each other hand in hand. Beyond this point he is not able to trace serfdom, but the open-field system is traced back at least two centuries further, and he says that, as it has always carried serfdom with it in the later period, it may fairly be assumed to do the same thing in the earlier period. "The community in villenage," he says (p. 105) "fitted into the open field system as a snail fits into a shell." But it is by no means clear that a free community might not have fitted into this shell equally well, as, indeed, the prevailing theory holds. The only argument to prove that the community could not have been a free one is (p. 177) that the Teutonic custom of dividing estates equally among heirs would have led to endless and intricate subdivisions of land. But this is exactly what we find to have been the case. The virgate or "yard-land," which he assumes to have been the regular peasant's holding, and which as a matter of fact was the usual one in the thirteenth century, was the fourth part of a hide; and it is generally held that the hide, not the virgate, was the original holding. And at any rate, in the thirteenth century, we find tenures of half and quarter virgates, and even smaller aliquot parts, by the side of the regular tenure of the virgate;<sup>2</sup> exactly the condition of things which Mr. Seebohm says would have come about.

To carry back, therefore, the open-field system to the seventh and sixth

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<sup>1</sup> *Sicut omnis liber facere debet.*

<sup>2</sup> For example, in the manor of Broctrope (Gloucester Cartulary, iii, p. 140), I find among the freeholders two tenants holding entire virgates, and five holding half virgates; and among the customary tenants one with a virgate, nine with half-virgates, two with quarter virgates, and five with an amount of land equal to a sixteenth of a virgate, these differences evidently coming from the sub-division of the original hide. For other examples, see my paper on Rural Classes in the Thirteenth Century, Vol. II, of the Transactions of the Academy: that the socage freeholds were originally servile holdings is shown in my paper on the Origin of the Freeholders, Vol. IV, of the Transactions.

centuries, as Mr. Seebohm does by almost certain inference, is a valuable contribution to our knowledge; but that serfdom went back with it is an unwarranted inference. The question of freedom or serfdom is the fundamental one, that of land tenure or husbandry being really but secondary. To this fundamental question of status, therefore, we will now apply ourselves, leaving that of land occupation aside for the present.

At this point it must be conceded, as I have said before, that the existence of a large body of free peasants in the Germanic nations of the continent, which I consider to be fully proved, does not necessarily prove the existence of the same class in England. The Angles and Saxons settled forcibly and very slowly in Britain, and it is not in itself impossible that the whole body of the Conquerors became a landed aristocracy in their new home, establishing such a system of manors, with a population of serfs upon them, as we find in later centuries. This is Mr. Seebohm's view. But the probability is the other way. The Angles and Saxons did not enter Britain as the Normans did afterwards, as a handful of conquerors, ruling over a subject people. They came *as a people*, bringing their wives and children with them, not *as an army*; and with regard to the Angles we are expressly told<sup>1</sup> that they left vacant the country which they had formerly occupied — the entire people having migrated. Moreover the native inhabitants were *as a people* exterminated; in the eastern parts of the island their language, their religion, and so, far as we can judge, their institutions and customs disappeared. If the invaders established a system of serfdom in Britain, they must have brought the serfs with them, otherwise the servile population would have had the preponderance of numbers, and the resulting community would have been, as in the case of the Normans and the Franks, the native population with an admixture of the conquerors, instead of — as the language shows to have been the case — the conquering population with an admixture of natives. Now the Germans had in their native land a class of serfs called *lidi* or *lazzi*, and the Anglo-Saxon laws mention a similar class called *laet*, whom we must suppose to have been the serfs (*lidi*), brought with them by the invaders. These *laet*, the serfs of the Anglo-Saxon period, Mr. Seebohm suggests (p. 175), may have been identical with the *villani*, who were the serfs of the later middle ages. This cannot, however, be the case, as the *villani* are invariably identified with a quite different class, the *ceorls*.

This brings us to the most fundamental question in the subject under consideration: Were the *ceorls* of the early period a free or a servile class? Two things are entirely certain: first, that the Anglo-Saxon *ceorls* were the *villani* of the Latin documents; secondly that the *villani* of the later middle ages were serfs. The point at issue is whether these *ceorls* were originally serfs, as Mr. Seebohm's theory would require, or became serfs by a gradual process of deterioration, as the common theory holds. I shall en-

<sup>1</sup> *de illa patria quae Angulus dicitur, et ab eo tempore usque hodie desertus inter provincias Jutorum et Saxonum erhibetur. Beda. Hist. Eccl., i, 15.*

deavor to show: first, that the *ceorls* of the early Anglo-Saxon period were freemen; secondly, that the *villani* of the later period were not always serfs, there being found some survivals of their original free condition.

The first thing to be noted is that, as has been already pointed out, there was, in the early Anglo-Saxon period, a class known by the name of *laet*, who were undoubtedly serfs, the *lidi* of the continent. They had below them the slaves, *esne* and *theow*, and above them the *ceorls*. Now as the *ceorls* certainly ranked above this servile class, it may be assumed that they were themselves probably free. This probability is made stronger by the consideration that the Saxons of the continent had a class of common freemen intermediate between the *lidi* or serfs and the *edelingi* or nobles, a class which has no representatives among the Anglo-Saxons unless in the *ceorls*, the class under consideration. This class upon the continent was called *frilingi*, and in Anglo-Saxon also we meet the *friman* (freeman)<sup>1</sup> although this term is for the most part superseded in the early Jutish laws by the Scandinavian word *ceorls*.

The probability is therefore that the *ceorls* were a free class. We will proceed, however, to examine the actual uses of the word, in order to determine whether this probability is sustained by facts. First we will take up the poems of Beowulf, a work which, whatever its date and place of composition, unquestionably presents the most ancient picture in existence of the institutions, condition and manners and customs of the Anglo-Saxons. In this poem I find the word *ceorl* six times. In none of these is it applied to a servile class, or even used in a disparaging sense. Twice (vv. 416 and 2,972) it is used of princes; in three cases (vv. 202, 908, 1,591) of the people in general, and in the sixth case (v. 2,444) of a man of the people. If it has one meaning that could apply to all these cases, it is perhaps *man*.<sup>2</sup>

We pass next to the Anglo-Saxon codes of law. In the earliest of these laws, those of Ethelbert of Kent (about 600) *ceorl* is several times used as equivalent to *man* or even *husband*. It is also used to designate a legal class below the King and *eorl* (officer). The King's *mundbyrd* is placed at 50 shillings, the *eorl*'s at twelve, the *ceorl*'s at six. The *ceorl* was therefore a man of standing. He even had other men under his protection. Section 16 speaks of his cup-bearer, *birele*, section 25 of his *hlafo-aeta* "loaf-eater" or dependent—the correlative of *hlaford* (lord) or "loaf-giver." The *ceorl* could therefore be the lord of another man. Section 17, following directly upon the mention of the *ceorls*' *mundbyrd* and *birele*, speaks of a *man's tun* or estate, as it has before spoken of the King's and the *ceorl*'s *tun*;

<sup>1</sup> Leg. Aeth. 24, 27, 29, 31.

<sup>2</sup> It should be noticed that in the *Rigs-mal*, the allegorical poem which treats of the origin of the Scandinavian classes, *Karl* (*Ceorl*) is the common freeman, "the red-haired and ruddy cheeked lad with piercing eyes," whose sons were "Freeman and Braveman, Hold, Thane and Smith, Broadshoulders and Bonde [*Peasant*]" etc. The corresponding German word *Kerl* has a somewhat disparaging signification, while the English word *churl* is significant of the degradation which the class sustained in England.

evidently the *man* here is the *ceorl*; the *ceorl* could therefore have an estate of land.

The later laws of Kent contain nothing that adds to the evidence here given. The next stage in the inquiry is the laws of Ine of Wessex, about 700, that is, about 100 years after those of Ethelbert, and 200 years after the first settlement of Wessex. In these laws we find clear recognition of the *ceorls* as a free class, inferior to the noble class of *sithcundmen*. The *ceorl's* fine for neglecting military duty is 30 shillings, that of the *sithcundman* being 60 or 120, according as he had land or not (§ 51). Now by Germanic law none but freemen could render military service. Therefore the *ceorl* was a freeman. Again, in accusations of homicide, he is placed in regard to compurgation on precisely the same footing with the *sithcundman* (§ 54). On the other hand a certain degradation is clearly visible, in the penalty of amputation of hand or foot, inflicted for certain offences (§§ 18, 37). It would appear also that the *ceorl* was already required, or at least expected, as he certainly was afterwards required, to have a lord; sections 37, 38 and 40 treat of the *ceorl*, and between them comes § 39, referring to "any one" running away from his lord — which would certainly seem to mean "any *ceorl*."

There is another passage of the laws of Ine (§ 67), brought up by Mr. Seebohm, as a proof of the existence of serfdom at this period, but which rather shows that it was in the process of introduction, than that it was already existent. I give his translation. "If a man agrees for a yard-land or more at a fixed *gafol* (rent) and plough it, if the lord desire to raise the land to him *to work and to gafol* he need not take it upon him if the lord do not give him a dwelling." This statute testifies to the practice of exaction and encroachment by which tenants were converted into serfs, a process well attested at this very period in the Frank monarchy. It is clear that the peasants (assuming them to have been originally free), had already in large part been reduced from proprietors to tenants, the lands were rapidly being absorbed into large manorial estates, and by the same process their proprietors were becoming tenants; the next step was to convert them from free tenants into serfs.

At about this period — the close of the seventh century — belong the earliest (except three or four) of the charters and land grants, which exist in great abundance, and afford the most valuable material for the study of early English social and economical relations. In them we find that the grants consist regularly of estates with their tenants;<sup>1</sup> and the size of the

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<sup>1</sup> The charters in question begin in the reign of Ethelbert of Kent, the first Christian king, in the year 605. In all his charters the grants are merely of land — *aliquantulum telluris mei* (a little bit of my land) Thorpe's *Codex Diplomaticus*, No. 1; *aliquam partem terrae juris mei* (a certain part of the land under my jurisdiction), No. 2; *villam nomine Sturigaw* (an estate named Sturigaw.), No. 4. A charter of his son Eadbald (No. 5) says *quandam partem terrae regni mei, xxx aratrorum* (a certain part of the land of my kingdom, 30 plough-lands). It is not until the close of the century, that the land is defined as of so many occupants; the first is (670) No. 7, *unum cassatum* (one cottager). From this time

estates is regularly estimated by tenants — *cassati, manentes, tributarii*, sometimes *mansa* and *hida*, all these terms being used as equivalent.<sup>1</sup> This shows that the peasants were at this time largely tenants upon the estates of others; it does not show that they were originally so, or that they were serfs. That they were still personally free, although upon the point of losing their freedom, is, I think, proved by the evidence which I have brought up: it is a fair inference, from the analogy of other Germanic nations, that their land was also originally their own, and this seems also to follow from the mention of the “*mannes tun*” (Aeth., 17), when speaking of the *ceorls*.

After Ine's laws, of about the year 700, there is a gap of nearly two hundred years, until the time of Alfred, in which reign the series of statutes begins again, and continues in an unbroken succession until the conquest. The most important change noted in the new series of laws after this interval, is the uniformity and reiteration with which it is required that every man must have a lord, and the rights of the lord are maintained against the caprice of the man, or the rivalry of other lords. *Omnis homo habeat advocatum suum* (every man shall have his surety) Edward, 1.: *non recipiat aliquis hominem alterius sine licentia illius* (No person shall receive the man of another without his permission), id. 7., are regulations repeated in substance in nearly every body of laws. But notwithstanding the rigid requirement of this submission to a lord, it appears that there still survived a certain freedom of choice in the act: *ne dominus libero homini hlafordsoknam interdicit* (let not the lord prohibit the free man to choose a lord). Here the free status of the man is clearly implied; and in the laws of Alfred we have a number of provisions testifying to the lawworthiness and therefore original freedom of the peasants. *Si quis in ceorlisces mannes flet gefeohte, i. e., in rusticani hominis domus area pugnet* (if any one fights in the court of a ceorl). Section 40. *Ceorli eodorbrece, i. e., rustici sepis fractio* (trespasses upon the enclosure of a ceorl), where the ceorl is placed on the same footing as the king, the bishop, the alderman, etc. Section 10 places the ceorl on the same legal footing with the twelfhynd and sexhynd men, who were thegns. Section 25 speaks of *ceorles mennenn*—

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this is the universal method; but there are several expressions which show that it is still the land, reckoned in peasants' holdings, rather than the peasants themselves, that is conveyed by the grant. No. 8, (675) says *quendam terram . . . id est, decem manentes* (a certain piece of land . . . that is to say, ten tenants). No. 10, *terram . . . xviii manentes continentem* (land containing eighteen tenants.) No. 12, *centum manentes qui adjacent civitati* (100 tenants adjoining the city). No. 33 (691) *terram . . . quadraginta quatuor cassatorum capacem* (land containing forty-four cottagers). No. 40, *quadraginta terrae illius manentes* (forty tenants of that land); and, especially, No. 20, *terra super verticem montis. . . est sub estimatione sex manentium* (land on top of the mountain reckoned to be of six tenants). In all these cases it is clear that measurements of land are in question, and in the last instance it is apparently unoccupied land, roughly estimated in terms of peasant holdings.

<sup>1</sup>“ . . . *terram septies quinos tributariorum jugera continentem. Est autem rus praedictum in quatuor villulis separatim . . . quinque manentium . . . decem cassatorum . . . decem mansionum . . . decem manentium.* Cod. Dipl. cxi.

*ceorles mancipium* (the slave of a ceorl). Sections 11 and 35 are peculiarly significant, as they aim to protect the ceorl and his wife against personal violence; showing that, while they were still free in law, they were nevertheless on the road to serfdom, and were especially subject to abuse by the powerful.

We have thus followed the word *ceorl*, and the class which it designates (the peasants) from the earliest times down to the time of Alfred, exactly the point of time which Mr. Seebohm reached, from the opposite direction. As he traced the manorial organization and a servile peasantry step by step from the time of Edward I. back to that of Alfred; so we have traced a class of free peasants from the time of the original conquest down to the reign of Alfred, and have found it gradually subjected to restrictions and obligations which have converted it into a servile or semi-servile class. Mr. Seebohm's serfs were known as *villani*; the free peasants of the early period were known as *ceorls*; and there is the most indisputable evidence that these are the Latin and the Anglo-Saxon names respectively for the same class; this class was the peasantry, who, by this evidence, appear to have been at first freemen and afterwards serfs.

Undoubtedly there were manorial estates, with serfdom, in the earliest times, existing by the side of the townships of free peasants, and following the same system of open-field husbandry. On the other hand it appears clearly that the entire class of peasants or ceorls was not reduced to servitude. We could not be surprised if no free *villani* or free townships (*villæ*) were met with in the records, for it was only the proprietary townships, or manors (especially those belonging to ecclesiastical proprietors), which had a sufficiently systematic administration, and exercised sufficient care in the preservation of documents, to afford adequate evidence as to their existence and condition. But as a matter of fact there is clear evidence of free peasants and even of free townships in the feudal period. For example: Alwarstoke in Hampshire, at the time of Domesday Book (i. 41, b.) was held by its own *villani* (*ceorls*), tenants of the convent of St. Swithun, of Winchester. The number of *villani* was forty-eight, and there were no slaves, or tenants of a lower grade (*bordarii*). Two hundred years later their charter was confirmed by the prior of Winchester, to the effect "that they and their posterity (*sequela*) should be forever free and quit from tallages, salt-rent, cherset of hens and eggs and pannage of hogs; should be at liberty to make wills and dispose of their children and avers [*averia*=beasts]; . . . all pleas except pleas of the crown should, by consent of both parties, be pleaded and tried without delay in the court of Alwarstoke, in the presence of the prior and his seneschal, according to the law and customs of England, and the usage of the free tenants of the county." This document is fortified by the seal of the community, given by Sir Frederic Madden in the Winchester volume of the *Archæological Proceedings* as: *Sigill: comune: hominum: prioris: Sci Swithuni: de Alwarestoke*. In 1841 an inquisition declares "that there are no traders in Alverstoke,



and that all live by agriculture and hand labor." Melebroc (Millbrook) in the same county the Domesday record (i. 41, b.) gives as being held by *villani*. Of Ibthorpe we are told: "The people of Ibthorpe are lords of their own manor and to this day exercise their manorial rights."<sup>1</sup> It is hard to explain these cases except as original village communities of free peasants, who, in losing the ownership of their land and becoming tenants, did not lose their freedom or their rights as a community.

I have shown that the Anglo-Saxon *ceorls*, or peasants, were in the sixth and seventh centuries, that is the period directly following their migration to England, not serfs but freemen, possessing houses, lands, serfs and slaves of their own; that at the end of the seventh century, the period of the laws of Ine, they are still distinctly recognized as freemen, but as subject to certain exactions and encroachments on the part of the more powerful classes, which were reducing them to a semi-servile condition, in particular encouraging the practice of *commendation*, or placing themselves under the protection of a lord, and becoming his "men;" and that in the time of Alfred this practice of commendation had become universal and obligatory, and their servile condition distinctly recognized.

In short, the history of the English peasantry in the Anglo-Saxon period, corresponds very closely to that of the same class upon the continent in the same period. In both England and Germany the free peasants appear to have been forced, by the disorders and distresses of society to *commend* themselves, or seek the protection of men higher in station than themselves. The protection was not granted without some equivalent — service, following, surrender of land to be given back again as tenure, requirements of labor, becoming more and more onerous as the relation became more and more fixed, until at last they were stripped not only of their possessions, but even of personal freedom, and reduced to the state of complete serfdom: — not so complete, however, in the case of the English peasants, but that the memory of their original freedom was preserved in the principle that it was only in relation to their lords that they were serfs, and that towards all others they were freemen, having well defined rights before the law, and a recognized place in the constitution.

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<sup>1</sup> Antiquary, February, 1888.

## TOWN, TOWNSHIP AND TITHING.

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BY PROF. WM. F. ALLEN.

The town is in many respects the most characteristic institution of the political system of the northern states of the American Union, and of the primitive constitution of the English people. It may be defined as a territorial district, the inhabitants of which compose a body politic, small enough to allow the immediate participation of all its citizens in the government of its local concerns, and forming an organic part of the structure of the state. Its powers of local self-government are not original and inherent, but derived from the larger body of which it forms a part; they are nevertheless substantial and permanent, in this respect differing from those of the school districts or wards into which the town or city is divided. The City under our system is only a larger and specially organized Town; the Incorporated Village of New York and the West is a peculiar addition to the Town system, not forming structurally a part of it.

The Town, as thus defined, is peculiar to England and the United States, and, in its complete development, to the New England States. In all the other Germanic countries the territorial division corresponding to the Town stopped short of an independent political life, being, from the point of view of the State, nothing but a private corporation for economical purposes, with only inchoate functions as a body politic. In all these countries the Hundred was the smallest district of a public character; just as in our southern states the County is the agent of local self-government. But the County and the Hundred are too large to allow the immediate participation of all the citizens in the transaction of public business. The communities in which these large districts are the only agent of local self-government are necessarily aristocratic in their political character. It was the growth of Feudalism, or the establishment of centralized monarchies, in the Germanic countries of the continent, that checked the development of an institution corresponding to the English Town. In England the growth of a landed aristocracy and of a centralized monarchical power were not early or rapid enough to kill the germs of local self-government, although they seriously interfered with its development.

The political functions of the English towns were so largely obscured during the middle ages by the manorial or feudal organizations to which they were subjected, that there have arisen some doubts as to their extent, and even their existence. Bishop Stubbs, in his "Constitutional History of

England" (Vol. i, p. 82), asserts that (in Anglo-Saxon times) "the unit of the constitutional machinery is the township, the *villata* or *vicus*." This is the view which I have already presented; but a review of Stubbs' work in the *North American Review* (July, 1874), understood to be by the then editor of the *Review*, Prof. Henry Adams, takes exception to the assertion, saying that the township has no constitutional functions "of any kind, sort or description;" that the unit of the constitutional machinery in England, as on the continent, was the Hundred. "The one permanent Germanic institution," he says, "was the Hundred. The one code of Germanic law was Hundred law, much of which is now the common law of England. The Hundred and its law survived all the storms which wrecked dynasties and Witan. It was the foundation of the judicial constitution under the couqueror as it had been under Cnut and Alfred." The same view is repeated in Prof. Adams' "Essays on Anglo-Saxon Law," p. 32.

That the hundred was the lowest political division in Germany, as Prof. Adams asserts, admits of no doubt. This fundamental fact, together with the non-political character of the lower territorial divisions, is perhaps best formulated by Sohm,<sup>1</sup> who points out that the local governments in Germany were purely private corporations, having no public character or functions. But it does not follow that what was true of Germany was necessarily true of England. England, although a Germanic country, received in many respects a different development from Germany; and it is the essence of Bishop Stubbs' position that this was the case with the territorial organization below the Hundred. As the word "town" (*tun*, *tunscip*) is peculiar to England, so, it may be, is the thing designated by it. This distinction is supported by Von Maurer, the writer of highest authority upon the genesis of local institutions, who, in his *Einleitung zur Geschichte der Mark, Hof, Dorf und Stadtverfassung* (§145, p. 332), asserts that the English institutions differed fundamentally from the German in this respect. When, therefore, Prof. Adams says that such an institution as the one in question "would be quite at variance with all that we know of German law," he appears to stretch the argument from analogy further than is warranted. The very question at issue is whether the development of English institutions did not upon this point depart from German analogy.

I shall speak first of the territorial character of the English towns, and then of their political character; and shall try to show that we are to seek

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<sup>1</sup> The following passage expresses Sohm's theory with great fulness: *Zum grossen Nachtheil der Gesamtaufassung nicht blos der Verhältnisse des fränkischen Reiches, sondern der gesammten mittel-alterlichen Entwicklung wird die Thatsache in der Regel übersehen, dass, der Reichsverfassung der fränkischen wie der deutschen, eine Ortsgemeindeverfassung unbekannt ist. Die Reichsverfassung kennt keine weiteren Zwecke ausser denjenigen, deren Realisirung in Gau und Hundertschaft vor sich geht . . . Die Ortsgemeindeverfassung ist aus keinem anderen Grunde local für jede Ortsgemeinde verschieden, als weil die Ortsgemeindeverfassung aus der autonomen Entwicklung der einzelnen Gemeinden hervorgegangen ist. Die Ortsgemeindeverfassung ist Verfassung nur kraft Corporationsrechts, nicht kraft Reichsrechts. Sohm, (Altdeutsche Reichs und Gerichtsverfassung, I, p. 231).*

for analogies with them, not so much in the institutions of Germany, from which those of England were in a sense derived, as in those of New England, which are simply a continuation of those of England.

That the towns in England formed a complete territorial system as subdivisions of the hundreds, needs no argument, as it is amply attested by mediæval writers and documents. It is a familiar fact that they were regularly represented in the courts of the hundred and the shire. I will also cite the authority of Chief Justice Fortescue, in his *De Laudibus Legum Angliæ*, who says that the Shires or Counties were divided into Hundreds, and the Hundreds into Towns or Vills (ch. xxiv). *Hundreda vero dividuntur per villas*. This language indicates clearly that "towns" were in the middle of the fifteenth century territorial divisions of the hundreds; that is, that the entire area of the hundred, and therefore of the county, was divided up into the areas of the several towns composing the hundred. And this is still further shown by his going on to say that under the appellation of towns, "the cities and boroughs are included. For the boundaries of these villas are not ascertained by walls, buildings or streets, but by a compass of fields, large districts of land, some hamlets, and divers other limits, as rivers, water-courses, woodlands and wastes of commons." It is evidently the intention of the writer in these words to contrast the English towns with some other towns, the bounds of which are determined not by natural objects, but by artificial ones; and this object of comparison can be only the walled towns and cities of the continent, especially of France, the country with which Fortescue constantly compares England. Attention is here drawn to the important fact that, whereas upon the continent the municipal system was sporadic, the open country having no institutions of local self-government proper, the English municipal system was continuous, embracing the entire territory of the country. The borough was, as Bishop Subbs says (vol. i, p. 92), "simply a more strictly organized form of the township;" and the city a bishop's seat, with borough organization. And both borough and city made, as Chief Justice Fortescue says, a part of the town system.

This town system was brought over to this country by our ancestors, and put in operation in all the northern colonies. The town system of New England, as a system of territorial areas, is the town system of mediæval England; and when the people of New England had outgrown the town system in its primitive form, they developed a new form of organization on precisely the same lines as the English. The New England "city" (and so the Pennsylvania "borough"), is simply a specially organized town, and forms a part of the town system, just as is the case with the boroughs and cities of Chief Justice Fortescue's definition. A city is territorially a town. And here, as in the case of so many so-called Americanisms, we have preserved the old English usage, which has disappeared in England itself. The town, in its ecclesiastical organization, was a "parish," and in the sixteenth century the parish organization began to supersede the co-

ordinate town organization for purposes of local self-government.<sup>1</sup> It would seem that in the seventeenth century, when this country was settled, this process had not been completed. The colonists brought with them both institutions, and — as all New Englanders know — the parish and the town were, as a rule, identical in New England as in Old England. But while in New England the ecclesiastical organization became quite secondary, and has now practically disappeared, in Old England the reverse was the case. The parish organization has crowded out that of the town. As an English correspondent writes me: "With us town=market town"—a specially privileged, and I suppose specially organized, class of towns. The towns of the open country are known as parishes, and the functions of local self-government, so far as they continue to be kept up, are administered by the vestry, or parish assembly. Still even now we find a survival of the old usage. The same correspondent writes: "I am talking with the squire; the church bell sounds, and I ask him if he knows why: he replies 'for a parish meeting, I suppose.' Again, in a conversation with a laborer, to the same question he will reply: 'for a town meeting, I suppose, sir.'" Here the primitive term has lingered among the peasantry, while it has been dropped by the aristocracy.

The transition from town to parish, and the equivalency of the terms, as well as the fact of local self-government, to be considered further on, are illustrated by local documents. For example: in the reign of Edward VI., under the influence, I suppose, of the radical reformation of the church favored by that monarch, we have a record of a large amount of church plate and other property sold in the eastern counties, by the authority, as it is stated, sometimes of the town, and sometimes of the parish, showing that the two terms are employed as identical. For example: "Barking. Certificat of Church wardens there. We present that we have solde by the consente of thole paryshe a crosse parcell gylte, etc. . . . to Robert Knappe and Roger Hylle of the same towne." "Beccles . . . solde anno primo Edwardi sexti Regis etc, by the Townshype and Churchwardens so moch plate as amounteth to the some of xl l." *East Anglian*, May, 1885. "Churchwardens of Martillesham. . . . goods sold by the said church Revies and other the hoole Inhitants of the said towne." *id.*, March, 1887. This last instance appears to show an identity of the church-wardens with the mediæval reeve. At a later date we find the village of Exning (Suffolk), which at the close of the sixteenth century "appears" says the correspondent who mentions it, "to have been dignified with the title of 'Town', viz.,

1590.

"Item. pd the xx daye of Aprill for a quarter of wyne for the TOWN xij. d. etc." *id.*, March, 1888.

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<sup>1</sup> See Gneist's *History of the English Constitution*, Vol. ii, p. 196. As this great writer is wont to depreciate the popular elements in the English constitution, it is not surprising that he does not recognize the town, *villata*, as a regular part of the machinery of government in the middle ages.

It will be noticed that in these extracts the words "town" and "township" are used interchangeably. This was the case also in the early history of New England. For example: in the Massachusetts Body of Liberties (1641) we find "town" in Articles 16, 50, 51, 57, 62 and 85; "township" in Articles 66, 68 and 84, used with no apparent distinction of meaning. Article 74 couples them together: "the freemen of every town or township." We can perhaps trace a disposition to use the word "town" when speaking of the corporate body, and "township" for territory, e. g., Article 78, where it is forbidden to expend "any town treasure but by the freemen of that township." At present I believe the word "township" is not in use in New England, except occasionally to designate the town from the point of view of the territorial area; never as a body politic. Curiously enough, it is this word, fastened upon by De Tocqueville, that is regularly used by foreign writers to describe the New England *town* system. The term "*township* system" is properly used in this country only for the six-mile square divisions of the public lands, laid out by the government surveys. The states erected out of these public lands have a *town* system of their own, parallel with the national *township* system, and generally coinciding with it in respect to division lines, but not always. For example, the town of Trempealeau, Wis., contains the whole of Township 19, N., Range 9, W., and parts of Townships 17 and 18, Range 9, and 18 and 19, Range 10. In the primitive Anglo-Saxon usage the word "township," *tunscip*, appears to have been regularly used to designate the town as a municipality while "town," *tun*, was the settled portion — what in New England is called the "village" or the "middle of the town."

This distinction is quite in accordance with the etymology of the word. It is well known that "town," *tun*, is the same word with the German *zaun*, hedge or fence. But while the Germans never used the word *zaun* to designate the enclosed (fenced-in) area; the Anglo-Saxons, on the other hand, never used the word *tun* except to designate this enclosed area; the primitive meaning of *enclosing body* having been entirely lost. Now the thing fenced in was the village, or group of houses, which was accordingly the *tun*; and the *tunscip*, or township, was the area of land which belonged with the village as a municipal organization. As a consequence, the word *tun* was popularly applied to any place of collective residence; as where the Saxon Chronicle (Land Ms. An., 584), says: *Ceawlin manige tunas genam* — "Ceawlin took many towns." In the course of time the word *town* appears to have crowded out the more strictly correct word *township*, in the sense of designating the territorial area as a municipality; and in this sense the word was brought to New England by the colonists of the seventeenth century. In this country the meaning of the word is precisely that of Fortescue's time. In England, on the other hand, the modern use appears to be a survival of the loose and popular early usage, as applying to any place of collective residence; being limited in England at the present day to large places.

In limiting the signification of the word *tun*, to designate not the object which encloses (its primitive meaning), but the space enclosed, the Anglo-Saxon agrees with the Scandinavian language, as is the case with so many words and institutions of the early Anglo-Saxon period. The definition of the Icelandic *tun*, as given by Vigfussen, is: "a hedged or fenced plot, enclosure within which a house is built; then the farm-house with its buildings; the homestead." This is precisely the meaning which the word has in the earliest Anglo-Saxon laws, those of Aethelbihrt of Kent; it will be recollected that the settlers of Kent were Jutes, that is Scandinavians, rather than Saxons, like the rest of the migratory tribes. In these laws we read of a king's *tun* (Ch. 5), an eorl's *tun* (Ch. 13), and a "*mannes tun*" (Ch. 17) in all which cases *tun* is clearly the hedged enclosure, the homestead.<sup>1</sup> From the fenced enclosure of an individual homestead or field to that of a village, as in the later laws, is an easy step; or rather the two uses are alike easy transitions from the original signification of the enclosing fence or hedge.

This further extension of the word, however, does not appear to have been made by the Scandinavians of the continent any more than by the Germans. None of the Teutonic nations of the continent appear to have had any territorial subdivision of the hundred, of a substantial, individual, public character. With them the hundred was the unit of the constitutional machinery; and any lesser subdivisions stood to the hundred very much as our school districts or wards do to our towns or cities — as mere shifting administrative districts, having no substantial powers, and not forming a body politic. Scholars are now agreed, as I have already said, that the *Dorfschaft* was a division of a purely secondary character, for agricultural and economical purposes. Nevertheless it corresponded closely in its origin to the English *township*; and might, except for the early feudalization of Germany, have attained an equal degree of independence. *Dorf*, village, is the exact equivalent in meaning (not in etymology) of the English *tun*, and the affix *schaft* is the English *scip*; so that "*township*" is in meaning precisely the German *Dorfschaft*.<sup>2</sup>

From the territorial character of the English township, we pass to the consideration of its political character, as "the unit of the constitutional machinery." Direct evidence for this is not very abundant, but seems to be entirely sufficient. I have already spoken of Chief Justice Fortescue's mention of town (*villa*) as an integral part of the hundred, just as the hundred was an integral part of the shire. It is important also to note the well-known fact that the town (*villata*) was throughout the mediæval

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<sup>1</sup> This signification appears to have survived in Scotland; as, in Scott's *Redgauntlet*, Letter XI., where Darsie Latimer expresses a doubt whether he ought to go to Redgauntlet's "town" in disguise, the context showing that it is only his house that is meant.

<sup>2</sup> The German city of the middle ages was created not like the English borough, by giving higher powers to an already existing organism, but by cutting out a section of territory and bestowing upon it public functions of a municipal character. See articles by v. Below, *Historische Zeitschrift*, 1888.

period the unit of representation:—and that not as a mere representative district, but as a body politic; for at this period representation was never of artificial divisions, but of corporate bodies. This is clearly a political or constitutional function. Such phrases as “by the consent of the saide Township,” and “with the consent of the hole Towne,” in the sales of church property mentioned above, imply organized and collective action—an assembly or “town meeting” of some sort.

That the township lacked the higher judicial powers is admitted by Bishop Stubbs, who says (p. 90): “their assemblies are rather gemots or meetings, than proper courts; for any contentious proceedings amongst men so closely connected and so few in number, must have been carried immediately to the hundred court.” That the township did have a gemot or meeting, is proved by the mention of a *tunscipesmot* in a charter of Richard I., and that this meeting had certain definite powers of self-government, apart from its function as a unit of representation, is shown, for example, by the Costomary of Tettenhall Regis (English Gilds, p. 432), a body of regulations or “bye-laws” made by the tenants of the manor at their Leet or Law-day. This Costomary is a complete body of laws for the government of the community; and in the body of these laws the word “town” is twice used to designate the manor in its public relations.

“Art. 19. No man shall make yates or gapes in the common field, upon the corne or grasse of his neighbors, but by the consent of [the] comonty; and if he do, he shall give to the lord 2s., and to the comonty of the towne 2s.”

“Art. 21. No man of oure towne shall enter upon the stubble of any other towne while the corne is upon the ground, except it is upon his own land, and by the good will of all his neighbors, under payne of iijs. to the lord.”

In the passages just cited we have “town” used as equivalent to “manor,” just as in those previously cited, it was used as equivalent to “parish.” The manor was the feudalized township, that is, the township converted into a fief, as the parish was the township regarded as an ecclesiastical organization. And just as, in the sixteenth century, the parish, or ecclesiastical organization, superseded the township; so in the middle ages the manorial or feudal organization superseded, or at any rate obscured, the township, the original municipal division. This process of feudalization, or converting a free township into a seignorial estate, began very early in the Anglo-Saxon period. Indeed, even on the assumption that England was colonized by free peasants, organizing in free townships, we must at the same time admit the probability of a considerable proportion of seignorial townships, or manorial estates, side by side with the free communities, and intermixed with them. And whatever may have been the original status, it is certain that long before the Norman conquest,

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<sup>1</sup> *Per quatuor legaliiores homines de qualibet villata* (Assize of Clarendon, 1.)



there remained very few self-governing townships, composed of free peasants.<sup>1</sup> I do not consider the king's, earl's and man's *tun* of Aethelbirht's Laws, to have been feudalized townships, at least not always or necessarily; they appear rather to have been farmsteads. But fifty years later the charters of the *Codex Diplomaticus* afford ample evidence of towns which were the private property of the King or powerful noblemen, the peasants or *ceorls* being their tenants and fast becoming their serfs, as I showed in my paper of last year.

The two-fold process here described, of converting the free townships into manorial estates, and the free peasants into servile tenants upon those estates, was consummated in the complete feudalization of England which followed the Norman conquest. Nevertheless the town organization was not obliterated, but only obscured. We have seen that it continued to serve as a basis for representation, and we have frequent mention of the town, *villa*, as the equivalent of the manor. The word *villa* is used about a dozen times Domesday Book, at least three of these times as equivalent to manor. E. g. (i. f. 199 b.) "Wluuin the thane held this manor. In the same town Reginald holds half a hide of Alberic." [So ii., 31 and 31b.] The Exeter Domesday and the Ely Inquest, documents which appear to be the rough draft from which the great record was made up, often use the word *villa* where the Exchequer Domesday says *manerium*, "manor."<sup>1</sup> But the two words are not used as equivalent, but rather as describing the same territorial area from different points of view. There might have been two manors in the same vill, or lands in the vill while were independent of the manor. Indeed it would naturally be the case that the manor would often vary from the town in respect to metes and bounds, while the parish or ecclesiastical organization would, like the town itself, be an unchangeable district. The manor, being a piece of private property, would be subject to the laws of private property, and would be divided, added to or diminished, through the processes of purchase, sale, inheritance and inter-marriage. So greatly have these processes changed the boundaries of manors, that it is stated that in East Kent there is only one manor co-extensive with the parish. (Academy, No. 167). We find, however, instances of this identification of manor and town as late as the sixteenth and seventeenth centuries. In the "Certificates of Church Goods in Suffolk," in the reign of Edward VI., is mentioned: "Mr. Sakford, lorde and patron of the Towne," evidently lord of the manor. In the time of the Civil Wars (1648), the Memoirs of Col. Hutchinson speak of Cromwell having "a design, by insinuating himself into Colonel Saunders, to flatter him into the sale of a town of his called Ireton." (ii., 137.)

When the town was feudalized and became a manor, its *gemot*, or meeting, seems to have become that branch of the manorial court known

<sup>1</sup> For examples, see paper upon "Village communities and serfdom in England."

<sup>2</sup> The Ely Inquest rests upon the evidence, among others, of *sex villani uniuscujusque villae*.

as the Court Leet. The Court Leet, found also in the Hundred and the Borough, was, as is shown by the example given above, an assembly for the passing of bye-laws and administering the affairs of the town, the precise prototype of the New England town meeting. It also had a limited police jurisdiction, held to be derived from that of the Sheriff's Tourn or Leet of the Hundred. It was not a necessary part of the feudal or manorial organization, but, "was created by special grants from the crown to certain lords of manor in order that they might administer justice to their tenants at home." Quoted by Elton, "Custom and Tenant Right (1882)," p. 89. It was a thoroughly democratic institution, "being regarded as the court of the residents within the district; not of the tenants of the manor;" and "so far is this carried that a stranger passing by may be compelled to serve on the leet jury. The fact of his being found within the district is deemed sufficient evidence." Digby, *Int. to the Law of Real Property*, p. 45. The Leet, as a popular court, is also found in Iceland during the middle ages. The antiquity and primitive character of this court is attested by Elton, who says (on Copyholds, p. 240) it "is in all probability older than the manorial system itself:" and by Ritson, "The Jurisdiction of the Court Leet," who says (p. 6): "The Leet is the most ancient court in the land." This court elected the constable, and, in some boroughs, the mayor (*id.* p. x.).

It is not surprising, considering their early and almost universal conversion into manorial estates, that we find so few traces of free townships in England. From their absence, Mr. Seebohm has attempted to establish the thesis that the townships of England were regularly manorial estates, and the peasants serfs, from the earliest settlement of the Anglo-Saxons in the country. "The evidence of the earliest Saxon and Jutish laws" he says, "thus leaves us with a strong presumption, if not actual certainty, that the Saxon *ham* or *tun* was the estate of a lord, and not of a free village community." (*English Village Communities*, p. 175.) I attempted in my paper, read a year ago to show that, with regard to the peasantry, his evidence was inadequate, and that we have good ground for affirming the existence of a large class of free peasants in the earliest time. My object in the present paper has been to continue the argument, and show that there is good reason to believe that there were free townships as well as a free peasantry in the earliest English period. In arguing, however, that the township was a body politic, and "the unit of the constitutional machinery." I would not be understood to claim for it original and self-existent autonomy, even in the period of the earliest evolution of institutions. Assuming that the Germanic peoples passed from a community of occupation based upon kinship to one based upon territorial relations; it was the Hundred, not the township, that formed the earliest territorial community or *markgenossenschaft*. The township, or *Dorfschaft*, is shown by Thudichum to have been formed out of the hundred by a process of sub-division; and in this process the German district thus formed succeeded to no integral share of the powers of the original organization, but stood to it as

ward to a city. The English district corresponding to it, on the other hand, became an autonomous community, with substantial and important, if not original powers.

The English town has therefore no counterpart in any other Germanic nation; for in all the other Germanic nations the unit of the constitutional machinery is the Hundred, a district too large to allow of this immediate and detailed exercise of local self-government which we find in the New England towns, and, as has been made to appear, in those of England. Much less has it any counterpart in the Celtic and Slavonic nations, which never advanced unassisted to the territorial principle of government; nor in the Romance nations, whose government, derived from that of the later Roman empire, was wholly summary and authoritative. On the other hand, the ancient Greeks and Italians — the only branches of the Aryan race which possessed an equally strong political sense with the Germanic — developed a territorial system which has a strong analogy with the English.

The City (*civitas*, *πόλις*), is the political type of the Greeks and Italians, as the Town is of the English; and while the two institutions diverged greatly in their development, they were essentially identical in their origin and structure. The Greeks, Italians and Germans alike passed from the social stage of institutions, based upon personal relations, to the political, based upon territory, at a very early period. In all of these we find the territory divided up into autonomous districts, small enough in extent to permit the direct participation of all the citizens in the work of government. The Greek City was thus identical with the German Hundred. But the development of all the Germanic nations, except the English, was arrested by the creation of great centralized monarchies. Even in England the more perfectly organized district, the Town, was shortly checked in its development by the establishment of the manorial system; and even where a higher municipal type was developed, in the boroughs, it was sporadic and thus incomplete.

The Greeks and Italians, on the other hand, concentrated and intensified their political life by what is known as *Synoikismos*,—the establishment in the middle of the territory of each city, of an *oppidum* or *urbs*, a place of collective residence, surrounded by walls, in which were erected their public buildings, and where they transacted all public and private business. This higher organization was applied to *all* cities, not merely to some here and there, like the English boroughs. These nations became urban in their life, while the English remained rural. But, in becoming urban, in building a city surrounded with walls for residence, trade, worship and social life, they did not shift the basis of their political organization. The city continued, as it had always done, to comprise the rural districts as well as the walled town; citizenship indeed was based upon ownership of land outside the walls equally with residence or property within the walls: the distinction between *rus* and *urbs* was purely social, in no sense political. Now the *oppidum*, inclosed within its walls, is very much the same thing as

the *tun*, enclosed with a hedge—a higher development upon the same general lines. But there was one point of contrast of vital moment. The Greek or Italian city, even if of no greater extent and population than an English town, was a sovereign state; the English town, however large and populous, was only a municipality, a part of a larger organism.

The word that is used in the Latin documents of the middle ages as meaning "town" is *villa* (or *villata*)—a word that has had a curious and interesting history. In classical Latin it means a country house—whether a farm-house, *villa rustica*, or a gentleman's country seat, *villa urbana*, in which sense it corresponds precisely to our modern word, *villa*. From meaning "house" it came by a not long or difficult transition, to mean the "estate" surrounding the house; and in this sense we find the word used in the later Roman empire. This was a period of great landed properties; but these properties, at least in Gaul, were not "plantations," *latifundia*, or vast and indefinite stretches of land, like the Dalrymple farm. Each great property was made up of a number of *villas*, not necessarily contiguous, each of these *villas* being a compact, organized estate of a moderate size. The small peasants' estates had for the most part disappeared, and Gaul at this epoch may be described as divided up into seignorial or domanial estates, corresponding roughly to the *communes*, or smallest territorial divisions of modern France. These *villas* agreed in many important particulars with the English manors, being perhaps of about the same extent, and being ruled autocratically by their owners.

The important fact to be noted here is the change in the significance of the word *villa*. From meaning a gentleman's country house, it has come to mean the estate depending upon that house; that is to say, it has acquired the meaning of a territorial district. And although the district thus designated in Gaul is a seignorial estate, it is easy, when the word has once become associated with the idea of an area of land, to extend its use to other districts of similar extent and grade. Thus we find it applied even on the continent to the *Dorfschaft* or village mark,<sup>1</sup> and in England it is used to designate the township, whether free or seignorial. But that it is the township that is thus designated, as a territorial area, and not the seignorial estate into which the township has been converted, is proved by the important fact, already noticed, that the manor and the township (*villa*) are not always identical. No argument, therefore, for the originally servile character of the English *tun* can be drawn from the fact that *tun* is in Latin *villa*; for although in Gaul a *villa* was a seignorial estate, in England it was not the estate as such, but an area of land, often identical with the manor, but often containing two or more manors, or parts of manors, or isolated pieces of land.

Thus the word *villa*, having acquired the signification of a territorial area, was used in England as the Latin equivalent of *Tunscip*. And as *villa*

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<sup>1</sup> Van der Kindere, *Notice sur l'origine des magistrats communaux*.

was "town" — whether free or seignorial — so the cognate word *villanus* was "townsman" — whether free or serf. It is used regularly as the Latin equivalent of "ceorl," the free peasant of the early period, the semi-servile peasant of the later period, and the *villein* of the feudal period. When the ceorls lost their ownership of land, and their free status, their name sinking from the designation of a free yeoman to the opprobrious term "churl;" so the equivalent word *villanus* sank likewise, until it too, from meaning a free townsman, a member of the body politic, came to mean one who lived upon the land of another man, who was his master, paying for it by obligatory labor. And as "ceorl" has sank to "churl," so the honorable term *villanus* has sank to the opprobrious term *villain*.

A few words in conclusion, upon a subject more obscure in itself, and of more purely antiquarian interest — the connection of *tithing* and *township*. The word *tithing* is used as equivalent to *township* in some of the southern counties of England at the present day,<sup>1</sup> and it has been a matter of some controversy what is the origin of this territorial signification of the word, and how far back in time it dates. For the discussion of this question I will refer to Prof. H. B. Adams' excellent paper in the Johns Hopkins Studies, Vol. I, No. 4. It is admitted that there is no positive evidence of any but the numerical use of the word *tithing* in Anglo-Saxon times, as designating a group of ten men — *tenmanne tale* (Edv. Conf. xx) — formed for the purpose of enforcing mutual responsibility, as the fundamental principle of the system of the time for the preservation of the peace. The groups would seem at this period to have been strictly organized by tens. But after the Norman Conquest, under the more efficient *frithborg* system then established, the numerical value appears to have become a secondary consideration, and we very soon find a tendency towards localizing the term. Of course the original tithings were in a sense local; that is, each voluntary group of ten must have been composed of neighbors, and each township would naturally contain a number of such groups, none of them extending their membership beyond the bounds of the township. But in the thirteenth century (1284) we find, in the *Liber Niger* of the Monastery of Peterborough, a list of townships, each of which consists of a fixed number of tithings, varying, no doubt, according to the population. Of the town of Barton we read (p. 109): *tota villata debet presentari per sex capitales decennarios* — the *capitales decennarii* being the "headboroughs" or "tithingmen." Other towns range from six of these officers to one, and we see the local character of the office in the fact that that they are the regular representatives of the town in the great court of the Hundred: (p. 113) *omnes libere tenentes et omnes capitales decennarii de predictis villis et foedis a tempore cujus non extat memoria, sc. ante tempus Willemi Regis Conquistoris . . . solebant venire bis in anno ad duas magnas curias que appellantur Turna vicecomitis, etc.* Now, it is evident that in the small townships which had only one tithing, it would be very natural and easy to identify the two terms, and

<sup>1</sup> Stubbs, Const. Hist. i, 85.

thus localize the word *tithing*. Of this we see further evidence in the Cartulary of the monastery of Gloucester. Vol. iii, No. 966, gives the items in the view of frankpledge in the Court Leet of the manor; among which we read: *de hiis qui sunt xii annorum, et non sunt in toethinga*. From this passage the tithing might appear to be a purely numerical group: but in No. 1,011 we read: *sunt tenentes in tethynga de Chirchesdona*, where the word tithing seems to have a clearly local value.

The passage from the numerical to the territorial signification is an easy one, and is illustrated by these passages. We see from the passage above cited that all boys of twelve were enrolled, not merely heads of families, as is sometimes assumed; and the same rule was observed in Anglo-Saxon times, as is shown by the law of Canute (ii., 20 *ofer xii wintra*). With the growth and order of good government, so large a number of groups as this came to be no longer necessary. Two centuries after the Conquest, we find small towns containing but one tithing, and the largest only six, which may perhaps have been divisions of its territory into wards or districts. From this condition of things the purely territorial meaning of the word in some parts of the country may easily have been derived.

My object in this paper has been partly to trace the origin and powers of the English town; partly to help to an understanding of its connection with the New England town. New England being colonized at just about the time that the parish organization was superseding that of the town in the mother country, it would seem, as I have already said, that the colonists, breaking away from the English ecclesiastical system, held to the town organization, making the parish purely secondary. The powers of the New England towns do not differ very widely from those of the English towns. We find, for example, in Russhemer, the "Implyments" of the money obtained by the sale of church goods to have been enumerated as follows:

towards the reparacioning of our churche	- - - -	xl s.
ffurther to makyng of a pulpett & a lectern	- - - -	xxij s. iiij d.
also to the makyng of a grett chest with locks	- - - -	iiij s. iiij d.
Item to the pore peple of the parysshe	- - - -	xx s.
Also to the mendyng of the high weyes	- - - -	xxij s. iiij d."

East Anglier, July, 1887.

In other cases we find: "for ssyendyng fforthe of v Souldours to the Kyngs Majesties warrs;" "in the wallyng of their marssh, in costs & chargs upon the havyn, And upon ther bulwerks of Gunnys powder, & shotte for the defense & safegard of the town.": "to mainteyne a ffree scoole," etc.

These examples are taken from what I suppose to be small country villages, the prototypes of the New England towns. It may reasonably be supposed, however, that the boroughs, or higher class of towns, would give the example for the larger powers exercised by our more independent towns; and I find in the East Anglian (1886-8) a series of extracts from the records of the important town of Ipswich, as late as the time of the Com-

monwealth, which remind one, by the variety and minuteness of their functions, of those of the New England towns: for example, the hiring of preachers and teachers, as well as the care of roads, the supervision of markets, etc. The "Great Court" of Ipswich, consisting of "all the free-men, Portmen, Aldermen and Bailiffs," corresponds very closely to the New England town-meeting. The most characteristic feature of the New England town-meeting is, however, wanting—the requirement that the magistrates assume no control of the assembly, but retire into a private station, as it were, for the occasion; the meeting electing its own chairman, and exercising authority as a self-governing democracy. In most popular assemblies the magistrates are the presiding officers: in the English "vestry" or parish-meeting it is the parson, in the Great Court of Ipswich, one of the bailiffs. This feature of the New England town meeting, which, with others, it shares with the higher parliamentary bodies, may perhaps be claimed as another instance of the survival in America of usages or institutions which have become extinct in the mother country. Gneist says (p. 202): "The meeting was summoned by the churchwardens; the chair was regularly taken by the parson, as the landlord of the vestry, and the first member of the ecclesiastical parish, as a matter of courtesy, but a positive right of presiding could be established neither by precedent nor by analogy. In analogy with the tax-granting commoners, the meeting was rather regarded as its own master, in respect to the appointment of a chairman, as well as in respect to its adjournment. The voting was conducted with equal rights for each individual, after the manner of the old courts leet, the parliamentary elections, and the parliamentary resolutions. The mode of giving the vote was, as a rule, by show of hands, but in difficult and doubtful cases, by a poll."

My thesis, that the English towns of the middle ages were an integral part of the constitutional machinery; and not mere corporations, like the corresponding bodies of Germany, I have attempted to prove by showing: first, their territorial character, as conterminous areas of land, embracing the entire country; secondly, their practice of self-government in local concerns, and their organic relation to the larger representative bodies. We have seen that in the sixteenth century, at which time the parish became the organ of local self-government, the terms *town* and *parish* were used indifferently for the same institutions; and that in the seventeenth century, when the American colonies were planted, the colonists carried with them a *town-system* essentially the same as the *parish-system* which continued in England. The analogy with German institutions is misleading. The English people developed the institution of the "town" upon their own soil; and it is to be compared, not with the imperfect creation of the continental Germans, from which it was perhaps derived, but with the matured institution of New England, to which it gave birth.

## REPTILIA AND BATRACHIA OF WISCONSIN.

BY PROF. W. K. HIGLEY.

This list is not presented without a realization of the fact that some species may be omitted. If, however, any such are found, it is believed that they will be rare and local species, perhaps found in the outskirts of the state, which is subject to the migration of species from other regions. The Mississippi river forms an excellent pathway for the introduction of some strangers to our Reptilian and Batrachian fauna.

It is hoped that the present list will not only be found complete, but that the key may be found adequate for the determination of species.

The key is one that has been used in class work under the direction of the writer, and has been found sufficient for all local purposes. It has been arranged for the species of this state *only*, and, it is believed, in such a way that no new species will be reported that cannot be brought under its range, for in its preparation all extralimital species, liable to be found here, were included.

The classification followed is to a great extent that used by my friend, Dr. W. H. Smith, in the Herpetology of the State Survey of Ohio.<sup>1</sup> Dr. Jordan's "Manual of the Vertebrates" and the list reported by Dr. Hoy in our State Geology, have also been of great service, the former in the identification of species, and the latter both as a check list, and also as a source of information as to the range of some species outside the districts from which the writer had identified specimens.

### REPTILIA.

Animals having an epidermal covering in form of scales or plates which in one division become united with the bony skeleton forming an outside shield or shell; cold blood and an incomplete circulation; the heart three chambered in our species; the lungs large, consisting of but few cells; no metamorphosis; the respiration pulmonary throughout life.

#### KEY TO THE ORDERS OF REPTILES.

- I. Epidermal covering united with the skeleton forming a shell which more or less completely covers the body; no teeth; anal opening roundish or longitudinal..... *Testudinata.*

<sup>1</sup> State Survey of Ohio, Vol. IV, Zoology and Botany.



- I. Epidermal covering not united with the skeleton, scales or rarely plates; anal opening transverse; teeth present.
  - a. Body much elongated, serpentiform; limbs wanting; mouth dilatable; eyelids none; no urinary bladder..... *Ophidia.*
  - b. Body elongated; feet usually present; mouth not dilatable; eyelids usually present; urinary bladder present. .... *Lacertilla.*

ORDER TESTUDINATA, TURTLES.

Body more or less perfectly inclosed in a bony or leathery shell-like case, plastron and carapace; epidermal plates usually quadrilateral in outline; animal variable in form, but generally short, thick-set or flattened; neck generally long allowing of considerable freedom of the head; the head, limbs and sometimes the tail may be completely withdrawn into the area of the shell; the bones of the skull finally became united by complete ossification; tongue thick; jaws forming a horny beak; food bolted; no teeth.

KEY TO FAMILIES OF TESTUDINATA.

- I. Plastron very flat and divided into distinct parts which are so hinged, by two transverse divisions, as to form, with the carapace, a very perfect box; carapace very convex and deep; animal thickset; toes only slightly webbed; jaws not hooked or but slightly so; food mostly carnivorous..... *Cistudinidæ.*
- II. Longitudinal section of the shell somewhat ovate in outline, caused by the position of the vital organs which are placed far forward, the carapace is thus higher anteriorly than posteriorly; plastron small and cruciform consisting of 12 plates; head and neck very muscular; jaws powerful and more or less strongly hooked; tail muscular with a ridge of horny obtuse or acute processes above, the longest often measuring more than an inch, and with two or more rows of scales underneath; very voracious and extremely fierce; mostly carnivorous and aquatic..... *Chelydeidæ.*
- III. Longitudinal section of the shell ovate or oval, usually deepest near the center; edge of carapace obovate or oblong in outline, broadest posteriorly; plastron with 12 plates covering the entire under surface of the body, the anterior lobe sometimes hinged to the posterior; jaws not hooked, obtuse; carnivorous ..... *Emydidæ*
- IV. Body placed far back in the shell, causing an obovoid longitudinal section; carapace osseous, margins more or less reflexed underneath; plastron composed of a variable number of plates, seven, nine or eleven, and hinged, allowing the animal to more or less perfectly close its shell; head pointed; odor strong..... *Cinosternidæ.*
- V. Shell orbicular or sometimes with an oval or oblong outline; covered by a leathery, more or less flexible skin; shell never fully ossified, and in some species with the ribs projecting; head long and conical..... *Tryonichidæ.*

FAMILY CISTUDINIDÆ, BOX TURTLES.

Represented by one genus and two species. Mostly carnivorous, and to some extent decidedly carrion eaters.

CISTUDO, Fleming.

*C. clausa*, Gmelin. Common Box Turtle.

Varies greatly in color; back ground always dark (black, brownish or drab) with yellowish spots or blotches; shell nearly oblong in outline; plastron sometimes truncate; anterior lobe the shorter, generally found in high but moist woods. Very rare. Two specimens have been reported from Walworth county.<sup>1</sup> Length of carapace about six inches; height about three inches.

*C. ornata*, Agassiz. Northern Box Turtle.

In many respects very similar to the last. Shell nearly orbicular and without keel. "Grant county; rare." Hoy: Walworth county.

FAMILY CHELYDRIDÆ, SNAPPING TURTLES.

Aquatic species of great strength, living in ponds and muddy streams. Represented by two genera and two species.

KEY TO THE GENERA OF CHELYDRIDÆ.

- a. Head covered with skin; tail with two rows of scales underneath..... *Chelydra*.
- b. Head covered with plates; tail provided with many scales underneath in several rows..... *Macrochelys*.

CHELYDRA, Schweigger.

*C. serpentina*, L. Common Snapping Turtle.

Very common and well known.

MACROCHELYS, Gray.

*M. lacertina*, Schw. Mississippi or Loggerhead Snapper.

This ferocious turtle is occasionally found in the Mississippi river as far north as the mouth of the Wisconsin. Hoy.

FAMILY EMYDIDÆ, POND TURTLE.

The members of this family are generally very mild when approached, simply relying on the rapidity of their motions or by plunging into the water to effect their escape. Some forms (*Crysemys*), however, when taken in the hand, will snap quite savagely at the fingers.

Represented by five genera and six species.

KEY TO THE GENERA OF EMYDIDÆ.

- a. Carapace more or less depressed or flattened; toes webbed; plastron broad and flattened, yellowish:
  - (a). Plastron movable on the carapace and divided, the anterior division being smaller and movable by a transverse hinge; plastron with irregular black spots..... *Emys*.
  - (b). "Upper jaw notched in front; shell not keeled in adult" (Jordan); toes strongly webbed; plastron immovable; carapace with outer plates usually marked with red..... *Chrysemys*.

<sup>1</sup> Since writing the above, the author has identified specimens of *C. clausa* from Milwaukee, Pine Lake, La Crosse and Green Bay.

- (c). "Upper jaw not notched in front; carapace more or less strongly keeled or tuberculated." (Jordan); toes strongly webbed; plastron immovable; lower jaw with a spoon-shaped dilatation..... *Graptemys*.
- b. Web small; shell elongated, nearly oblong in form; plastron without hinge; carapace deep; black with or without orange or yellow spots which are round or oblong; upper jaw notched slightly; plastron light yellow with black irregular spots..... *Nanemys*.

EMYS, Brogniart.

*E. meleagris*, Shaw. Blanding's Box Tortoise.

Carapace dark colored with irregular yellow spots that are seldom absent. Terrestrial but generally found near water, to which they rapidly retreat if approached. Excellent swimmers. Common.

CHRYSEMYS, Gray.

*C. marginata*, Holb. Lady Turtle. Western Painted Turtle.

Neck, tail and legs striped with red; the plates of carapace variously marked with red or yellow. A beautiful species. Very common.

*C. oregonensis*, Holb. Plain Tortoise.

A form without red markings of *marginata*, is found occasionally in the western part of our state.

GRAPTEMYS, Agassiz.

*G. geographicalis*, Le Sueur. Map Turtle.

Streaked and reticulated with various shades of yellow upon a brownish back ground; neck and limbs quite gaily colored; carapace deeply notched posteriorly; aquatic; not common.

Probably this species is the most bold and active of this family. L. 9 inches.

*G. Le Sueurii*, Gray. Le Sueur's Map Turtle.

The characters distinguishing this from the preceding are not numerous but prominent. The colors are less striking in general, but the yellow markings are more intense; back ground grayer; each vertebral plate has a dark colored posterior which overlaps the succeeding plate; plastron clouded with brown or black; length of carapace 5-6 inches. Quite common in southern half of the state.

NANEMYS, Agassiz.

*N. guttatus*, Ag. Speckled Tortoise.

Carapace black with yellow spots scattered here and there; plastron with more or less black. But two specimens are known to me to have been found in this state. These were from Walworth county.<sup>1</sup>

FAMILY CINOSTERNIDÆ. CINOSTERNOID TURTLE.

Represented by one genus and species.

<sup>1</sup> Additional localities, reported after the above was written, Beloit, Madison, Eau Claire and other places, indicating that it is rare but generally distributed throughout the southern part of the state.

AROMOCHELYS, Gray.

*A. odoratus*, Latreille. Musk Tortoise.

Jaws strong; color dark with or without spots; head large with yellow spots on the side; a strong musky odor is always present; plastron black and yellow; marking more or less obscured by the adhering mud. Rare. Found in southern part of the state. I have found it in Walworth county.

FAMILY TRIONYCHIDÆ. SOFT-SHELLED TURTLES.

Represented by two genera and two species.

- a. "Nostria terminal, crescent shaped" (Jordan); carapace with tubercles on the anterior margins..... *Aspidonectes*.
- b. "Nostrals rather under the top of snout" (Jordan); no tubercles on the anterior margin of carapace. .... *Amyda*.

ASPIDONECTES, Wagler.

*A. spinifer*, Le Sueur. Soft-shelled Turtle.

The habits of this animal are such that they do not need hard shells for protection. Their color is not far from that of the mud of the streams in which they live. I have repeatedly passed by groups of them while dredging, without seeing them. My observations lead me to believe that they are generally found in groups. They are found in the southern and western parts of the state. Though not often met I believe them to be quite common.

AMYDA, Schweigger.

*A. mutica*, Le Sueur. Leathery Turtle.

Upper parts brownish; beneath, whitish without spots; anterior margin of carapace without spines or tubercles. This last character distinguishes it from the last. Found in the western half of the state and more common than the last, and with the same habits, though my observations lead me to believe that it is not so voracious.

ORDER LACETILIA. LIZARDS.

Body elongated or lacertiloid in form and covered by scales; limbs four (or two) or none; top of head covered with plates; tail quite long and generally brittle; <sup>1</sup> jaws with teeth, but they are not in sockets.

KEY TO THE FAMILIES OF LIZARDS.

- 1. Tongue squamose, thick, fleshy, emarginate at the free extremity—free anteriorly and not protrusible; eyes medium size; eyelids scaly; scales quincuncially arranged; head subtriangular cephalic plates present and regular..... *Scincidæ*.

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<sup>1</sup> This serves as an excellent means of defense. It is very natural for one to catch the tail of a lizard sooner than any other part because of its swiftness. The tail being very brittle it is no sooner touched than it breaks off. Jordan says this is owing "to a thin, unossified, transverse septum, which traverses each vertebra." I have had them lose their tails also when confined to close quarters.

2. Tongue palpilose, fleshy, emarginate and more or less free anteriorly; cephalic plates more scale-like or irregular; scales carinated; head short; eyelids scaly..... *Iguanidae*.
3. Limbs not visible but present in a rudimentary state beneath the skin; ear distinct; lateral fold present; serpentine in form; cephalic plates quite large; abdominal region covered with square plates; tongue bifid..... *Anguidae*.

FAMILY SCINCIDÆ. THE SKINKS.

Represented by one genus and two species.

EUMECES, Wiegmann.

*E. quinquelineatus*, L. Blue-tailed Skink.

Color bluish-black with five yellow stripes, the dorsal stripe divides at the head sending a branch to each side of the vertical plate; beneath light blue; throat whitish; tail deep blue; the stripe disappears to a great extent with age: L. 7-8 inches; tail 4-5. Walworth County; rare.

I believe that this species will be found more common in all the southern counties, though it has not been reported to my knowledge. Its range is very extensive. It may be found to the best advantage in May, in dampish, unfrequented woods under bark.

*E. septentrionalis*, Baird. Northern Skink.

Olive with four darker stripes; two narrow lateral lines of white and black. Walworth County, "Not uncommon as far north as Lake Winnebago."<sup>1</sup> Hoy.

FAMILY IGUANIDÆ. THE IGUANAS.

Represented by one genus and one species.

SCELOPORNS, Wiegmann.

*S. undulatus*, Harlan. The Brown Swift.

Color brownish with irregular bands of black; greenish blue laterally; abdomen yellowish with dark spots; toes whitish; throat with skin more or less folded; L. 6 inches; rare. A few specimens have been reported from this state. I have not met it myself.

FAMILY ANGUIDÆ. THE GLASS SNAKES.

Represented by one genus and one species.

OPHISANRUS, Daudin.

*O. ventralis*, Daudin. The Glass Snake.

Color dark and yellowish with black streaks; quite common.

"In early days they were not uncommon near Kenosha. They occur in the western part of the state as far north as La Crosse." Hoy.

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<sup>1</sup> Since writing the above, the writer has examined several specimens from the western part of the state.

ORDER OPHIDIA. SNAKES.

Body covered with imbricated scales; beneath with a single row of band-like scales (gastrosteges) as far back as the anus. Represented in this state by two families.

KEY TO THE FAMILIES OF SNAKES.

1. Both jaws with ungrooved conical teeth; tail tapering, plates underneath (Urosteges) in pairs, without a rattle; no pit in front of the eyes; head more or less oblong, and usually tapering gradually into the neck..... *Colubridæ*.
2. No solid teeth, or but few in the upper jaw; jaw provided with grooved erectile poison fangs; tail provided with a rattle; Urosteges undivided, at least anteriorly; a pit in front of each eye; scales carinated; head separable from the body and more or less triangular..... *Crotalidæ*.

FAMILY CROTALIDÆ. THE CROTALID SNAKES.

Represented by two genera and two species. To this family belong some of the most deadly poison snakes.

KEY TO GENERA OF CROTALIDÆ.

- a. Head covered with small scales, tail with large rattle..... *Crotalus*.
- b. Head covered with nine large plates; tail with rather small rattle.. *Crotalophorus*.

CROTALUS, L.

*C. durissus*, L. Yellow Rattle Snake. Banded Rattle Snake.

Sulphur brown with darker in blotches or arranged, more or less regularly, in bands; head very triangular and ugly; dorsal scales in 23-25 rows; G. 170-180; U. 23-28; L. 3 to 5 ft. In rocky places; rare. Formerly this species was very common, but it is seldom met now. It may be found in the rocky bluffs of our larger rivers. Very poisonous.

CROTALOPHORUS, L.

*C. tergeminus*., Holb. Massassauga or Prairie Rattlesnake.

Color brownish, "Spots of dark brown margined with black, and exterior to this a still lighter circle; vertebral blotches, 34 in number, almost quadrate, notched in front and behind, and extending from neck to tail; 2 to 3 series of lateral blotches on each side varying from circular to oblong" (Smith). There are other series of lighter lines, but the above will be sufficient to determine the species. Dorsal scales 25 rows; G. 140-150; U. 25-30; L. 2-3 ft.; not rare; in grassy marshes throughout the state. Poisonous.

*Variety Kirtlandii*, Holb.

Much darker and more uniform, with darker blotches above. Walworth county; rare. W. H. Smith in the State Survey of Ohio says,\*— "The

\* Vol IV, p. 674.

specimens of *C. tergeminus* which I have seen from Wisconsin, have a broader head and the transition from the head to neck is more abrupt than in Illinois or Ohio specimens."

It is safe to assume, then, that all snakes that have a triangular head, that may be met in this state, are to be avoided.

FAMILY COLUBRIDÆ. THE COLUBRINE SNAKES.

Represented by eleven genera, twenty species and several varieties.

The following Key for the determination of the genera is a modification of that used by Jordan, Smith, and others.

- Dorsal scales carinated, a.  
 Dorsal scales smooth, i.
- a. Post-abdominal scutella entire, b.  
 a. Post-abdominal scutella bifid, c.  
 b. Dorsal rows of scales not exceeding 23 ... .. *Entœnia*.  
 b. Dorsal rows of scales exceeding 25 ... .. *Pityophis*.  
 c. Loral and anteorbital plates, both present, d.  
 c. Lorals absent ... .. *Storeria*.  
 d. Dorsal rows of scales, 19 or more, e.  
 e. Cephalic plates typical, f.  
 e. Cephalic plates not typical, large, h.  
 f. Post-orbitals three, rarely two; ante-orbitals usually one; dorsal rows of scales, 23-29 ... .. *Tropidonotus*.  
 f. Post-orbitals two; dorsal rows of scales, 19-21 ... .. *Regina*.  
 h. Muzzle projecting and recurved ... .. *Heterodon*.  
 h. Muzzle not projecting ... .. *Coluber*.  
 i. Ante-orbital plates both present, j.  
 j. Post-abdominal scutella entire or bifid; dorsal rows of scales 25 ..... *Ophibolus*.  
 j. Post-abdominal scutella bifid; dorsal rows of scales not exceeding 21, k.  
 k. With yellow ring around the neck ... .. *Diadophis*.  
 k. Without a ring around the neck, l.  
 l. Dorsal scales in 15 rows ... .. *Liopeltis*.  
 l. Dorsal scales in 17 or more rows ... .. *Bascanion*.

EUTÆNIA, B. & G.

Our most common snakes; terrestrial; ground color dark; one vertebral and two lateral stripes; gastroteges 140-170; urostegeges 50-120; dorsal rows of scales 19.

It is believed that the following Key will enable one to trace any species or form commonly found, though great variations in the markings exist.

- (a) Lateral stripe on the third and fourth rows of scales; body slender; tail nearly one-third of total length, (b).  
 (a) Lateral stripe on second and third rows of scales; body stouter; dorsal band on one and two half rows of scales; tail one-fourth of total length; G. 132-170; U. 55-80 ... .. *Sirtalis*.  
 (a) Scales rough; stripes all narrow; lateral not usually over a scale in width, placed on part of two rows; six or seven series of brownish or blackish spots; outer row of scales often very broad ... .. *Radia*.

- (b) Occipital plates with a yellow spot; upper labials eight; dorsal band on one and two half rows of scales; lateral stripe on third and fourth rows; G. 165-180; U. less than 110. . . . . *Proxima.*
- (b) Orbital plates yellowish; upper labials seven on each side; dorsal line on about one row of scales terminating at posterior margin of the occipital plate; G. 175-180; U. 115 or more. . . . . *Saurita.*

*E. sirtalis*, L. Striped or Garter Snake.

Ground color, blackish; dorsal band yellow; lateral band yellowish; abdomen greenish; occipital plate sometimes with two yellow spots; upper labials 7 or 8; offensive when handled; L. 2-2½ feet; tail about 6 inches; abundant.

*Variety dorsalis*, B. & G.

Dorsal stripes broad and marginal on each side with black in one row of scales; lateral stripe with a row of dark spots above; common.

*Variety parietalis*, B. & G.

Dorsal stripe medium; brick red spots in lateral bands; not rare.

Variety ——— with dorsal stripe absent, yet with all the characters of the typical form present. Walworth county; rare.

Dr. W. H. Smith suggests for this variety the name *melanota*.

*E. radix*, B. & G. Hoy's Garter Snake.

General color above black, with three very narrow yellow lines; head short; L. 2-2½ feet; G. 150-165; U. 53-85. Not rare.

*E. saurita*, L. Swift Garter or Ribbon Snake.

Slender; tail very long and slender, pointed; color dark brown; stripes extending the whole length, but indistinct in the tail and sometimes becoming obsolete near the end; dorsal and upper edge of lateral lines with blackish or brownish margins; under parts greenish; L. 2½-3 feet; tail 9 inches; southern part of the state in damp woods; not rare.

*Variety faireyi*, B. & G. Fairie's Garter Snake.

Occipital plates with two yellow spots; lateral line margined on both sides by black; same range as the last; not common.

*E. proxima*, Say. Say's Garter Snake.

Ground color black; beneath whitish to olivaceous, dorsal band yellow or darker; lateral greenish or whitish; beneath lateral strip lighter than above; L. under 3 feet; tail under 9 inches; southern half of the state; not rare.

PITYOPHIS, Holbrook.

*P. sayii*, Schl. Western Pine Snake.

"Whitish or reddish with many dark blotches and spots; dorsal scales usually 25 rows. G. 220-230; L. 40-70." Jordan.



“A large species; in early days it was common in the western part of the state; now rare.” Hoy.

L. 4-11 feet; reported from northwestern counties; rare; large specimens very rare.

STORERIA. B. & G.

KEY TO THE SPECIES OF STORERIA.

- (a) Scales 15 rows; belly red; G. 120-123; U. 40-50; Anteorbitals two; upper labials 5 or 6; lower 6 or 7..... *occipito-maculata.*
- (b) Scales 17 rows; under parts greenish or nearly white; G. 120-140; U. 46-60; upper and lower labial plates 7..... *dekayi.*

*S. occipito-maculata*, Storer. Red-bellied Snake.

General color above grayish or brownish, with (usually) or without a dorsal band margined by darker spots; L. 9-15 inches; tail about 2 inches; common throughout the state.

*S. dekayi*, Holb. Little Brown Snake.

General color grayish brown; dorsal stripe lighter margined by dotted lines; a black line from the occipital plate to the angle of the mouth; one or two black spots below the eyes; L. 12 inches or less; tail about 2; southern part of the state; not rare.

TROPIDONOTUS, Kuhl.

Our species have eight upper and ten lower labial plates; these are large and prominent; aquatic habits; food mostly fish and other water animals.

KEY TO THE SPECIES OF TROPIDONOTUS.

- (a) Dorsal scales 27 rows; outer row smooth; above with quadrangular dark spots about 48 or 50 in number, and reaching to the end of the tail..... *rhombifer.*
- (b) Dorsal scales 23 (variety with 25); above with three series of dark blotches, the dorsal row larger than the others; abdomen irregularly marked with yellow and brown..... *sipedon.*
- (c) Dorsal scales 23; under parts copper colored; head large, triangular; general color above, reddish black without spots or blotches..... *erythrogaster.\**

*T. rhombifer*, Hallowell. Holbrook's Water Snake. Water Adder.

General color, brown; L. 2½-3 ft.; G. 140-145; U. 63-74; tail about 6 inches; unfrequented damp places; rare; Walworth county.

*T. sipedon*, L. Water Snake. Water Adder.

General color brownish; markings sometimes obscure in old specimens; young with markings very decided, but with some variations in their colors; body large; carnivorous, living almost entirely on fish; L. 3-4 ft.; tail 10-13 inches; G. 150-155; U. 65-80; southern counties; not common.

\* *T. erythrogaster*, Shaw. Since this report was presented to the Academy, I have seen two specimens of this species; one from near Beloit, and the other from Lake Geneva. Rare.

REGINA, B. & G.

Habits aquatic or terrestrial; dorsal scales in 19 rows.

KEY TO THE SPECIES OF REGINA.

- (a) Ante-orbitals two; upper labials, 7; lower, 8; beneath yellow; three black dorsal and a yellow lateral band ..... *leberis*.
- (b) Ante-orbitals one; *beneath brick red*, with dark near the exterior of the scutellæ; upper labials, 6; lower, 7.....*Kirtlandii*.
- (c) Ante-orbitals two; beneath, yellowish; upper labials, 7; lower, 8; above, brownish; dorsal line lighter and bordered with black; lateral line yellow, bordered with dark, in first second and third rows ..... *Grahamii*.

*R. leberis*, L. Yellow-bellied or Leather Snake.

Above, brownish; lateral band on the first and second rows; L. 2-2½ ft.; tail 5-6 inches; G. 140-150; U. 65-80; not common.

*R. kirtlandii*, Kennicott. Little Red Snake.

Above brownish or purplish brown with irregular blotches in four rows, the outer being the larger; L. about 1 ft.; tail about 3 inches; G. 120-140; U. 55-65; Walworth county, and probably throughout southern counties; rare.

*R. Grahamii*, B. & G. Graham's Snake.

Scales strongly carinated; lateral line broad; L. 1½-2 ft.; tail 3-4½ inches; G. 160-165; U. 57; mostly in western countries; not rare.

HETERODON, Beauvois.

Body quite thick set and can be dilated at will of the animal by inhalation of air; hissing very peculiar and characteristic, similar in sound to the rattle of the rattlesnakes; head triangular. These snakes have a strong resemblance to venomous species, when angered or disturbed, flattening their bodies and head and hissing in a very threatening manner. Odor very marked and unpleasant.

*H. platyrhinus*, Latreille. Hog-nose Snake. Blowing Viper. Spreading Adder.

Above brownish with 28-30 dark dorsal blotches varying from quadrate to circular; lateral blotches irregular; these blotches become rings on the tail; *vertical plate longer than broad*; beneath, slate color and varying on post-abdominal region from yellow to reddish; upper labials yellow; dorsal scales 25 rows (usually); G. 125-150; U. 45-50; L. 2½-3 feet; tail 7-8 inches; on sandy or dry localities as far north as Madison; not common.

*Variety niger*, Catesby. Black Viper.

Uniform black or brown above without spots; said to be more ferocious than the type but is harmless; about the same range as the last; rare.

*H. simus*, L. Hog-nosed Snake.

General color lighter and more yellow than the last species; about 32-35 dorsal blotches; *vertical plates broader than long*; interfrontal region with 4-8 small plates; dorsal scales 23-27 rows; L. 2½-3 feet; G. 130; U. 45-55; sandy localities throughout the state; not rare.

COLUBER, L.

Body large; head elongated; ante-orbitals one; post-orbitals two; mouth deeply cleft; upper labials 8, lower 11.

KEY TO THE SPECIES OF COLUBER.

- (a) Dorsal scales 25 rows; color above light brown with more or less quadrate, chocolate colored blotches in three rows, the dorsal two or three times larger than the lateral; head light brown or yellowish above..... *vulpinus*.
- (b) Dorsal scales 27 (usually); color black and shiny; scales often margined with yellowish; head black above..... *obsoletus*.

*C. vulpinus*, B. & G. Fox Snake.

Vertical plate broader than long; abdomen with colors in blotches; L. 5 feet; tail about 10 inches long, large at the base; prairies throughout the state; food, small vertebrates and insects; not rare.

*C. obsoletus*, Say. Pilot Snake or Racer.

Upper labials yellowish; beneath darker and more or less mottled with yellow, black and whitish; vertical plate longer than broad; dorsal scales 27 rows (usually); L. 4-6; tail 10-11 inches; G. 230-235; U. 80-85; found throughout the state in timbered districts, but is not common.

Feeds on squirrels, birds, bird's eggs, etc.; is somewhat arboreal in its habits. The larger forms are very rare.

OPHIBOLUS, B. & G.

*O. triangulus*, Boie. Milk Snake.

Local names numerous and various. General color grayish with three series of black margined brown blotches, the dorsal row numbering about 50, and elliptical to oval in shape; lateral spots in two rows, varying in size; head with two blotches above; blotched beneath; dorsal scales in 21 rows; G. 200-210; U. 48-55; L. 3-4 ft.; tail 5-6 inches; varies greatly; habits carnivorous; common.

DIADOPHIS, B. & G.

*D. punctatus*, L. Ring-necked Snake.

Bluish black (or darker) above, without spots; occipital region with yellow ring or spots; beneath orange or lighter, each plate generally having a dark spot; head depressed; dorsal scales 15 rows; G. 140-165; U. 35-58; L. 1½ ft.; tail about 3 inches, found under stones or bark of decaying trees; odor strong; not rare.

LIOPELTIS, Fitzinger.

*L. vernalis*, De Kay. Green or Grass Snake.

Body slender; head elongated; color above bright and uniform deep green; lighter or yellowish beneath; L. 1-1½ ft.; tail about 4½ inches; G. 129-140; U. 70-98.

A beautiful species, very lively in its movements; insectivorous. Common throughout the state in damp places, and may often be seen in the morning when there is dew on the grass.

BASCANION, B. & G.

*B. constrictor*, L. Blue Racer or Black Snake.

Varies in color; our form varies from azure blue to blue-black; beneath greenish; mouth deeply cleft; head elongated; dorsal scales smooth and usually in 17 rows (sometimes 19); L. 4-6½; G. 170-205; U. 80-115; southern part of the state; not common.

This form varies considerably from the Black Snake of the east in its color, which is often a very intense azure blue; especially immediately after moulting. Dr. W. H. Smith suggests that this form might well be made a variety with the very appropriate name of *cæruleus*.

BATRACHIA.

Body always without true scales and covered by a smooth skin; metamorphosis after birth and usually complete; respiration branchial in the young, and either pulmonary or both pulmonary and branchial in the adult; heart with two auricles and one ventricle; circulation incomplete.

KEY TO THE ORDERS OF BATRACHIA.

- I. Body thick set and when adult without a tail; the posterior limbs much longer than the anterior and developed first in the metamorphosis; skin smooth, granular or warty; tongue free behind and can be protruded with great rapidity..... *Anura.*
- II. Body elongated; the four limbs very widely separated, short and of nearly equal length; tail, persistent and usually long; tail compressed or terete; fore limbs developed first in the metamorphosis; motions more or less snakelike..... *Urodela.*

ORDER ANURA. TAILLESS AMPHIBIANS.

KEY TO THE FAMILIES OF ANURA.

- 1. Posterior toes webbed; anterior toes more or less webbed; upper maxillary and vomer-palatine teeth present; skin smooth, or essentially so; posterior limbs exceeding the length of the body and much longer than the anterior; tympanum distinct and prominent; fingers not dilatable; tongue emarginate at free extremity; live near water..... *Ranidae.*

2. Toes more or less webbed; upper maxillary and vomer-palatine teeth present; tympanum distinct; fingers and toes with disks at their tips; skin more or less granulated; tongue usually simply notched at the free extremity; chiefly arboreal..... *Hylidæ*.
3. Toes webbed; posterior limbs hardly as long as the body; skin usually warty; tympanum small and not apparent; jaws without teeth; tongue entire at free extremity; terrestrial, nocturnal, and insectivorous..... *Bufo* *edæ*

## FAMILY RANIDÆ. THE FROGS.

Represented by one genus and five species.

The following is a key to species of the genus:

## RANA, L.

- (a). Dorsal region with *large* and distinct irregular dark spots in usually two (rarely more and these scattered) rows upon a greenish or brownish background; beneath very white or yellowish; eyes prominent and usually with two dark blotches between them<sup>1</sup>..... *halecina*.
- (b). Dorsal region with or without *small* dark spots:
- (1). Color green or brown; irregularly spotted (or speckled) on the legs and sides with dark which may reach to the dorsal region; beneath white to yellow; irides yellow..... *clamitans*:
- (2). Reddish or greenish brown; a dark line passes through the tympanum and eye, often reaching to the nostrils; legs usually barred or blotched with dark above; tympanum small; beneath yellowish or whitish.  
*temporia, var. sylvatica*.
- (3). Greenish brown with dark irregular spots which are conspicuous on the legs and sides; beneath yellowish, often mottled with dark brown; tympanum large; animal very large and muscular; pupils black; irides green..... *Catesbyana*

*R. halecina*, Kalm. Leopard Frog.

L. 3 to 4 inches; posterior limb 6 inches; in wet places and especially in marshes and along streams; common.

*R. clamitans*, Daudin. Green or Spring Frog.

Thighs granulated posteriorly; L. 2-3 inches; posterior limb about 4 in.; anterior limb about 1½ in.; common along brooks and ponds; often in wet weather may be found wandering to some distance from any stream.

*R. temporaria*, L. *Var. sylvatica*, Le Conte. Wood Frog.

L. 2 inches; posterior limb about 2½ in.; anterior limb about 1½; in damp woods among leaves; not rare.

*R. nigrescens*, Ag. Black Frog.

Prof. Agassiz determined a specimen caught at Racine as the *Nigricans*; Rare." Hoy.

<sup>1</sup> *R. palustris* has the dorsal spots usually square, in four rows with smaller spots scattered irregularly outside.

Having no description, and never having seen this form, I am unable to place it in the Key. Some of our authorities, however, consider it merely a form of *clamitans*.

*R. palustris*, Le Conte. Marsh or Tiger Frog.

This is quite common in Michigan, and may possibly be found in Wisconsin; L. 2-3 inches; posterior limb about 4; anterior limb about 1½.

FAMILY HYLIDÆ. TREE TOADS.

Represented by two genera and four species.

KEY TO THE GENERA OF TREE TOADS.

- a. Toes nearly or quite distinct; fingers quite distinct; disks small; body slender; tongue emarginate behind..... *Chorophilus*.
- b. Toes webbed; fingers more or less webbed; disks large; body often thick set; tongue, if at all, only slightly emarginate behind..... *Hyla*.

CHOROPHILUS, Baird.

*C. triseriatus*, Wied. Little or Striped Tree Frog.

Color bluish ash or blackish; more or less striped; skin with granulations; no warts; toes with trace of web at the base; L. 1 to 1½ inches; posterior limb about twice as long as the anterior.

“*C. maculatus*, Ag. Spotted Tree Frog.

Found on Lake Superior.” Hoy.

HYLA, Laurenti.

*H. versicolor*, Le Conte. Common Tree Toad.

“Patches of vomerine teeth slightly elevated; tongue slightly notched behind.” W. H. Smith.

Color varying from green to brown with irregular spots; below dirty white to yellow, seldom spotted; common.

“*H. pickeringii*, Holb. Pickering’s Tree Toad, abundant.” Hoy.

“Patches of vomerine teeth not elevated; tongue truncate behind;” W. H. Smith. Reddish or yellowish brown; spots dark, rhomboidal; lines dark, and sometimes cuneiform in arrangement.

FAMILY BUFONIDÆ. THE TOADS.

Represented by one genus and one species.

BUFO, Laurenti.

*B. lentiginosus*, Shaw. Var. *Americana*, Le Conte. Common Toad.

Body warty and very rough when adult; color cinereous and brownish; speckled; below yellowish or dirty white; tympanum not very apparent; pupils black; very common.

## ORDER URODELA. TAILED AMPHIBIANS.

## KEY TO THE FAMILIES OF URODELA.

1. Gills persistent..... *Proteidæ.*
2. Gills caducous; gill slit closed in the adult..... *Salamandridæ.*

## FAMILY PROTEIDÆ. THE MUD PUPPIES.

Represented by one genus and one species.

## MENOBRANCHUS, Harlan.

*M. lateralis*, Say. Mud Puppy. Dog Fish. Water Dog.

Body cylindrical and smooth; general color brownish with spots of darker; a black lateral line is sometimes present; gills red and bushy, in three groups on each side; tail compressed; nocturnal and aquatic, living but a few moments on land; L. 1 to 2 ft.; common and carnivorous.

## FAMILY SALAMANDRIDÆ. THE SALAMANDERS.

Represented by five genera and eleven species.

## KEY TO THE GENERA OF SALAMANDRIDÆ.

- a. Tongue fleshy, attached by the center, the lateral and anterior margins being free; costal grooves very distinct; vomero-palatine teeth transversely arranged; posterior toes, 5; color dark; skin smooth with numerous pores; tail compressed..... *Amblystoma.*
- b. Tongue attached by the anterior and posterior edges, a small part of the lateral being free; costal grooves indistinct; vomero-palatine teeth longitudinal and divergent behind; posterior toes, 5; tail compressed from the base; colors bright..... *Notophthalmus.*
- c. Tongue roundish, the anterior edge and center attached, the lateral and posterior free; vomerine teeth in two patches; posterior toes, 5; general color dark; tail tapering to tip..... *Plethodon.*
- d. Tongue oval, attached by the anterior edge; toes, four in front and behind; costal grooves distinct; general color above brown; beneath white with black spots; tail, long, round at the base and then compressed..... *Hemidactylum.*
- e. Tongue attached by the center, the entire edge being free (boletoid) costal grooves distinct; vomerine teeth in a transverse row; posterior toes, 5; color yellowish or red; tail long, tapering and compressed.... *Spelerpes.*

## AMBLYSTOMA, Tschudi.

*A. opacum*, Gravenhurst. Blotched Salamander.

Color above dark with transverse bluish gray bars or blotches; head with a triangular spot; below slaty; costal furrows or grooves, 11; no large pores on head. L. about three inches; tail about 1½ inch; rare. "Racine." Hoy.

*A. punctatum*, L. Large Spotted Salamander.

Black or nearly so with bright yellow spots arranged along each side on the dorsal furrow, which is quite distinct; skin with numerous pores which are enlarged and arranged in two patches on each side of the head; costal furrows or grooves, 11; L. 6 inches; tail, 2½ inches; southern part of the state; not common.

*A. tigrinum*, Green. The Great or Tiger Salamander.

Everywhere dark with yellow spots which are either round or irregular; costal furrows or grooves, 11; dorsal groove quite distinct; head depressed; L. 7 inches; tail 3 inches; common.

*A. jeffersonianum*, Green. The Granulated Salamander.

Variable; in general brownish or blackish with ashy spots, but "sometimes uniform plum" (Jordan); costal furrows 13; the furrows on the tail extending nearly to the tip; L. 3 to 4 inches; tail 1-2 in.; Walworth county; rare. Dr. Hoy reports them from Racine. I have reason to believe that they may also be found in the extreme northern part of the state.

NOTOPHTHALMUS, Raf.

*N. viridescens*, Raf. Common Spotted Triton. Newt. Eft.

Color: olive to scarlet above, and orange to red underneath (variable); spots on sides, vermilion enclosed in a black ring and usually in a line; beneath with black dots; costal grooves about 14. *H. miniatus*, Raf. I believe to be the same species, and I have included its characters in the above description. I have seen the two forms at the same pond during the breeding season, and have also noted gradations in color between the two extremes. It seems to me highly probable that age has something to do with the darker color; L. 3-4 inches; tail 1-2; common in brooks and ponds.

PLETHODON, Tschudi.

*P. erythronotus*, Green. Red Backed Salamander.

Dorsal stripe red, extending nearly the whole length of the animal; sides cinereous; head brown above; lower jaw whitish; costal grooves or furrows 16 to 19; caudal grooves 18-22; L. 3-4 inches; tail 1-2; southern Wisconsin; not rare.

*Variety cinereous*, Green.

Without the red dorsal stripe. This form may be met, and I have placed it here as a variety merely to aid in identification for it would seem from the investigations of our best authorities that the changes are simply those wrought by age.

Their food consists of snails, worms and insects.



*P. glutinosus*, Green. Gray Spotted or Viscid S.

Above glossy black with very small gray spots; lateral spots larger; costal furrows 14; spotted below; in moist places; color varying with age, there being fewer spots on old specimens; not common.

HEMIDACTYLIUM, Tschudi.

*H. scutatatum*, Schlegel. Four-toed Salamander.

"Color above, brown, muzzle yellowish, limbs and tail orange brown; upper surface with black spots on each side scattered irregularly; beneath white with patchy black spots," Smith. Rare; "Racine." Hoy. Habits, Insectivorous.

SPELERPES, Rafinesque.

*S. ruber*, Daudin. Red Salamander. Red Triton.

Color above, intense red with small roundish black spots; color less marked beneath; head triangular; costal grooves 14-16; L. 5 inches; tail about 2; in damp and unfrequented swamps of southern half of state; not rare.

*S. longicaudus*, Green. Cave or Long Tailed S.

Yellow spotted with dark; below spotless, yellowish; head oval; costal furrows 13; L. 5 inches; tail 3-3½ inches; Walworth county; Racine," Hoy; rare.

*S. bilineatus*, Green. Stripe-backed Salamander.

Yellowish or darker with two (or three) longitudinal black lines; below yellowish and unspotted; costal grooves 14; L. 2-3 inches; tail 1½ inches; two or three specimens have been reported from southern Wisconsin, "Racine," Hoy; rare.

REFERENCE AND CHECK LIST OF THE REPTILIA  
AND BATRACHIA OF WISCONSIN.

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REPTILIA.

LACERTILIA.

SCINCIDÆ.

- Eumeces quinquelineatus*, L. Blue-tailed Skink.  
*Eumeces septentrionalis*, Baird. Northern Skink.

IGUANIDÆ.

- Sceloporus undulatus*, Harlan. Brown Swift.

ANGUIDÆ.

- Ophiosaurus ventralis*, Daudin. Glass Snake.

OPHIDIA.

CROTALIDÆ.

- Crotalus durissus*, L. Yellow Rattlesnake.  
*Crotalophorus tergeminus*, Holb. Prairie Rattlesnake, or Massassauga.  
*Crotalophorus tergeminus*, Var. *kirtlandii*, Holb. Massassauga.

COLUBRIDÆ.

- Eutania sirtalis*, L. Common Garter Snake.  
*Eutania sirtalis*, Var. *dorsalis*, B & G.  
*Eutania sirtalis*, Var. *parietalis*, B & G.  
*Eutania sirtalis*, var. *melanota*, Smith.  
*Eutania radix*, B. & G. Hoy's Garter Snake.  
*Eutania saurita*, L. Swift Garter or Ribbon Snake.  
*Eutania saurita*, Var. *faireyi*, B. & G.  
*Eutania proxima*, Say. Say's Garter Snake.  
*Pityophis sayii*, Schl. Western Pine Snake.  
*Storeria occipito-maculata*, Storer. Red-bellied Snake.  
*Storeria dekayi*, Holb. Little Brown Snake.  
*Tropidonotus rhombifer*, Hallowell. Holbrook's Water Snake.

*Tropidonotus sipedon*, L. Water Snake, Water Adder.  
*Regina liberis*, L. Yellow-bellied or Leather Snake.  
*Regina kirtlandii*, Kenicott. Little Red Snake.  
*Regina grahamii*, B. & G. Graham's Snake.  
*Heterodon platyrhinus*, Latr. Blowing or Spreading Viper.  
*Heterodon platyrhinus*, *Var. niger*, Catesby. Black Viper.  
*Heterodon simus*, L. Hog-nosed Snake.  
*Coluber vulpinus*, B. & G. Fox Snake.  
*Coluber obsoletus*, Say. Pilot Snake or Racer.  
*Ophibolus triangulus*, Boie. Milk Snake.  
*Diadophis punctatus*, L. Ring-necked Snake.  
*Liopeltis vernalis*, DeKay. Green or Grass Snake.  
*Bascanion constrictor*, L. Blue Racer. Black Snake.

TESTUDINATA.

CISTUDINIDÆ.

*Cistudo clausa*, Gmelin. Common Box Turtle.  
*Cistudo ornata*, Ag. Northern Box Turtle.

CHELYDRIDÆ.

*Chelydra serpentina*, L. Common Snapping Turtle.  
*Macrochelys lacertina*, Schw. Mississippi or Loggerhead Snapper.

EMYDIDÆ.

*Emys meleagris*, Shaw. Blanding's Tortoise.  
*Chrysemys marginata*, Holb. Lady Turtle.  
*Chrysemys oregonensis*, Holb. Prairie Turtle.  
*Graptemys geographica*, Le S. Map Turtle.  
*Graptemys lesueurii*, Gray. Le Sueur's Map Turtle.  
*Nanemys guttatus*, Ag. Spotted Turtle.

CINOSTERNIDÆ.

*Aromochelys odoratus*, Gray. Musk Turtle.

TRIONYCHIDÆ.

*Aspidonectes spinifer*, Le S. Soft-shelled Turtle.  
*Amyda mutica*, Le S. Leathery Turtle.

BATRACHIA.

ANURA.

RANIDÆ.

- Rana halecina*, Kalm. Leopard Frog.  
*Rana clamitans*, Merrew. Green or Spring Frog.  
*Rana temporaria*, L. *Var. sylvatica*, Le C. Wood Frog.  
*Rana catesbyana*, Shaw. Bull Frog.  
*Rana nigrescens*, Ag. Black Frog.

HYLIDÆ.

- Chorophilus triseriatus*, Willd. Little Tree Frog.  
*Chorophilus maculatus*, Ag. Spotted Tree Frog.  
*Hyla versicolor*, Le C. Common Tree Toad.  
*Hyla pickeringii*, Holb. Pickering's Tree Toad.

BUFONIDÆ.

- Bufo lentiginosus*, Shaw, *Var. Americanus*, Le C. Common Toad.

URODELA.

PROTEIDÆ.

- Menobranchus lateralis*, Say. Mud Puppy.

SALIMANDRIDÆ.

- Amblystoma opacum*, Gray. Blotched Salamander.  
*Amblystoma punctatum*, L. Large Spotted Salamander.  
*Amblystoma tigrinum*, Green. The Great Salamander.  
*Amblystoma jeffersonianum*, Green. Granulated Salamander.  
*Notophthalmus viridescens*, Raf. Spotted Triton.  
*Plethodon erythronotus*, Green. Red-backed Salamander.  
*Plethodon erythronotus*. *Var. cinereus*, Green. Ashy Salamander.  
*Plethodon glutinosus*, Green. Spotted or Viscid Salamander.  
*Hemidactylum scutatum*, Schlegel. Four-toed Salamander.  
*Spelerpes ruber*, Daudin. Red Salamander.  
*Spelerpes longicaudus*, Green. Cave or Long-tailed Salamander.  
*Spelerpes bilineatus*, Green. Stripe-backed Salamander.

## SUMMARY.

	Orders.	Families.	Genera.	Species.	Varieties.
Reptilia ...	Lacertilia.....	3	3	4	.....
	Ophidia.....	2	13	22	6
	Testudinata.....	5	11	13	.....
Batrachia .	Anura.....	3	4	8	1
	Urodela.....	2	6	12	1
	5	15	37	59	8

## RAISED BEACHES OF LAKE MICHIGAN.

BY FRANK LEVERETT.

There are around the head of Lake Michigan several raised beach lines and sea cliffs, the latter being eroded escarpments of the tall plains and moraines. These have been discussed at some length by Dr. Edmund Andrews, of Chicago, President of the Chicago Academy of Sciences, in a pamphlet entitled: "The North American Lakes Considered as Chronometers of Post Glacial Time." The portions of the raised beach lines and sea cliffs in Cook county, Illinois, have been referred to by Mr. Bannister of the Illinois Geological Survey, in his report on the geology of Cook county, Vol. III, p. 240-2. Neither of these gentlemen have given the distribution of the separate lines with sufficient detail to subserve our purpose, and slight inaccuracies of distribution occur in Dr. Andrews' map which accompanies his pamphlet. We, therefore, feel warranted in presenting here the distribution and connections of the beach lines without further reference to previous publications, since our description is based upon those facts only which we have obtained independently.

The beach lines vary in number at different points around the head of the lake, in places there being but one or two — but elsewhere, several, and in Lake county, Indiana, a large number. There seem, however, to be but three lines which are maintained distinctly and vigorously for any great distance. We shall describe these as the Upper, Middle and Lower raised beaches.

## UPPER RAISED BEACH.

Between Waukegan and Winnetka, Illinois, the lake shore is now farther west than it was at the time of the formation of the upper raised beach, for the lake is undermining undulating till ridges which show no evidence of having been submerged for any long period. North from Waukegan raised beach lines are developed at intervals, but they have not been studied with sufficient thoroughness to warrant a description. We, therefore, begin our description at Winnetka, in northern Cook county. An ancient sea cliff passes in a southerly course from the lake bluff through the eastern part of this village. The cliff is about twenty feet in height, and is a prominent feature in the village. Its base is very nearly 60 feet above the present level of Lake Michigan.

Following the sea cliff south we find it soon changes to a beach line, and gravel and sand in forms quite similar to those of the present beach lines of

the lake are developed for a distance of six or seven miles through the south part of Tp. 42 N., R. XIII E., and the central part of Tp. 41 N., R. XIII E. The highest part of the beach line, or beach lines, for a series of ridges is developed, is about 60 feet, occasionally 61 feet above Lake Michigan. In the vicinity of the Chicago river, the elevation gradually decreases to the level of the river bank, which is about 40 feet above Lake Michigan. These gravel deposits of the beach line, or of succeeding beach lines which lap onto its eastern face, have an eastward extension on the north side of the river, so that when we cross the river to find the beach line on that side we must go nearly two miles up the stream to catch it. This protrusion of the sands and gravels on the north side of the stream indicates that at the time this beach was forming the transportation of sand and gravel was southward along the shore, and that the current from the Chicago river, which opened into the lake at the point represented by the position of the beach line on the south side of the river, carried the material lakeward which was brought down by the slow moving lake current from the north. This extension is not in the form of a delta built up at the debouchure of the river into the lake — but lies wholly on the north side of the river valley. Moreover, to make it still more evident that it was the lake and not the river which contributed the great bulk of the beach deposit which skirts its north bank, we find that the river valley above the point where it entered the old lake has very little assorted material, such as would accumulate above a delta. The beach appears on the south side of the river in the south part of Sec. 19, Tp. 41, R. XIII E. It has here a very different aspect from that immediately across the river, being a low sea cliff, 6—15 feet in height, with occasional deposits of beach gravels and sands along its front. The terrace or sea cliff made by the lake, is crossed by the Wisconsin division of the Chicago and Northwestern railway, at Norwood Park. The profile of this road shows that the base of the sea cliff has an elevation of 45 feet, and the top an elevation of sixty feet above Lake Michigan.

At the point where the Chicago, Milwaukee & St. Paul railway crosses the cliff, in Sec. 32, Tp. 40, R. XIII E., the base has an elevation of 42 feet and the top 66 feet. The Omaha division of the Chicago & Northwestern railway crosses it at Oak Park, with an elevation of 38 feet at the base and 49 feet at the top of the cliff, and a mile further south the Wisconsin Central railroad crosses a beach deposit with an elevation of 41 feet at the base and 49 feet at the top.

The sea cliff phase extends only to Oak Park, a village on the east bank of the Des Plains river. The sea cliff passes through the east part of the village to the vicinity of the Chicago & Northwestern railway, where beach gravels conceal it, and we find here an extension of the beach gravel down the east side the Des Plains river, similar to that extension down the north side of the Chicago river. The gravel extends south from Oak Park, in the form of a ridge, or bar, 20 to 40 rods in width and 10 feet or more in height, for about two miles to the south part of Secs. 13 and 14, Tp. 39

R. XII E., tern in tng in a club-like expansion which rises to an elevation of about 55 feet above Lake Michigan, and nearly 20 feet above the plain which lies east of the Des Plains river, immediately south from its terminus. This bar or spit shows evidence, where opened, of having been built up from the east, by successive deposits shingled on its eastern slope — which dip with the slope. An excavation at Haas's gravel pit which extends from the east side of the bar west part of the center — shows beds dipping at various angles, but all toward the east — some of the beds increase in thickness as they descend, but the lower bed, which is mainly sand, increases in thickness toward the deeper portion of the ridge. It appears to be a sand bar upon which the beach deposits were built. The following section was obtained at the south-side of this gravel pit, which shows the section of that particular place only, for I am informed by Mr. Haas that the material of the same bed varies greatly in coarseness within the space of a few feet, but the dip of the beds is uniformly toward the east.

1. A brown-stained gravel at the surface extending down the slope. Depth 18—30 inches.
2. Fine gravel (unstained) 24 inches at top, increasing to 48 inches near base.
3. Sand beginning with scarcely any thickness at the top, but increasing to a thickness of 36 inches at the base of the excavation.
4. A bed of fine gravel increasing like No. "3" from 0—48 inches in thickness.
5. Fine gravel nearly four feet in thickness, which passes upward from near the east side of the excavation assuming a nearly horizontal position beneath the crest of the ridge.
6. Sand at the bottom of the excavation becoming thicker toward the higher part of the ridge. Depth 6—36 inches.

Molluscan shells thought to be *Unios*, and also smaller shells have been found in No. "6," but none of these were at hand at the time of my visit. Mr. Haas afterwards sent an oyster shell which was imbedded in No. "6," and near it was the tooth of a mammoth. If the oyster shell has not been artificially introduced it suggests much as to a salt water lake. It is possible that the shells thought by Mr. Haas to be *Unios*, were salt water mollusks. We learned of no other instance of the occurrence of molluscan remains along this upper beach.

Passing now to the west side of the Des Plains river we find about a mile above the southern end of the bar just described a low sea cliff or lake margin bearing in a curved course through Sec. 14, across the north side of Sec. 22, and then northwest into Sec. 16, Tp. 39, R. XII E. This is so low a beach that it scarcely attracts notice, being in places but 2—4 feet in height, but it has the continuity and horizontality of base that marks fossil lake shores.

A tributary of Salt Creek has removed the traces of the old shore west from Sec. 15. The beach comes to the swale which the stream follows.



Passing south about a mile we find the beach well defined in the north-west part of Sec. 28, of this township on the south side of Salt Creek. It is here a beach ridge composed of sand and gravel, and rises 10—12 feet above the border of the plain on the east. The beach line is 30—40 rods wide, and extends nearly one mile south from Salt Creek when the gravel disappears, and a sea cliff marks the continuation of the shore. The bank ridge is excavated about 40 rods from the north end in a similar way to ~~that~~ at Haas's pit; the excavation being from the east side of the beach west nearly to the outer slope. The excavation is 12—14 feet deep in the deepest part, and reveals a series of beds dipping slightly toward the east. The upper 5—6 feet is a brown-stained gravel. The lower portion is a fine gravel with sandy portions almost free from gravel. These sandy portions are not so calcareous as glacial sands. A slight effervescence was obtained in but one or two tests, out of a dozen or more. The gravel is made up of worn pebbles comprising nearly every class found in the drift of the vicinity. There is not such a predominance of limestone pebbles as in the kaves of the neighboring moraines. The nature of the gravel is very similar in Haas's gravel pit to that in the one just described.

A sea cliff passes south from the beach ridge just described, through La Grange. At the point where it is crossed by the C., B. & Q. Ry. its base is 46 and its top 64 feet above Lake Michigan. This cliff continues in a southeasterly course from La Grange to the west border of the Des Plaines river valley, having a height of 10—15 feet throughout the greater part of the course. It swings down the river and becomes a part of its bluff— from a point almost directly west from the village of Summit, near the corners of Secs. 10, 11, 14 and 15, Tp. 38, R. XII E.

Before continuing our discription of the distribution of the upper beach it will be necessary to say a word respecting the outlets of Lake Michigan at that time— since the beach lines are open opposite these outlets. There were two channels of discharge into the Des Plaines valley. The most northerly one had its western border, as stated above, about two miles west of Summit, and its eastern border was about three miles south from Summit, where the river enters the Valparaiso moraine. Between these points the water from the lake entered the channel now occupied by the Des Plaines river.

Another avenue of discharge into this valley was through what is known as "the sag," a low belt of marshy land about one-half mile in width, which passes almost centrally through Tp. 37 N., R. XII E., from east to west, and opens into the Des Plaines valley in Sec. 14, Tp. 37, R. XI E., at Say Bridge Station. Between these two outlets is a prominent portion of the Valparaiso moraine whose base shows evidence on all sides that it was washed by the waters of the lake, the rise from the plain on the east being nearly as abrupt as the bluff of the Des Plaines river on the west or the border of the sag on the south. The sea cliff which was formed around this moraine is flanked occasionally by gravel and sand deposits similar to those found farther north along the sea cliff which was cut in the plain.

South of the sag a sea cliff was formed along the foot of the Valparaiso moraine for about 15 miles southeast from the Des Plaines valley, the sag itself lying near the foot of the moraine for 10 miles or more. The Wabash railroad rises onto the moraine from the sag, whose elevation, as shown by its profile, is but 16 feet above Lake Michigan. The gravel flanking the high land each side of the sag indicates that a depth of 40—50 feet of water passed through it at the time of the formation of the upper beach lines.

The plain in Tp. 36 N., R. XIII E., which lies between the sag and the moraine, rises toward the moraine quite rapidly, its border next the moraine being 50 feet above Lake Michigan at the point where the C., R. I. and P. Ry. passes from the plain to the moraine. The sea cliff here rises 28 feet above the plain or 78 feet above Lake Michigan. It is not probable, however, that the water stood as high as the top of the cliff. There is evidence along the border of the moraine, a short distance east, that it was some five feet or more in depth — for sand and gravel deposits flank the moraine to about this elevation above the level of the plain.

In the northwest part of Sec. 25, Tp. 36 N., R. XIII E., a beach line leaves the border of the moraine, and from this point southeast to the state line near Dyer, Indiana, it lies one to two miles north. The Illinois Central railroad crosses it about one mile north of Homewood. The top of the ridge is 65 feet above Lake Michigan (as shown in the profile of this railroad). The beach deposits cover a width of nearly a mile where crossed by this railroad, and their north border is but 41 feet above Lake Michigan. The highest portion of the ridge is mainly sand, and evidently was drifted by the wind so that its crest is now several feet above the water level at the time of the formation of the beach.

At the crossing of the Chicago and Eastern Illinois Railroad near Glenwood, the crest of the ridge is 55 feet above Lake Michigan. The ridge maintains about the same elevation to Dyer, Indiana. A sea cliff flanked by beach gravels is developed near the state line.

Before taking up the description of this beach in Indiana we will note the effect produced by the lake upon "Blue island," a till ridge running north from Blue Island village, some five or six miles. It is evident that this till ridge was an island in the old lake, for its border is very abrupt like a sea cliff and its surface is billowy. Furthermore flanking nearly the whole of the western face — there are beach deposits — whose base is 35—45 feet above Lake Michigan. Toward the north end of the ridge the sand has drifted into dunes, a few of which attain an elevation of 80 feet above Lake Michigan, but the beach gravels were nowhere observed to have an elevation to exceed 55 feet above the lake. From the north end of the ridge a bar composed of both sand and gravel extends out across the plain in a W. S. W. direction for more than a mile. The plain is about 45 feet above Lake Michigan, and the bar rises in plains to an elevation of 15 feet above this plain. This was evidently formed in the lee of the ridge and is

an indication that the waters flowed west past the north end of Blue island, at the time when the bar was formed.

The upper beach in Indiana presents a very different aspect except at the immediate border of the two states from what it has in Illinois, for it is composed mainly of sand, and the sand has drifted into prominent dunes and ridges which have frequently an elevation of 25 feet or more above the plains which lie south of them, and still higher above those on their north face. The elevation of the plains which lie immediately south of the sand ridges seldom exceeds 60 feet above Lake Michigan. It is evident, therefore, that the level of the lake was not more than 60 feet at the time of the formation of this beach, though its dunes have sometimes an elevation of 80 feet above Lake Michigan.

From Dyer, a sea cliff flanked by beach gravels passes nearly due east, changing within two miles to a ridge of dunes. This ridge of dunes passes through Schereville and extends east of this village about two miles when it quite suddenly terminates on a till plain in the east part of Sec. 12, Tp. 35 north, range IX, west. The sand here apparently has drifted in a continuous ridge a mile or more beyond the old lake border, for passing northwest to the vicinity of Griffith, a distance of a mile or more, we find the lake border marked by another line of dunes or rather a belt comprising several more or less continuous lines of dunes trending W. S. W., E. N. E. in the same direction as the course of the Joliet division of the Michigan Central railroad from Griffith to Lake—and thence along the main line of the Michigan Central railroad for about five miles farther east. The belt is 1 and  $\frac{1}{2}$  miles in width and lies almost entirely on the south side of these railroad lines. Near Liverpool this belt is joined by the line of dunes which represents the middle raised beach, and from this village eastward the two branches are closely associated. Near the crossing of the Baltimore and Ohio and Michigan Central railroads, a sudden deflection in the direction of the dune ridges occurs. The whole belt comprising here four main ridges and several smaller ones suddenly swerves from an E. N. E. to a nearly due north course—and passes north to the Calumet marsh, at the border of which all the ridges suddenly terminate. North of this marsh the lower beach ridges, or at least ridges which are quite continuous with those farther west that are evidently later than the upper and middle beaches, occupy the interval between the present beach of the lake and the till tracts which lie south of the system of raised beaches. We consequently find no indications on the north side of Calumet river, nor indeed in the portion of Indiana east from there that these beaches remain, for the sands of the lower beach conceal everything. In Michigan, however, we find traces of the earlier beaches, some of which have been mentioned in the preceding chapter. The till ridge which lies east of New Buffalo, has gravel in indistinct ridges at intervals on its western slope—the highest observed deposits being about 60 feet above Lake Michigan.

North of Galvin river in Secs. 36 and 25, Tp. 7 S. R. XXI W., is a beach

line running from the bluffs of the Galvin river valley, north to the lake bluff. Its elevation at the lake bluff is about 55 feet, by aneroid determination, above the present lake level. This probably represents the Upper beach.

At several points between these "clay banks" in Sec. 30, Tp. 7 S., R. XX W., and Sawyer in Sec. 2, of the same township, the gravels on the river slope of the till ridge, which passes from the clay banks northward are in the forms of beach lines. They occur at an elevation as great as the track of the Chicago and Western Michigan railroad, which is 55-60 feet at several points where comparisons could be made. One of the best developed fragments of a beach line may be seen 100 rods or more west of the depot at Sawyer, where it is crossed by a wagon road. No beach lines were observed north from Sawyer, which will be included with the Upper beach deposits, but occasionally the slopes of till ridges were coated slightly by gravel at elevations about the same as those of the Upper beach — *i. e.*, — 55 feet or more above Lake Michigan.

The lake bluffs north from St. Joseph were examined with reference to finding the elevation to which the gravels occur, both in eroded dunes and above till bluffs, but nowhere were any deposits found at a height exceeding 35 feet above the lake. Quite frequently eroded dunes exposed gravel to an elevation of 20-35 feet, but this is probably to be classed with the gravels of the middle and lower beaches.

#### THE MIDDLE BEACH.

We find it necessary to explain the general surface features of a tract north of the Chicago river before attempting to give the distribution of the beach lines which border it. There is a till plain lying east of the portion of the upper beach that lies north of this river. Its western border is 30 feet or more above the level of Lake Michigan. This till plain has a width of two to four miles, and descends toward the east to an elevation of but 10-15 feet above the lake. East of this till plain there is a prominent beach line rising to an elevation of 30-35 feet above Lake Michigan. The plain therefore appears to be bordered by two beach lines, the one on the west being 40 feet more or less above the level of the lake, while that on the east is 30-35 feet. Taking up now the distribution of these beach lines we can best describe the western one as lying along the eastern face of the portion of the upper beach north of Chicago river, differing from it only in elevation, and in having a more easterly extension down the north side of Chicago river. The eastern beach line leaves the lake bluff about two miles north of Evanston and passes nearly due south for some seven miles to Rose Hill cemetery. At the cemetery it makes an abrupt turn to a course slightly south of west and extends to Bowmanville in Sec. 12, Tp. 40 N., R. XIII E., where it drops down quite suddenly near the bank of the Chicago river. It does not reappear on the opposite side of the river. The interval between the eastern end of this ridge and the western terminus of the spur-

like prolongation of the western beach line down the north side of the river is fully  $1\frac{1}{4}$  miles. This inward curving of the southern ends of the two beach lines diminishes the distance between the ridges one-half, but still leaves so wide a gap that the connection of the eastern ridge with the series of raised beaches is not yet satisfactorily determined.

No good exposure was found in the western beach line, but the eastern has a diagonal exposure of its whole vertical section at the lake bluff. Portions of the plain which lies immediately west of this ridge are covered with peat, and we find that at the exposure along the lake a peat bed which lies near the surface just west of the ridge, passes under the ridge as shown in the following section and description.

Section near beach line beneath plain which borders it on the west:

1. Soil and gray sand.....	12-15 inches
2. Peat.....	2-3 inches
3. Gravelly sand.....	6-36 inches
4. Yellow pebbly clay, very calcareous.....	11-12 feet

The clay No. "4" assumes a bluish cast near the bottom, just above the water's edge. Its upper surface is eroded, and No. "3" has filled up the old channels or irregularities in its surface. It is for this reason that it varies so much in depth. No "3" contains blocks of limestone 8-10 inches in diameter, but the majority of its pebbles are small.

As we go from this exposure through the exposed section of the beach, we find the sand which overlies the peat bed in the above section, increases in thickness as soon as the ridge is entered. When it attains a thickness of about five feet, a coarse gravel and cobble appears above the sand. This cobble-gravel is a thin bed at first, but increases to a thickness of 11-12 feet beneath the highest part of the beach ridge, and has here layers of sand interstratified with it. The bed of sand which lies beneath this gravel has a depth of some ten feet or more beneath the deepest portion of the ridge. It is underlain by a peat bed, the continuation of the peat which lies near the surface west of the ridge, as is shown in the above section. The peat bed has slight breaks in it beneath the beach ridge, but can be easily followed at a quite definite horizon entirely through it. It is 3-6 inches in thickness. It contains pieces of mangled wood beneath the higher portions of the ridge. Between this peat bed and the yellowish blue till which forms the base of the exposure, there is a gravelly sand 6-18 inches in depth. The till rises about 12 feet above the level of the lake. The elevation of the crest of the beach ridge is about 35 feet above Lake Michigan.

The peat bed is found along the lake shore east of this beach, near the surface, as it is west of the beach. The beach appears, therefore, to have been built upon a submerged land surface. There is probably significance in the fact that the peat only extends a few rods west from the beach ridge, but fringes it on this border for several miles. East of the beach the peat occupies a considerable portion of the interval between this and a

Lower beach which is described later, and it was observed beneath this lower ridge in the same situation as beneath the ridge just described. The writer has not been able thus far to satisfy his own mind with any theory explaining the burying of this peaty surface beneath these lake beaches. If the beaches were composed entirely of sand, their material might have been drifted beyond the lake border and covered the adjacent lands, but there is here a heavy deposit of coarse gravel capping the beach, which certainly could not be drifted by the wind. It might seem easy to account for the phenomena by supposing that there have been oscillations of level with periods of emergence followed by periods of submergence, but we found no evidences of such oscillations elsewhere. The limitation of the peat to the immediate border of the beach also presents difficulties in forming an explanation under hypotheses which have thus far arisen. The writer has attempted to conceive a method by which a protective bar could have been built up into the form which this beach line presents, but has not been successful.

Continuing now the distribution and description of the Middle beach from the Chicago river southward, we find that the western Middle beach repeats the phenomena of the Upper beach in swinging down the north side of the Chicago river so that when we cross the river to find its continuation we must pass up stream some two miles. The Middle beach is well developed immediately north of Jefferson, in Sec. 9, Tp. 40, R. XIII E. It has here an elevation of 40 feet above Lake Michigan, and is therefore as elevated as the portion of the beach immediately opposite, and some 5—10 feet higher than the spur referred to above as extending eastward along the north side of the river.

This beach line has a course varying slightly to the east and west of south through Cragin's and Austin to the south part of Secs. 16 and 17, Tp. 39, R. XIII E., when it assumes a southeasterly course to the Des Plaines river, at Riverside. The following are the elevations of the crest of this beach at points crossed by railway lines: Jefferson, 40 feet; Cragin's, 38 feet; Austin, 38 feet; Wisconsin Central crossing (west side of Sec. 16, Tp. 39, R. XIII E.) 38 feet; Riverside, 40 feet.

This portion of the beach line between the Chicago and Des Plaines rivers seldom rises more than 6—7 feet above the plain, which borders it on the east, and but 2—3 feet above that on the west. It is a low beach, coated by beach gravels 1—2 feet in depth, with an occasional depth of 6—8 feet. This bench is a noticeable feature on the level plain, though its elevation is so slight, and its course is well shown by a narrow belt of timber, which follows it across the otherwise treeless prairie.

Between Riverside and Summit is the old outlet of Lake Michigan into the Des Plaines valley. At Summit there is a prominent beach line turning down the east bluff of the Des Plaines river, which traced eastward from this opening into the river valley, takes a more or less direct course toward the north end "Blue island till ridge," and keeping slightly north

of this till ridge, it swings around to its eastern side, and bearing away from its southern end, comes to the Calumet river near Riverdale. Its elevation at Summit is 40 feet; at Washington Heights, 41 feet; but at several points between these villages a survey made by the Chicago Drainage Commission, reports its elevation as 35 feet above Lake Michigan.

The best exposure of the structure of this portion of the beach is found at Summit. An extensive excavation is made near the curving portion of the beach, just as it is about to turn down the River Valley. The beds of gravel dip toward the north with a low angle (10—15°). There is but little sand with the gravel. For a short distance the excavation shows a depth of 20 feet of beach deposits, but in passing eastward the pebbly clay which underlies them rises perceptibly. The gravel is brown, stained to a depth of 3—4 feet from the surface. Below this depth it is unstained. It is but slightly calcareous, even in the finer sandy portions. The pebbles seldom exceed one inch in diameter. They are worn smooth like those along the present beach of the lake.

We are told that shells of Unios and of smaller mollusks, also fragments of wood, have been found at the base of the gravels, but none were at hand at the time of our visit. Portions of the beach east of Blue Island are quite sandy.

South from the Calumet river this beach has a wide break, for the lake discharged past the south end of Blue Island through the sag into the Des Plaines river valley. The outlet from Blue Island, west to the point where the sag narrows to pass through the Valparaiso moraine, has a width of no less than three miles. Its north border is well marked in the form of a sea cliff, on the north side of the sag, and on the south it washed the foot of the Valparaiso moraine. An island locally known as Lane's Island, lies in this outlet, and its borders are flanked by gravelly deposits, to an elevation of about 35 feet above Lake Michigan. This island apparently, was submerged at the time when the upper beach was formed, for its surface is very level and has a coating of sand. Similarly, a large tract of land west of Blue Island, which was not submerged at the time of the formation of the Middle beach, was covered by the lake at the epoch of the Upper beach.

We were interested in noting a boulder-strewn belt occupying the portion of the sag outlet, just east of the Valparaiso moraine. The boulders in places, number several thousand per acre, so that it is very difficult to till the soil. They are both Paleozoic and Archaen. They may, many of them, have been dropped by ice-floes at the time of the lake expansion, for the configuration of the channel west from here, is such as to impede a free discharge into the Des Plaines valley, but a portion of them probably, were dropped there by the glacier, at a much earlier period, for other gaps in the moraines, similar to the sag, where the lake had no outlet, often have a large number of bolders in them.

The lake at the epoch of the Middle beach, probably extended nearly as far

south as at the time of the Upper beach, for no beach lines were observed west of the Illinois Central railroad. East from this railway, however, a well-defined beach exists. It assumes sufficient prominence to be noticeable in Secs. 27 and 28, Tp. 36, R. XIV E., there being on these sections a low beach 10—15 feet high, a portion of which is a rocky escarpment, but the remainder is till across Thorn Creek, from the east end of this bench in Sec. 35 of the same township, a beach line of much strength is developed. It is 40—80 rods wide, and has dunes 20 feet or more in height. It has a nearly due east course for three miles in Illinois, passing through the village of Lansing. It continues into Indiana with the same course, lying along the north border of Cady marsh, to the eastern end of the marsh, thence it continues with a course slightly north of east to Liverpool, where it becomes associated with the Upper beach lines, and its further distribution is given in connection with those beaches. The Indiana portion of this beach west of its junction with the Upper beaches, is a single ridge of sand slightly pebbly in places. It drifts into dunes at several points, but none were observed whose height exceeds 40 feet above the plain at the base of the ridge. The ridge where not drifted into dunes, is some 15 feet above its immediate base, and has a width of 40 rods more or less. Its elevation at Lansing, Illinois, is 43 feet above Lake Michigan. No other elevations are at hand at time of writing.

Between this beach line and the Calumet river there is a plain underlain by pebbly clay, and having scarcely any coating of sand or gravel. The beach deposits seldom extend more than 80 rods north from the base of the ridge.

#### THE LOWER BEACH.

The most northerly point at which this beach has been identified is at Evanston, Illinois. It rises here nearly 25 feet above the lake, and has at its northern extremity a width of 30 rods or more. It passes through the eastern part of the city of Evanston, and its course from Evanston to Ravenswood is nearly south. From Ravenswood it bears slightly east of south, to Lincoln Park in the north part of Chicago, and passes through the western part of this park. In the early days of Chicago, the ridge was developed at intervals through the eastern part of the city, but all traces are now removed. In the southeast part of Chicago, and in Hyde Park, the beach has not been removed. Between Hyde Park and Englewood it is well developed, having an extreme elevation of 19 feet above the lake. From Englewood it passes south through Sec. 21, to the center of Sec. 28, Tp. 38 N., R. XIV E. South from here it is a low belt of land  $\frac{1}{2}$ — $\frac{3}{4}$  mile in width, and rising scarcely 10 feet above Lake Michigan, which connects the low lands west of Chicago, and in the Stock Yards in the southwest part of Chicago, with the low land along Lake Michigan, near Lake Calumet.

South from this low belt there are two beaches, neither of which are the exact equivalents in height of the ridge we have just traced. The innermost of these beaches extends from the head of Lake Calumet, east of Pulman, northwest to the vicinity of South Lynn. In is a bench 4—6 feet



in height, capped by a slight deposit of beach gravels. Its elevation is but 12 feet above Lake Michigan, for two miles or more from Lake Calumet, but further west it is 15—20 feet. Low as it is, it marks a quite distinct change in the surface deposit. On its east side is a sand deposit, 1—18 feet in depth, but on the west there is a pebbly clay, except along beach lines already described.

A second beach lies about a mile west from the one just described. It is a bench or low sea cliff 10—12 feet in height along its southern part, but less in the northern part. It can be traced easily from the Calumet river, near Riverdale, north through Kensington, to the northwest corner of Sec. 15, Tp. 37 N., R. XIV W., where it merges into the plain which borders it. South of the Calumet river, in Riverdale, is a ridge of sand and gravel which is probably of the same age as the bench at Kensington. It has a course almost due southeast to the Indiana line, entering that state about  $1\frac{1}{2}$  miles south of Hammond.

An interesting problem arises as to the outlet of Lake Michigan at the time the lower beach was forming. There may have been a narrow outlet through the Calumet, from Riverdale to Blue Island, and thence through "the sag," into the Des Plaines valley. There may have been another from near Lake Calumet, just between the Englewood beach and the low benches above described, into the Chicago river near the Union Stock Yards, and thence west through a marshy tract called "Mud Lake," to the Des Plaines river. There may also have been an outlet via the Chicago river, through the city to "Mud Lake," and thence into the Des Plaines valley. There are no points along any of these low belts that exceed 16 feet above the present level of the lake, and those via "Mud Lake" are in no case above 10 feet. Probably the whole region in and near Chicago, whose elevation is 15 feet or less above Lake Michigan, was covered with water at the time when this beach was forming. It is also probable that the outlet at the north end of Lake Michigan was opened during the period when the lower beach was forming, if it had not opened previous to that time.

We are indebted to Prof. Oliver Marcy, of Evanston, for a careful section of the beach at the lakeshore in Evanston, made in 1864, at which time there was a peculiarly good exposure. The section was exposed north of Heck Hall, at the border of the University campus:

1. Surface soil, sandy.....	1½ feet
2. Brown sand and fine gravel.....	2½ feet
3. Coarser gravel, stratified.....	2½ feet
4. Fine sand.....	2 feet
5. Gravel containing bones of deer.....	1½ feet
6. Fine sand containing oak logs.....	1½ feet
7. Peat or carbonaceous earth, with a marl bed containing molluscan shells in the lower portion, or interstratified with the peat.....	1½ feet
8. Gravel.....	¾ feet
9. Humus soil with cedar stump and logs.....	4-6 inches
10. Yellow clay laminated and contorted—containing pockets of gravel.....	¾ feet
11. Blue pebbly clay.....	2 feet
Height of bluff.....	22 feet

Prof. Marcy has representatives of the above beds in their natural order, in a glass cylinder. He also has the organic remains referred to. The bone is a portion of the femur of a deer — (species not determined). The oak wood is well preserved but the cedar is mangled and slivered. Prof. Marcy also has specimens of mollusks collected from the marl beds associated with the peat in No. "7" of the above section. The following are specifically identified — 1. *Planorbis campanulatus*. 2. *Planorbis pava*. 3. *Amnicola hinosa*. 4. *Pisidium dubium*. 5. *Cyclas sulrata*.

Unios of various sizes occur, which are not specifically identified. There are also other molluscan remains not included in the above species.

Mr. H. M. Bannister of the Illinois Geological Survey, mentions the fossils found in these beach lines in Vol. III, p. 242, of the Illinois Geological Reports. He states that there are found existing, species of *Unio*, *Pisidium*, *Physa*, *Lymna*, *Planorbis*, *Volvata*, *Amnicola*, *Milantho* and *Ancylus*.

A partial exposure at the point on the shore represented by Prof. Marcy's section above given, was examined by the writer in 1887, and the following section obtained:

- |   |             |
|---|-------------|
| 1. Yellowish red (iron-stained) sand .....  | 3-5 feet    |
| 2. Band of bog iron ore granular .....  | 4-6 inches  |
| 3. Gravel with beds of sand included.....   | 5-7 feet    |
| The stratification is very irregular in thickness and assorting very imperfect) — |             |
| 4. Coarse sand not calcareous.....  | 6-12 inches |
| 5. Calcareous loam.....   | 3 inches    |
| 6. Yellow clay very calcareous with leaves embedded.....                          | 3 inches    |
| 7. Carbonaceous band not calcareous.....  | 2 inches    |
| 8. Yellow calcareous clay similar to No. "6".....                                 | 4-6 inches  |
| 9. Band of carbonaceous material not calcareous.....                              | 2 inches    |
| 10. Brown sand with twigs and peaty material.....                                 | 8-10 inches |
| 11. Water bearing sand .....  |             |

Talus obscures the lower portion of the bluff. Nos. "6" and "8" contain gasteropod shells.

Several exposures of Nos. "6—9" were noted along the lake bluff further north. They were found well developed at outcrops beyond, i. e., further northwest than the outcrops of beach deposits, which overlie them in the above section. Beneath them is a yellowish sand four feet or more in depth, and beneath the sand resting upon a pebbly clay is an occasional outcrop of humus soil, probably No. "9" of Prof. Marcy's section.

In a cut where the wagon road comes down to the lake shore, south of the Evanston waterworks, the peat beds pass back into the peaty soils of the low land west of this beach ridge. The connection of this peaty bed with that beneath the eastern ridge of the middle beach, has already been discussed in connection with that ridge.

The profile of Fullerton Avenue conduit in the north part of Chicago shows the depth of sand and gravel through the entire width of the deposit between the lake shore and Chicago river. The ridge portion of the lower

beach lies 1,400—2,100 feet from the lake shore, and the maximum depth of sand (25 feet), is about 1,700 feet from the lake. On the west border from 2,100—2,600 feet, the depth is about 17 feet, and from 2,600—6,000 feet it averages about 12 feet in depth. From the latter point westward the depth gradually decreases and the sand disappears 1,900 feet east from the Chicago river. From the inner border of the beach ridge, to the lake shore a distance of 1,400 feet, the deposits are about 18 feet in depth. At the water's edge the depth is but 10 feet. The profile continues out 1,100 feet beneath the lake and there is but three feet of sand and gravel at its terminus. The deposit throughout is mainly sand, but some gravel was encountered. Shells of *Unio* and other mollusks were imbedded at frequent intervals throughout nearly the whole width of the deposit. Beneath these beach deposits there is everywhere a pebbly blue-gray clay, and no difference could be detected in emerged and submerged portions. This pebbly clay is described in a previous chapter. .

In Hyde Park, the lower beach contains much more gravel than is shown in the Fullerton Avenue profile. The width of the system of raised beaches between Hyde Park and Englewood, is fully one mile, and between these beaches and the present beach, the surface is covered with sand and gravel.

At Riverdale the beach deposits are scarcely four feet in depth, but at Dolton Junction they are eight feet and two miles east of Dolton, the depth along the west of the ridge is 12—15 feet, and at the state line it is reported to be about 24 feet. The whole surface from Lake Calumet south to the beach ridge just alluded to, is covered with sand, the depth of which in places is at least 18 feet. The whole interval in fact between the lower raised beach and the present lake shore is covered with sand, not only in Illinois, but also in Indiana and Michigan, as will appear on a subsequent page. Its separation from the present beach is merely a matter of elevation, apparently, consequent upon the gradual lowering of the level of the lake.

The beach which enters Indiana about  $1\frac{1}{2}$  miles south of Hammond, passes east through the villages of Hessville, Tolbston and Miller, lying 1—2 miles north of the Little Calumet, and about an equal distance south of the Grand Calumet river. East from Miller the beach is quite continuous as far as Michigan City, lying  $1-2\frac{1}{2}$  miles back from the present beach. East from Michigan City there are only fragmentary beach lines, the distribution of which will be given presently.

Between the beach just described and the present beach, there are in Lake County, Indiana, a series of lower beach lines separated by narrow swamps, which fill the whole interval between the lake and the beach, leaving no such broad level tracts as occur between the Middle and Lower beaches along the Little Calumet and between the Upper and Middle beaches along Caebby marsh. On the meridian of Hessville, there are not fewer than thirty of these lower beach lines. These beaches are more closely associated with the main Lower beach in Porter county, for the

interval between this beach and the lake is much narrower than in Lake county. These minor beach lines are but a few feet in height, and 6—10 rods in width. At their western ends they are lost in the sandy plain which borders Wolf Lake, Lake Calumet and other small lakes near the state line or the borders of Lake Michigan. It is probable that these beach lines have each in turn shut off portions of the lake lagoons, and thus made encroachments upon it. They were probably built up as bars, working their way westward along the coast, for the shore currents at the present day are carrying sand across the south end of the lake in a westerly course, and building up broad branches at the head of the lake.

By reference to the Illinois beach lines it will be seen that from Chicago south, the beach which formerly bore west of south to Englewood, has by gradual accretions along its eastern border, been built out several miles to the eastward. The shore currents on the west side of the lake are southward, and consequently they unite with the westerly currents on the south shore to build up a broad beach at the head of the lake; near the state line between Illinois and Indiana. Between the western ends of the low beaches in Lake county, Indiana, and the southern ends of the beach lines near Englewood, in Illinois, is a low sand-covered tract occupied by several small lakes, and nowhere rising to the height of the beach lines, much of it being scarcely five feet above the level of Lake Michigan. This was apparently an open bay at the time these bar-like beaches were forming, but has now become filled with sand, leaving Lake Calumet and other lakelets and ponds as remnants of its waters.

The shores of the lake at the present day are not stationary. In one place encroachments are made upon the bordering shores while in adjacent portions of the shore accretions and accumulation is going on. Thus from Waukegan to Evanston, Illinois, the bluffs are undermined and removed at a rapid rate, but from Evanston, south to the head of the lake, the accumulation along the beach is greater than the removal. On the opposite side of the lake from Langatuck, Michigan, to a point on the shore some ten miles southwest from Michigan City, Indiana, the removal is greater than the accumulation, but as is shown above, the accumulation exceeds the removal along the remainder of the south shore. The projecting points along the lake are undermined more rapidly than the heights, so that the lake tends toward a more regular outline by its erosive power, and as we have seen above the bay-like elongation at the head of the lake has been greatly reduced since the epoch of the main lower beach, so that the lake is also tending toward a smoother outline by its depositing power.

The lower beach in Indiana is composed mainly of sand—gravel being found only in its deeper portions. The sand has drifted into dunes throughout the entire length of the beach lines in this state—so that elevations taken along the crest of the main ridge do not show the height at which the lake stood during its formation. By aneroid determinations there is a range of more than 50 feet in the elevation of this crest, some portions be-

ing 80 feet or more, while other portions are but 30 feet above Lake Michigan. The depth of sand at the powder works near Miller, is 32 feet. Beneath the sand is gravel and sand in which are shells of mollusks called snail shells by the well-digger, who reported them. The elevation of the surface is probably not more than 50 feet above Lake Michigan.

Gravel has been encountered near the bottom of wells along the ridge in several instances; the writer has no means of computing accurately the elevation above Lake Michigan, but it is certainly not more than 20 feet. The Lower beach in Michigan occurs at intervals only. It consists of dunes and low sandy ridges lying back of the dunes of the present beach, which form a bold front along much of the Michigan shore. They are usually separated from these higher dunes by marshy belts, but sometimes lie immediately back of them. Their height seldom exceeds 40 feet, while the dunes along the shore are in some cases 125 feet or more in height.

The most southerly development of these older ridges in Michigan is found on the east side of the Michigan Central railroad in New Buffalo township, where they extend for more than a mile along the railroad. North from here no ridges of this epoch were noticed south of the clay banks, in Tp. 7 S., R. XXIV, but north from there to the vicinity of St. Joseph, dunes were noted at frequent intervals lying east of the belt along the shore. A similar distribution of two series of dunes was noted west of Carrot, in Van Buren county. Further north this Lower beach was not thus identified. Occasionally gravel deposits are exposed along the lake shore, capping the till at elevations of 10—20 feet, which may represent this epoch, but quite as frequently these deposits, as has been already noted, rise to heights corresponding with the elevation of the Middle beach (30—35 feet above Lake Michigan). The main development of the raised beaches, not only of this epoch, but of all epochs, is found in Illinois and Indiana, for it is only around the head of the lake that the land has gained more than it has lost since the epoch of the first (Upper) beach.

## ON THE EMPLOYMENT OF THE METHOD OF LEAST SQUARES IN THE REDUCTION OF TRANSIT OBSERVATIONS.

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BY PROF. T. H. SAFFORD, WILLIAMSTOWN, MASS.

In longitude work upon the continent of Europe the polar stars employed to find the azimuth and collimation of the transit are usually within a few degrees of the north pole. Each such star gives a value of the azimuth, and three are generally observed each evening, in reversed positions of the instrument; while the time-stars are, according to the instructions, twenty or more in number, arranged symmetrically about the polars, in such manner as to give opportunity for two exchanges of signals. The declinations of these time-stars are arranged at the same zenith distances south, as the polars are north of the zenith, so as to eliminate pivot-errors.

This arrangement, for latitudes near  $50^\circ$ , combines the following advantages:

1. The polar stars are slow enough in their apparent motions for a deliberate reversal during each of their transits.
2. The time-stars are in the declinations most favorable to accurate observation when they are equally distant from the zenith with the polars.
3. The reduction becomes extremely simple in execution, as the different instrumental corrections are directly determined and equations of conditions, to be solved by the method of least squares are not required.

For the more southern latitudes of Europe, which correspond to those of the northern part of the United States, these three conditions cannot be simultaneously fulfilled. If, for instance, the second condition be insisted upon, the first falls out, for latitude  $43'$ , and *vice versa*. In order to fulfill this second condition the average declination of time stars must be taken at about  $20^\circ$ ; and the polar-stars at  $66^\circ$ : which is too far south to accomplish the necessary reversals without hurry during the single transits.

Certain limitations, however, which are necessary in Europe, are needless in America. For instance, the greater length of the circuits over which very much of our telegraphic longitude work is done, renders it very difficult to observe the same stars at both stations. As our absolutely definitive reductions are not immediately necessary, the star-places used in any campaign can be left open for future improvement; when, for instance, geodetic measures shall be made over the whole territory. Again, the unsettled country in which much of the work is done renders it necessary for us to

adopt a different type of instruments from the European, lighter and more portable, less liable to injury in transportation; but, on the other hand, more care has to be exercised in so arranging our star-lists that all conceivable instrumental errors shall be eliminated; we cannot depend too fully upon one particular arc of the circle described by the telescope. A few things considered, it has been the practice of American observers to select their time and polar stars in a much wider range of declination than the Europeans employ; and to use the method of least squares in their reductions.

I have myself employed these methods, both of selection of stars and reduction, in second longitude campaigns; and have formulated for myself the practical rules to be followed. The earlier years of this work were spent in determinations at very distant points, accessible with difficulty, and with quite inferior instruments; so that, as they were also usually in bad repair, it required very careful handling to produce even tolerable results.

Later, in 1878, I had the use of an excellent transit instrument, which was in first-rate condition; and was then able to apply the rules which I had previously made for myself, to a better state of external circumstances. In the present paper I shall state the conditions for a good series of time-determinations in this country, as I now understand them, with especial reference to the western States and Territories, and the methods of reduction.

The observations to which I have last referred were made in 1878, at Ogden, Utah, in latitude  $41^{\circ} 13'$ . The results are given in the Report of the Chief of Engineers for 1879-80 (Executive Documents, 2d Session, 46th Congress, Vol. 5), pages 1983-5. It will be seen that during a space of 2½ months, from July 25th to October 10th, 74 days in all, there were 67 determinations of time. Signals were exchanged on 26 nights with the regular observers of Captain Wheeler's survey; and the observations on these nights reduced by the method of least squares; all these calculations, as well as the preliminary ones necessary for the other nights, were completed within the two months after the first exchange, August 12th, so that the method of reduction is not too complicated to be practicable.

The following would be, in my judgment, an advantageous selection of stars for a latitude  $41^{\circ} - 44^{\circ}$ ; the group is arranged nearly as at Ogden, and differs from my ordinary arrangements in those times only because I had then fewer close polar stars available. The stars are taken from the Berlin Jahrbuch, or other ephemerides, and from my catalogue of 2018 stars published by the Engineer Bureau:

Name of Star.	A. R. 1885.0	Decl. 1885.0	Remarks.
Cassiopeiæ .....	0 26 28	+ 62 18	Reverse on this star.
$\pi$ Andromedæ.....	0 30 44	+ 33 5	
55 Piscium .....	0 33 52	+ 20 48	
$\sigma$ Cassiopeiæ .....	0 38 19	+ 47 39	
$\delta$ Piscium .....	0 22 43	+ 6 57	
Cephei 43 H.....	0 53 12	+ 85 38	
$\epsilon$ Piscium .....	1 2 27	+ 5 2	
$\tau$ Piscium .....	1 5 20	+ 29 29	
$\alpha$ Piscium .....	1 7 30	+ 23 59	
$f$ Piscium.....	1 11 52	+ 3 1	
$\psi$ Cassiopeiæ .....	1 17 41	+ 67 31	

It will be noticed that I have introduced no stars at lower culmination. The reason for this is, that unless they are very near the pole, the azimuth co efficient which they furnish is positive in sign, and the stars which balance them as to the sign of this co-efficient do not as to the form of the pivots. In other words, a combination of stars below and above pole would give the clock correction with a large probable error and with a danger of constant error, while a combination of stars below pole with those at corresponding south zenith distances would be far less advantageous, owing to the identity of sign in the azimuth co-efficient, and its greater magnitude for the southern stars, than a combination of stars above pole on the north side with the ordinary northern time-stars.

When the least square reduction is made, the theoretical test of a good combination is obtained by Jacobi's theorem, which I quote below; the practical test by the quotient.

$$\frac{\text{Weight of clock-correction.}}{\text{Number of transits}}$$

which should approach the weight of one transit of a zenith star: Practically I usually employ the following formula for the weight of one complete transit (on 5 or more wires, or 7 or more, according to the way the diaphragm is arranged).

$$w = \frac{1.3}{1 + 0.3 \text{ Sec.}^2\delta}$$

For latitude 43° 42' 5, this gives the weight of a zenith star equal to 0.836; in general it is easy so to arrange the groups that the weight of the clock correction from 10 stars shall be 7 at least; but where lower culminations and southern stars are freely employed this number frequently is reduced to 5 or less. That is to say, 10 stars well arranged give as good a clock correction as 14 ill arranged; and waste of time spent in computation is thus avoided. The few extra minutes lost in observations are usually of less account; and are perhaps compensated by the greater pains necessary beforehand. In order to modify the weight-formula to advantage more



observations are needed, which I intend to make with a portable instrument now constructing for Williams College Observatory; the field observations have confirmed it with sufficient certainty for my purposes. For in my least square reductions I have pursued the course so strongly recommended by Gauss (*Astr. Nachrichten* v. 5, cols. 227 following; *Méthode des moindres carrés*, mémoires traduits par J. Bertrand, p. 163) of determining in advance approximate values of the unknowns, and using the least squares only to find minute corrections. And the following are the results for the clock-corrections of the dates in the Ogden campaign, as published in the Report before alluded to:

Date.	Correction to provisional result.	Date.	Correction to provisional result.
	s.		s.
Aug. 12.....	-0.008	Sept. 20.....	+0.001
19.....	-0.021	21.....	-0.020
21.....	-0.003	22.....	+0.001
26.....	-0.010	26.....	+0.001
28.....	-0.006	27.....	-0.008
Sept. 5.....	+0.016	30.....	+0.011
7.....	+0.010	Oct. 1.....	-0.002
8.....	0.000	3.....	-0.009
10.....	-0.010	5.....	-0.005
11.....	+0.017	6.....	-0.005
12.....	+0.009	7.....	-0.003
13.....	+0.010	8.....	-0.013
17.....	-0.031	10.....	-0.007

The total effect upon the longitudes of the application of least squares, consists in the differences of their corrections for the stations. The observers at the corresponding stations in this campaign had worse instruments than I, and were not so scrupulous in arranging their star lists; so that the corresponding corrections came out rather larger. Their time determinations did not suffer sensibly from this cause, however; as both were experienced observers. The average without regard to sign of the 26 numbers given above—each of which, with trifling exceptions is the result of two groups of stars—is 0.<sup>s</sup> 0091; and the probable error of one preliminary solution  $\pm 0.<sup>s</sup> 0077$ ; or for a single group of 10 stars  $\pm 0.<sup>s</sup> 011$ .

It is evident, then, that if the weights are assigned by my formula with approximate corrections—so, for instance as to make sufficient distinction between a very slow-moving and a quiet-moving star—there need be no fear that it is not correct enough. The objections to the old process of giving all stars a weight unity is that the polars of high declination dominate too much in azimuth; this process is about equivalent to leaving out the quicker-moving stars north of 65° altogether.

Another practice which is quite common is altogether meaningless. When the weights are approximately correct there is no necessity of omit-

ting the polar stars in arranging the final table of clock corrections. Each star, quick-or slow-moving, should go in, with its proper weight to the clock-correction. The method of least squares gives, namely: the *most probable* values of all the unknowns; and a *more probable* one than this cannot be obtained in any other way, unless the original system of weights be altered. But this would involve a contradiction; the weight, according to definition, refers not to the use to be made of the observation, but to the measure of its precision. The following example taken from my work on the longitude campaign of 1878 will illustrate several points of this paper.

The observer at Fort Bliss (latitude 31° 45') frequently inserted stars subpole in his determinations. As a consequence the weight of the final time determination was less, proportionately, than it otherwise would have been; for a zenith star my formula would give

$$\frac{1.3}{1 + 0. z \sec^2 31^\circ 45'} = \frac{1.3}{1.415} = 0.919$$

But the group after signals on September 8th contains 11 stars, giving a final weight of 6.92; or about that of 8 or 9 stars nearer the zenith; two stars are below pole, and therefore less advantageous. The results of the individual stars (those north of 65° are marked with an asterisk; these are now between 45° and 65°) are as follows:

	Clock Corr.	Clamp.
	m s	
θ Aquarii.....	-1 24.79	W
γ Aquarii.....	-1 24.89	W
π Aquarii.....	-1 24.82	W
Draconis 9 H. sp.....	-1 25.28*	W
Groomb. 3334.....	-1 25.39*	W
ζ Pegasi.....	-1 24.75	W
λ Pegasi.....	-1 24.83	E
τ Cephei.....	-1 25.07*	E
Bradley 1508 sp.....	-1 25.37*	E
ο Andromedae.....	-1 25.09	E
α Pegasi.....	-1 24.74	E

The least square solution gives the mean clock-correction -1' 24".888, but this includes, with their proper weight, the stars marked with an asterisk. If we omit these, and give all others a weight unity we shall have -1' 24".844, or +0".044 more. But it is plain from least square solution that some cause affects the observations north of the zenith, probably wear of pivots<sup>1</sup>; and the mean of the 6 stars south of the zenith gives -1' 24".803;

<sup>1</sup> This is confirmed by the other dates when the same instrument was employed.

the three north of the zenith and above pole  $-1' 25''.183$ ; and the zenith distances are nearly equal for these two groups. It is plain from this that the least square value  $-1' 24''.888$  is probably nearer correct than the greater (algebraic) value  $-1' 24''.803$ ; as it ought to be. In other words, the exclusion from the final clock corrections of the quick moving polar stars renders the elimination of pivot error very questionable; as, in fact, does the employment of groups not sufficiently well-balanced.

The simpler method of reduction, which gives the instrumental corrections separately, without least squares, really assigns to the polar stars their proper weight; especially if they are all observed at upper culmination, as the German instructions recommend. For in this case the final clock corrections from each time star are actually reduced by interpolation to the zenith, as may be seen by using Dr. Braun's graphical method given in vol. 109 (No. 2595) of the *Astronomische Nachrichten*. So that in the previous example it is not surprising that the preliminary solution gave a value ( $1' 24''.90$ ) very nearly equal to the final result. Nor is it very plain that the least square method is absolutely indispensable; I have employed it in my reductions without objection, although I have never known a case in which it materially aided in producing a better agreement in the resulting longitude. The chief argument in its favor here is that it renders it unnecessary to restrict the selection of stars to a narrow range, while it removes the arbitrary character of the reductions when this restriction has not been carried into effect. The chief objection to the method of least squares is that observers who are not both experienced and careful sometimes permit a blind faith in it to mislead them in preparing their working lists; and forget the necessity of making observations enough and of the right quality, which is no less when least squares are used in reductions than at any other time.

Jacobi's theorem is in substance the following; and bears directly upon the point in question:

In order to obtain the least square result for any unknown of  $m$  equations with a less number of unknowns, we solve all possible combinations  $n$  by  $n$  of the  $m$  equations, and multiply each such result for this unknown by the square of the corresponding determinant. We add all these products together and divide their sum by the sum of the squares of the determinant factors; the quotient will be the least square result sought for.<sup>1</sup>

To a least square result, then, unfavorable combinations furnish small contributions relatively to favorable ones; and if the favorable ones cannot be made, the unfavorable ones are better than nothing. Stars below pole are the proper ones to employ in combination with those above, when the azimuth is the unknown most needed, as in setting up a meridian mark; but for time-determinations proper the best combination is that of polars above pole with time-stars at nearly equal zenith distances on the other side.

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<sup>1</sup> Jacobi, *De Formatione et Proprietatibus Determinantium*: Crelle's Journal.

I have annexed to this paper, a table for Ogden observatory, latitude  $41^{\circ} 13' 8''.6$ , which is calculated according to the formula.

$$P = \frac{1.3}{1 + 0.3 \sec^2 \delta}$$

$$A = \frac{\sin(\varphi - \delta)}{\cos \delta}$$

$$C = \frac{1}{\cos \delta}$$

The columns  $p$ ,  $C p$ ,  $C_2 p$  hold good for any station; the values of  $A p$ ,  $A_2 p$ ,  $A C p$  must be recalculated for every new latitude. But I have not omitted them, as their values will serve as a control for a good many places near the same parallel. The numbers are given to four decimals, to enable the computer to interpolate readily to three.

The 52 nights out of 78 upon which signals were not exchanged at Ogden, afforded an excellent opportunity for the criticism of the instrument. A peculiarity of much far western longitude work is that the telegraph lines are in bad order much of the time, and do not afford opportunities for long exchanges. On some nights of the exchanges with Fort Bliss (Texas), it was impossible to get a circuit through on the more direct route, by way of Cheyenne, Denver, and Santa Fé, and recourse was had to a line of 2,000 miles in length via San Francisco, Southern California, and Arizona. The time expended while waiting is, under such circumstances, best applied to the study of the peculiarities of the instrument.

In conclusion, I will indicate the principal points of this paper as a summary of directions for the determination of time in latitudes  $25^{\circ}$  to  $49^{\circ}$ .

1. A group of time-stars should contain about 10 stars in all, with one reversal.
2. It should contain no more than two or three polars; one of which may be within 10 degrees of the pole.
3. Stars north of the zenith, not polars, should be included; and may take the place of polars to some extent.
4. Lower culminations should in general be avoided; and time-stars far south of the zenith.
5. The stars of a group should so balance at the zenith that the co-efficient of azimuth and collination in the normal equation for clock-correction should be very small, and the weight of the clock-correction large in proportion to the number of stars.
6. With proper blank forms the preliminary reduction without least squares can be very simply effected, and this should always be done.
7. The least square deduction is of little benefit except in removing the effect of any arbitrary assumptions in the previous process; and should be

employed only for the signal-nights, or other times when the last degree of precision is required.

8. In making the least square reductions the weights at different declinations should be combined with the coefficients for azimuth and collination; and the unknowns should be in the form of corrections to the values derived from the preliminary reduction.

JACOBI'S THEOREM.

NOTE.—[I give this in the original Latin, as it is very important, and seems not to be well known to mathematicians.]

Proponantur aequationes:

$$ax + a'x_1 + a''x_2 \dots \dots \dots + a^{(n)}x_n = 1$$

$$a_1x + a'_1x_1 + a''_1x_2 \dots \dots \dots + a^{(n)}_1x_n = 1_1$$

$$a_px + a'_px_1 + a''_px_2 \dots \dots \dots + a^{(n)}_px_n = 1_p$$

Quarum numerus incognitarum numerum excedat; e quolibet systemate  $n+1$  aequationum praecedentium valor incognitae eruatur atque per quadratum Determinantis eius systematis, RR, multiplicetur; quibus factis pro singulis aequationum propositarum combinationis omnium illorum productorum summa per summam omnium RR dividatur: eruitur incognitae valor idem atque invenitur, si aequationes propositae per Methodum Minimorum Quadratorum tractantur."

Observandum est, valores omnium incognitorum qui ex eadem aequationum propositarum combinatione proveniant secundum Prop. praec. per eandem quantitatem RR multiplicare, quam ideo in applicationibus ad *Methodum Minimorum Quadratorum* convenit appellare *Pondus Combinationis*, a pondore valoris incognitae bene distinguendum.

The theorem is thus given in Crelle, vol. 22, p. 316; it is also given independently by Mr. J. W. L. Glaisher in Vol. 40, of the Monthly Notices, p. 607.

SQUARES AND PRODUCTS OF LEAST SQUARE CO-EFFICIENTS  
FOR TIME — OGDEN.

Decl.	P	A p	C p	A <sub>2</sub> p	A C p	C <sub>2</sub> p
0°	1.0000	+ .6589	+ 1.0000	.4342	+ .6589	1.0000
1	— 1 .9999	181 .6458	+ 1 1.0001	— 172 .4170	— 180 .6459	+ 2 1.0002
2	2 .9997	183 .6325	2 1.0003	168 .4002	180 .6329	7 1.0009
3	3 .9994	184 .6191	4 1.0007	166 .3836	129 .6200	12 1.0021
4	5 .9989	184 .6057	6 1.0013	164 .3672	129 .6071	16 1.0037
5	7 .9982	186 .5921	8 1.0021	160 .3512	127 .5944	22 1.0059
6	7 .9975	187 .5784	9 1.0030	158 .3354	128 .5816	26 1.0085
7	10 .9965	188 .5646	10 1.0040	155 .3199	127 .5689	31 1.0116
8	10 .9955	189 .5507	12 1.0052	152 .3047	128 .5561	35 1.0151
9	11 .9942	140 .5367	14 1.0066	148 .2897	127 .5434	41 1.0192
10	13 .9929	141 .5226	16 1.0082	147 .2750	128 .5306	48 1.0240
11	15 .9914	143 .5083	17 1.0099	144 .2606	128 .5178	48 1.0288
12	17 .9897	144 .4939	19 1.0118	141 .2465	129 .5049	56 1.0344
13	19 .9878	145 .4794	20 1.0138	139 .2326	129 .4920	61 1.0405
14	19 .9859	147 .4647	22 1.0160	135 .2191	130 .4790	67 1.0472
15	22 .9837	148 .4499	24 1.0184	133 .2058	132 .4658	71 1.0543
16	23 .9814	149 .4350	25 1.0209	130 .1928	133 .4525	78 1.0621
17	25 .9789	151 .4199	27 1.0236	127 .1801	134 .4391	83 1.0704
18	27 .9762	153 .4046	29 1.0265	123 .1678	136 .4255	89 1.0793
19	28 .9734	153 .3893	30 1.0295	121 .1557	138 .4117	95 1.0888
20	31 .9703	156 .3737	31 1.0326	117 .1440	140 .3977	101 1.0989
21	32 .9671	157 .3580	33 1.0359	115 .1325	142 .3835	107 1.1096
22	34 .9637	159 .3421	35 1.0394	110 .1215	145 .3690	114 1.1210
23	36 .9601	160 .3261	36 1.0430	107 .1108	147 .3543	121 1.1331
24	38 .9563	162 .3099	38 1.0468	104 .1004	151 .3392	127 1.1458
25	41 .9522	164 .2935	39 1.0507	100 .0904	154 .3238	135 1.1593
26	42 .9480	166 .2769	40 1.0547	95 .0809	157 .3081	142 1.1735
27	45 .9435	168 .2601	42 1.0589	92 .0717	162 .2919	149 1.1884
28	47 .9388	170 .2431	43 1.0632	87 .0630	165 .2754	158 1.2042
29	50 .9338	171 .2260	45 1.0677	83 .0547	170 .2584	165 1.2207
	52	174	45	79	175	174



SQUARES AND PRODUCTS OF LEAST SQUARE CO-EFFICIENTS  
FOR TIME — OGDEN.

Decl.	P	A p	C p	A <sub>2</sub> p	A C p	C <sub>2</sub> p
56	.6635 <sup>172</sup>	.3027 <sup>200</sup>	1.1865 <sup>+ 2</sup>	.1381 <sup>231</sup>	.5413 <sup>513</sup>	2.1218 <sup>571</sup>
57	.6463 <sup>178</sup>	.3227 <sup>197</sup>	1.1867 <sup>-6</sup>	.1612 <sup>254</sup>	.5926 <sup>536</sup>	2.1789 <sup>594</sup>
58	.6285 <sup>184</sup>	.3424 <sup>193</sup>	1.1861 <sup>16</sup>	.1866 <sup>279</sup>	.6462 <sup>561</sup>	2.2383 <sup>615</sup>
59	.6101 <sup>192</sup>	.3617 <sup>188</sup>	1.1845 <sup>27</sup>	.2145 <sup>305</sup>	.7023 <sup>587</sup>	2.2998 <sup>638</sup>
60	.5909 <sup>198</sup>	.3805 <sup>182</sup>	1.1818 <sup>38</sup>	.2450 <sup>333</sup>	.7610 <sup>613</sup>	2.3636 <sup>661</sup>
61	.5711 <sup>205</sup>	.3987 <sup>174</sup>	1.1780 <sup>52</sup>	.2783 <sup>362</sup>	.8223 <sup>640</sup>	2.4297 <sup>684</sup>
62	.5506 <sup>212</sup>	.4161 <sup>166</sup>	1.1728 <sup>67</sup>	.3145 <sup>392</sup>	.8863 <sup>668</sup>	2.4981 <sup>705</sup>
63	.5294 <sup>218</sup>	.4327 <sup>157</sup>	1.1661 <sup>89</sup>	.3537 <sup>423</sup>	.9531 <sup>697</sup>	2.5686 <sup>728</sup>
64	.5076 <sup>225</sup>	.4484 <sup>145</sup>	1.1579 <sup>100</sup>	.3960 <sup>457</sup>	1.0228 <sup>725</sup>	2.6414 <sup>748</sup>
65	.4851 <sup>230</sup>	.4629 <sup>133</sup>	1.1479 <sup>119</sup>	.4417 <sup>490</sup>	1.0953 <sup>754</sup>	2.7162 <sup>769</sup>
66	.4621 <sup>236</sup>	.4762 <sup>119</sup>	1.1360 <sup>139</sup>	.4907 <sup>526</sup>	1.1707 <sup>784</sup>	2.7931 <sup>788</sup>
67	.4385 <sup>242</sup>	.4881 <sup>102</sup>	1.1221 <sup>161</sup>	.5433 <sup>561</sup>	1.2491 <sup>812</sup>	2.8719 <sup>804</sup>
68	.4143 <sup>246</sup>	.4983 <sup>85</sup>	1.1060 <sup>186</sup>	.5994 <sup>598</sup>	1.3303 <sup>840</sup>	2.9523 <sup>820</sup>
69	.3897 <sup>250</sup>	.5068 <sup>66</sup>	1.0874 <sup>211</sup>	.6592 <sup>635</sup>	1.4143 <sup>867</sup>	3.0343 <sup>834</sup>
70	.3647 <sup>253</sup>	.5134 <sup>43</sup>	1.0663 <sup>238</sup>	.7227 <sup>672</sup>	1.5010 <sup>894</sup>	3.1177 <sup>843</sup>
71	.3394 <sup>255</sup>	.5177 <sup>-21</sup>	1.0425 <sup>268</sup>	.7899 <sup>710</sup>	1.5904 <sup>918</sup>	3.2020 <sup>850</sup>
72	.3139 <sup>256</sup>	.5198 <sup>+ 5</sup>	1.0157 <sup>297</sup>	.8609 <sup>746</sup>	1.6822 <sup>940</sup>	3.2870 <sup>854</sup>
73	.2883 <sup>256</sup>	.5193 <sup>33</sup>	.9860 <sup>329</sup>	.9355 <sup>781</sup>	1.7762 <sup>959</sup>	3.3724 <sup>853</sup>
74	.2627 <sup>254</sup>	.5160 <sup>62</sup>	.9531 <sup>363</sup>	1.0136 <sup>816</sup>	1.8721 <sup>975</sup>	3.4577 <sup>846</sup>
75	.2373 <sup>251</sup>	.5098 <sup>94</sup>	.9168 <sup>396</sup>	1.0952 <sup>847</sup>	1.9696 <sup>988</sup>	3.5423 <sup>837</sup>
76	.2122 <sup>246</sup>	.5004 <sup>127</sup>	.8772 <sup>431</sup>	1.1799 <sup>877</sup>	2.0684 <sup>996</sup>	3.6260 <sup>819</sup>
77	.1876 <sup>239</sup>	.4877 <sup>162</sup>	.8341 <sup>466</sup>	1.2676 <sup>903</sup>	2.1680 <sup>998</sup>	3.7079 <sup>797</sup>
78	.1637 <sup>232</sup>	.4715 <sup>198</sup>	.7875 <sup>501</sup>	1.3579 <sup>925</sup>	2.2678 <sup>997</sup>	3.7876 <sup>767</sup>
79	.1407 <sup>220</sup>	.4517 <sup>-234</sup>	.7374 <sup>-536</sup>	1.4504 <sup>943</sup>	2.3675 <sup>988</sup>	3.8643 <sup>782</sup>
80	.1187	.4283	.6838	1.5447	-2.4663	3.9375



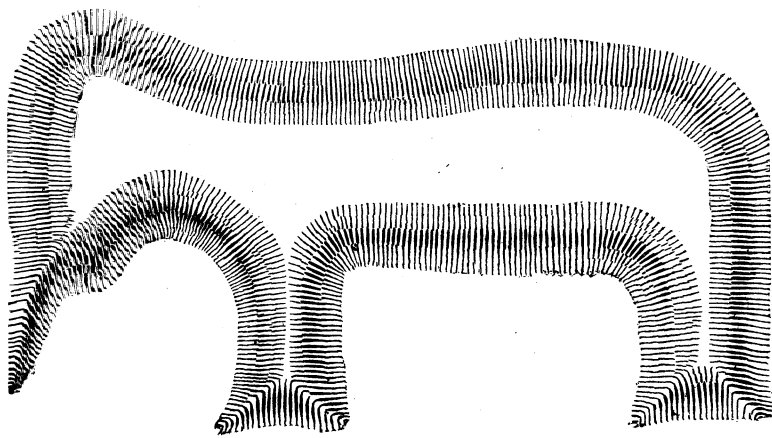
SQUARES AND PRODUCTS OF LEAST SQUARE COEFFICIENTS  
FOR TIME — OGDEN.

Decl.	P	A p	C p	A <sub>2</sub> p	A C p	C <sub>2</sub> p
80°	0.1187	-.4283	+.6838	1.5447	-2.4663	3.9376
	<small>-207</small>	<small>+ 273</small>	<small>-570</small>	<small>+ 956</small>	<small>+ 973</small>	<small>+ 689</small>
81	0.0980	.4010	.6268	1.6403	2.5936	4.0065
	<small>192</small>	<small>310</small>	<small>603</small>	<small>963</small>	<small>951</small>	<small>640</small>
82	0.0788	.3700	.5665	1.7366	2.6587	4.0705
	<small>175</small>	<small>347</small>	<small>633</small>	<small>964</small>	<small>923</small>	<small>584</small>
83	0.0613	.3353	.5032	1.8330	2.7510	4.1289
	<small>163</small>	<small>385</small>	<small>662</small>	<small>958</small>	<small>888</small>	<small>521</small>
84	0.0457	.2968	.4370	1.9288	2.8398	4.1810
	<small>12</small>	<small>419</small>	<small>686</small>	<small>945</small>	<small>844</small>	<small>454</small>
85	0.0321	.2549	.3684	2.0233	2.9242	4.2264
	<small>114</small>	<small>454</small>	<small>709</small>	<small>925</small>	<small>795</small>	<small>378</small>
86	0.0207	.2095	.2975	2.1158	3.0037	4.2642
	<small>89</small>	<small>484</small>	<small>728</small>	<small>897</small>	<small>738</small>	<small>299</small>
87	0.0118	.1611	.2247	2.2055	3.0775	4.2941
	<small>65</small>	<small>513</small>	<small>741</small>	<small>865</small>	<small>676</small>	<small>217</small>
88	0.0053	.1098	.1506	2.2920	3.1451	4.3158
	<small>40</small>	<small>538</small>	<small>751</small>	<small>826</small>	<small>608</small>	<small>131</small>
89	0.0013	.0560	+0.0755	2.3742	3.2059	4.3289
	<small>-13</small>	<small>560</small>	<small>755</small>	<small>776</small>	<small>536</small>	<small>+ 44</small>
90	0.0000	0.0000	0.0000	2.4518	3.2595	4.3158
	<small>+13</small>	<small>577</small>	<small>755</small>	<small>722</small>	<small>460</small>	<small>-44</small>
89 sp	0.0013	+0.0577	-0.0755	2.5240	3.3055	4.3289
	<small>40</small>	<small>590</small>	<small>751</small>	<small>664</small>	<small>381</small>	<small>131</small>
88 sp	0.0053	.1167	.1506	2.5904	3.3436	4.3158
	<small>65</small>	<small>599</small>	<small>741</small>	<small>603</small>	<small>301</small>	<small>217</small>
87 sp	0.0118	.1766	.2247	2.6507	3.3737	4.2941
	<small>89</small>	<small>603</small>	<small>728</small>	<small>634</small>	<small>220</small>	<small>299</small>
86 sp	0.0207	.2369	.2975	2.7041	3.3957	4.2642
	<small>114</small>	<small>603</small>	<small>709</small>	<small>467</small>	<small>140</small>	<small>378</small>
85 sp	0.0321	.2972	.3684	2.7508	3.4097	4.2264
	<small>136</small>	<small>598</small>	<small>686</small>	<small>387</small>	<small>+ 60</small>	<small>554</small>
84 sp	0.0457	.3570	.4370	2.7905	3.4157	4.1810
	<small>156</small>	<small>591</small>	<small>662</small>	<small>327</small>	<small>-15</small>	<small>521</small>
83 sp	0.0613	.4161	.5032	2.8232	3.4142	4.1289
	<small>175</small>	<small>578</small>	<small>633</small>	<small>257</small>	<small>88</small>	<small>584</small>
82 sp	0.0788	.4739	.5665	2.8489	3.4054	4.0705
	<small>192</small>	<small>564</small>	<small>603</small>	<small>187</small>	<small>158</small>	<small>640</small>
81 sp	0.0980	.5303	.6268	2.8676	3.3896	4.0065
	<small>+ 207</small>	<small>+ 544</small>	<small>-570</small>	<small>+ 121</small>	<small>-222</small>	<small>-689</small>
80 sp	0.1187	+.5847	-.6838	2.8797	-3.3674	3.9376

## THE SO-CALLED ELEPHANT MOUND IN GRANT COUNTY, AND EFFIGIES IN THE REGION SURROUNDING IT.

BY REV. S. D. PEET.

The survey of the mounds in the neighborhood of the so-called elephant effigy, which was undertaken under the auspices of the Wisconsin Academy of Arts, has not, for various reasons, been reported until now. The survey was conducted by the writer mainly during the year 1885, but a trip previous to that in 1882, and subsequent to it in 1886, are to be taken into the account. It is very fortunate that the Society recommended this survey at the time that it did, as many of the mounds then in a good state of preservation, have been destroyed since. A railroad has been built along the valley of the Mississippi and the track has been laid in the very midst of the mounds that were surveyed. Before giving a description of the survey we propose



0 5 10 20 30 40 50 60 70 80 Feet.

Scale 34 feet to the inch.

Fig. 1.

to give a history of this effigy. The discovery of the elephant effigy was made by Mr. Jared Warner, of Patch Grove, Grant County, and the account was first published in the Smithsonian report of 1872, with a cut, an electrottype. (See Fig. 1). Mr. Warner says "this effigy was situated on the high sandy bottom lands of the Mississippi, on the east side, about eight miles below the mouth of the Wisconsin river. There are on each side of

the mound, some fifteen or twenty rods distant, sandy, grassy ridges, some fifteen feet higher than the land about the mound; the mound is, therefore in a shallow valley, sloping gently to the Mississippi river, and only about eight feet above high water. Its total length is 135 feet; from hind feet to back, sixty feet; from fore feet to back, sixty-six feet; width across fore legs, twenty-one feet; across hind legs, twenty-four feet; space between hind and fore legs, fifty-one feet; from end of proboscis to fore legs, thirty-nine feet; across the body, thirty-six feet; general height of body above surrounding ground, five feet. The head is large, and the proportions of the whole so symmetrical that the mound well deserves the name of the "Big Elephant Mound." Next to Mr. Warner was Mr. Moses Strong, who published an account of the effigy and the mounds surrounding it in the Smithsonian Report for 1876. Mr. Strong was at the time connected with the Geological survey of the state, and took in the exploration of the mounds incidentally. He describes a group of mounds on the Mississippi bottom situated on Sec. 17, N. E. quarter Tp. 5, R. 6 W. [The effigy is on Sec. 21].

Mr. Strong says, "following the course of the Mississippi about a quarter of a mile southeast of the preceding locality, numerous long mounds are seen arranged in several rows parallel to each other and to the river. They are situated in the cultivated fields and are nearly obliterated. At the time these localities were visited the valley was covered by a crop of standing corn which rendered it difficult to find them; and it is probable that many exist which were not noticed. No circular or effigy mounds were found in connection with them. Continuing down the valley we come to a group in which the three kinds of mounds are well represented. They lie upon the alluvial bottom quite near a bayou of the Mississippi and none of them are more than eight feet above high water mark, while those in the southern part of the group are not more than three feet. In this group where all kinds are represented, there seems to be a separation of the long and round mounds from each other. There is nothing of peculiar interest in the occurrence of the long and circular mounds, but we have here two quite singular effigies. The central one of the group is evidently intended to represent a bird with the wings spread in the act of flying; the head is directed to the south. The wings measure ninety-four feet each way from the center of the body to their extremities, and the length of the tail is sixty-five feet. It is quite a large and well-formed effigy and is different from the other bird mounds in having an angle in the wings. Situated at the northern end of the group is the most interesting effigy mound any where observed. A description of it by Mr. Warner, of Patch Grove, was published in the Smithsonian Report of 1872, page 416. It is known as the "Elephant Mound," and as it lies upon the ground it resembles an elephant or mastodon, much more closely than any other animal, and the resemblance is much more perfect in this instance than in other effigies. This mound, in common with all the rest in the group, has been under cultivation; and on account of its size, special efforts have been made with plows

and scrapers, to bring it to the level of the adjacent field. Its size alone has protected it. These efforts have resulted in diminishing its height, increasing its width and general circumference, and rendering its outline somewhat indistinct so that it was difficult to make exact measurements."

The writer first visited the effigy six years after Mr. Strong made his report. It was then nearly obliterated. Subsequent to this first visit the employes of the Ethnological Bureau surveyed some groups of mounds and effigies on the bluffs, three miles north of the effigy, but their report has not yet been published. Subsequent to their survey, Mr. Brown, a student in Wisconsin University, and an assistant of Prof. Conover, of Madison, Wis., was employed to make measurements of the mound, so that a cast might be made of it and put on exhibition with the Smithsonian relics, at the New Orleans Exposition, during 1885. The exploration of the writer under the auspices of the Society was subsequent to all these. It embraced not only the so-called elephant effigy, but all the mounds in the vicinity. The mound was again measured, making the fourth actual survey.

The following is the result of the personal examination of the mound at this time: When the the writer visited the locality in 1885, only two mounds out of the whole group were left, one which is described as the bird effigy, the other known as the elephant mound. Both of these had been nearly plowed down, but owing to peculiar circumstances were plainly visible. During the spring preceding the visit, the water from the bayou had set back into the swail and remained standing upon the low ground, but did not quite reach to the summit of the effigies. There was at the time a growth of clover upon the soil, but this was drowned out by the flood except where the effigies stood. As a result the effigies were covered with the clover, but the surrounding ground was either bare or had a slight covering of grass upon it. Standing upon the summit of the hill or ridge adjoining, we were able to look down upon the swail and see the outlines of the two effigies, the dark color of the clover contrasting with the light shade of the grass. The shapes of the two effigies were easily made out. The bird had its head toward the southwest, its wings extending across the swail, nearly reaching the foot of the sand ridges. The so-called elephant effigy had its head in the same direction, to the southwest, but its body was lengthwise of the swail, its heavy legs extending toward the southeast. The two effigies were in contrast, as the bird had long, narrow wings, small body and neck, while the animal had a broad, heavy body, almost square in shape, with its legs unusually wide and clumsy. On approaching nearer the outlines of the effigy were not so distinct as when at a distance, though the clover seemed to give it an elevation. The real mound was but slightly raised above the surrounding surface and there were no sharp lines to the effigy.

The measurement of the mound was very unsatisfactory on account of the condition in which it was. The figures would not represent the mound as it was when first seen, and would be very unreliable as there were no

points from which to begin or end the measurement. One thing was noticeable, however, to the eye and confirmed by measurements. There was no proboscis to the figure. The point which extended from the nose was indistinct and appeared to be the result of the washing of the sandy soil down to the level. It was evident that that which was taken for the proboscis was never long enough or wide enough to properly represent that part. The writer has had considerable experience in tracing out mounds which were nearly obliterated and ordinarily would be able to describe the figure from what might be called the shadow of it. The peculiar color of the soil, which originally belonged to the figure, and the indescribable shading of this soil into the undisturbed surface of the soil or ground surrounding it, will ordinarily give the figure to the eye, even if the measurements should be unsatisfactory. The impression formed by this effigy, and especially the part of it which is the distinctive and deciding point was that the proboscis was never there. The writer hesitates to put himself on

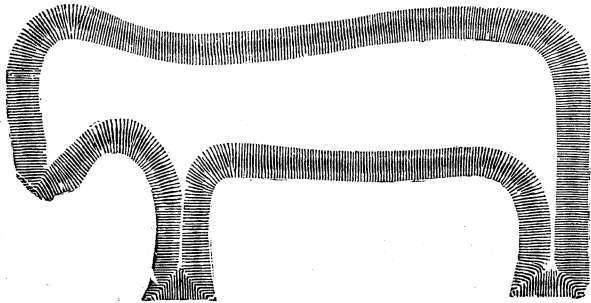
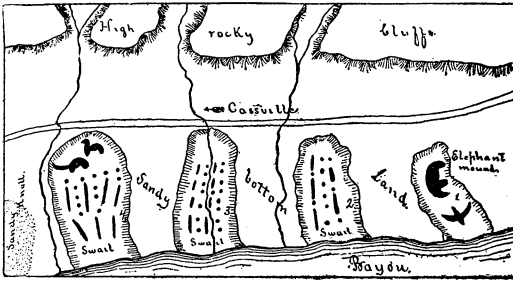


Fig. 2.

record as contradicting such reliable persons as have given a description of the effigy to the public. There is this, however, to be considered. If the engraved figure which was made according to a scale from the measurements of Jared Warner, and those accompanying him, should be taken, and the narrow, pointed snout left off from the figure as uncertain, we should have an effigy which bears very little resemblance to the elephant. (See Fig. 2.) On the other hand, if any one undertakes to draw the figure so that it shall have the trunk in its usual place and shape he would have to completely overdraw and distort the figure, as it is now. This view led the writer, at his first visit, to doubt the intent of the effigy, and every other visit has increased the doubt. The examination of the effigy itself proved so unsatisfactory that the writer determined to study and survey the groups adjoining, and therefore a description of these groups is added to the report. It should be said that the study was given first to the groups on the bottom-lands, then extended to the bluffs, and afterward the whole region was traversed and examined, until all the groups in the vicinity were explored. These will be given in their order.

We call attention to the mounds in the immediate vicinity of the so-called elephant effigy. The writer traversed the region in a reverse order or direction from that which Mr. Strong pursued, but was able to identify some of the groups which he mentions. There were no effigies in the vicinity, except two, which were very nearly obliterated.



There were several groups in the swails which cut through the bottom land in this vicinity, and to these we first gave our attention. The swails are the dry beds of water courses, which in the time of heavy rains, flow out from gorges or so-called "coolies" in the bluff toward the bayous of the river. These swails are generally in a direct line with the openings in the bluffs, and extend from the foot of the bluffs across the sandy bottom land or terrace to the bayous. They are so much below the surface that the mounds in them are not seen until one suddenly comes upon them as he reaches the edge of the swail. The swail in which the so-called elephant mound was placed was not exactly in a line with the rest but angles to the southwest, and where the effigy is, was much deeper than the other swails. The method of arranging these mounds in the swails was peculiar. They were placed in parallel rows which extended lengthwise of the swail, sometimes three or four rows in each swail and in some of the swails as many as thirty or forty mounds in a group. Four such groups were discovered by the writer in passing from the elephant mound, northward, the most of them composed of alternate rows of long mounds and round mounds, arranged in parallel lines. There were no effigies in the swails, merely round and long mounds. The only place where effigies were discovered was on the terrace or bottom land outside of a swail about a mile north from the elephant effigy, on what was called the Bagley place. These effigies were nearly obliterated but seemed to have been very large in size, and possibly one or two of them may have resembled in shape the effigy which is called the elephant. But the figures were so far gone that no effigy could really be traced.

It should be said of these that if one were determined to make out the existence of the elephant and camel effigies, the shadowy shape left upon the surface of the soil might easily satisfy him. There were two

figures. One with a large body and a snout (Fig. 3) extending from it to a great length, curved somewhat like the horns of the mastodon. The other with a body slimmer and not so large, but with a long neck protruding above the body. Still no man of candor would undertake to build up a theory on so shadowy a foundation as this, for we have only to reverse the figure to make it represent a gigantic raccoon instead of an elephant, and the theory is upset. In reference to the different groups of mounds, which were found in the swails, we should say that they belonged to the same age as the so-called elephant effigy, and yet there was a fresh look to them, as if they were of a comparatively recent date. It would hardly seem possible for mounds to be preserved in the sandy soil, during the many centuries which have elapsed since the mastodon became extinct, and the theory that they were built at the time of the mastodon seems untenable. The evidence that they belonged to the same time and belonged to the same people, is that they were situated in the same kind of swails and were arranged in the same order, and at the same time were near the group in which the effigy is found. The probabilities then are against this effigy being an elephant, and the figure is given only to show how easily one may be mistaken.

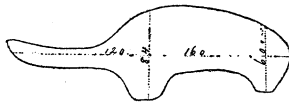
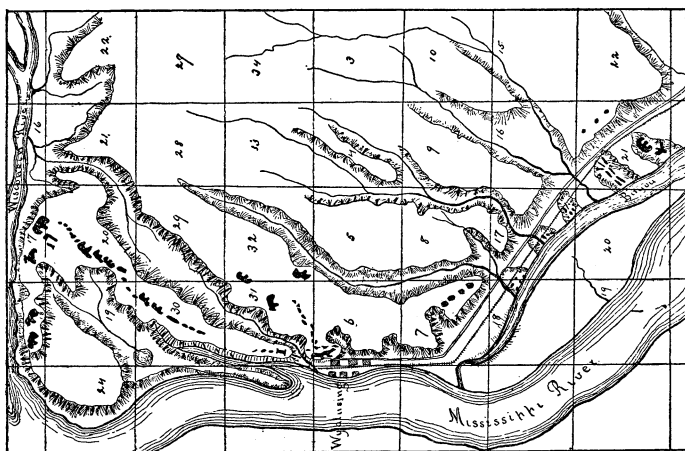


Fig. 3.

The examination of the effigies and mounds on the bluffs followed that of the mounds on the bottom lands. It should be said that the bluffs, in this region, are very precipitous, and are broken into narrow and crooked ridges, on either side of which the water courses through deep gorges, down to the streams and water-spouts, until it makes its way to the bayou and to the river. The only way to reach the summit is to climb the precipitous face of the cliff, or to follow up the narrow and crooked valley of the stream to the plateau above, and then retrace one's steps out on the level to the edge of the bluffs. When one reaches the summit from either direction he is pretty sure to find mounds on the ridge. They are hidden from view until he reaches the hill-top, but they run in long lines from the edge of the cliff back to the plateau at the head of the gorges. A perfect net-work of these long mounds, round mounds, and effigies, was discovered, nearly every ridge having its own line, but some of the ridges having lines that were connected. They seem to be the most numerous on the bluffs which intervene between the Wisconsin and Mississippi rivers, and yet we understand that others are to be seen on the bluffs immediately overlooking the so-called elephant effigy. The lines of mounds extend to great distances, some of them three or four miles in length, and it was not difficult to imagine them to be sort of elevated roadways con-

necting lookout stations, on which warriors might watch the enemy coming down the Wisconsin river, or up the Mississippi river, and so notify the people residing in the village of the danger that threatened them. At least the lines of long mounds and round mounds seem to follow along the ridges which intervene between the two rivers, as if the object was to connect the valleys by lookout stations and elevated roadways. The view from the edge of the high bluffs is always extensive and commands the bottom lands below. There are, however, lines which extend from the face of the bluffs back to the prairies and open plateau in the interior, and an explanation of these would be that they were elevated ways on which hunters might run while watching the game that should be driven from the plateau down the gorges to the bottom land below.



Map 1.

The explanation, however, is not the purpose of the survey, but merely the statement of the facts. The long lines of mounds on the bluffs, all seem to have effigies, and the object was to ascertain what kind of effigies they were. The lines which were followed out were more or less directly connected with the group in which the elephant effigy was situated, at least they were on the bluffs which overlooked the same terrace and we understood some of them were on the edge of the same gorge through which the water would make its way, while passing through the swail where the effigy mound is seen. The elephant effigy forms the southernmost limit; but the northern limit of the long mounds and effigies upon the bluffs is seven or eight miles distant, on the Wisconsin river. The groups on the bottom lands and on the bluffs adjoining, seem to form connecting links, so that if one were to study one group, he needed to study all. There are three or four lines of effigies on the bluffs and three or four groups of parallel mounds on the bottom lands. One object was to see if there was any connection between the different parts of this system. Another object was to



examine the different effigies on the bluffs and compare them with those on the bottom lands and ascertain the character of both. A third object was to ascertain whether there was any effigy on the bluffs which in any way had resemblance to the so-called elephant effigy on the bottom lands. With these three questions in mind, the exploration was undertaken. It was not an easy thing to do, as the gorges were long and the bluffs were steep, but it was accomplished by the aid of a guide who knew the location of all the groups. We take up the groups or lines of mounds on the bluffs in their order, and call attention to the map of these different mounds as well as the topography of the country in which they were found. We give the names of the people who owned the land, and call the groups by the name of the place. (1) The group on the Kendall place. This is composed of a series of long mounds and effigies which run from the edge of the bluff, overlooking the village of Wyalusing, out across land belonging to Mr. Glenn, Sec. 31, to land belonging to Mr. Kendall, on Sec. 32. This group or line of mounds overlooked the gorges on either side, and extended out to the level plateau at the head of the gorges. The line was composed mainly of long mounds, but the effigies were situated at either end of the line, the effigy of a squirrel being at the west end of the line on the edge of the bluff, and three effigies at the east end of the line; a moose, wild cat, and bear. The squirrel was a very unique and interesting effigy, representing the animal as in the attitude of running; the wild-cat was of the ordinary shape, but the moose was the most interesting of all. It was situated on the edge of the bluff overlooking a deep gorge, south of it, and commanding a view of other effigies on the other side of the gorge. (See map 1, the works in Grant Co., also Figs. 4 and 5.) The attitude of the moose was very natural.

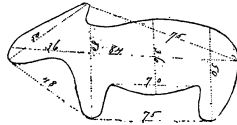


Fig. 4.

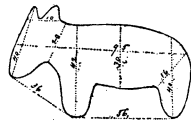


Fig. 5.

We call attention to the different effigies found in these groups, as the answers to questions asked will be found in them. It will be noticed that there are no elephant effigies in any of the groups. The effigies as discovered are as follows: (1) The squirrel on the bluff overlooking Wyalusing, map 2, Section 31. (2) The moose, Fig. 4, situated at the head of the gorge on the Kendall place, Section 32. (3 and 4) The bear and the wild-cat situated in the same group. (5) Raccoon on the Darby place, Fig. 5, Section 31. (6) The buffaloes on the Glenn place, Section 30. (7 and 8) A group of bear and three deer on the Locke place, Section 17. See Fig. 6. (9) Two buffaloes on Section 18, Figs. 7 and 10. A group of turtles on the Scene place, Section 22. These were just such effigies as are common throughout

the state, though the attitude of the squirrel and buffalo and stag or deer were quite unique and interesting. They represent the animals which formerly abounded here. We cannot resist the impression that they represented the animals which were hunted and for which the mounds were erected as observatories. They possibly may have been the "dream gods" or "dream totems," or they may have been "game gods" or "game totems," both signifying the same thing to the superstitious hunters. There was nothing which had any resemblance to the elephant or could convey the idea that the elephant or mastodon was hunted or even known by this people.

The locality which was next examined was north of the Wisconsin river, in Crawford county. This is a region which has been explored by the assistants of the Ethnological Bureau, and we need not dwell upon it in detail. It will be sufficient to say that an interesting discovery was the result of the exploration by the writer. It was found to be the residence of a clan, the swallow being the totem of the clan. We speak of this because it is important, as throwing light on the so-called elephant effigy. The point in mind is this: The swallow which was everywhere discoverable in all the groups visited in Crawford county, shows that this was a totem of this region; and the probability is that the buffalo, which is the most num-

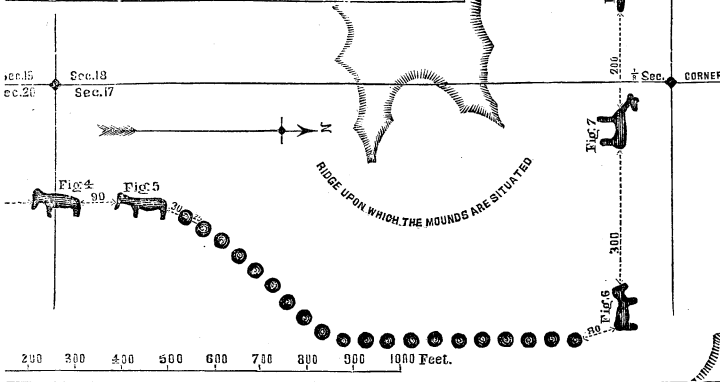
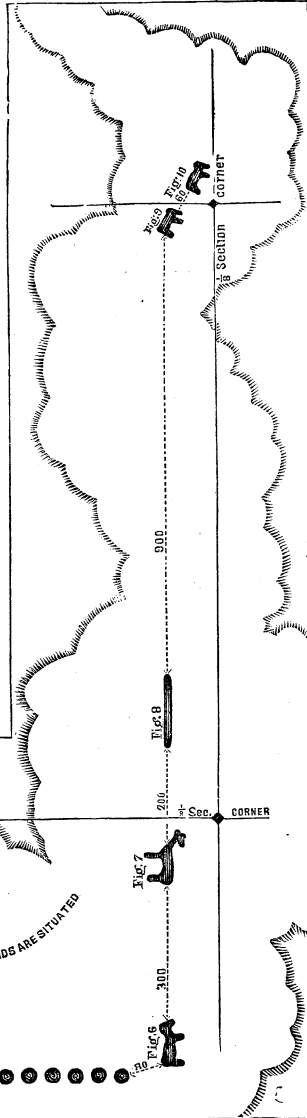


Fig. 6.

erous and prominent effigy in Grant county, was the totem of that region. If this is so, then we have an additional reason to believe that the so-called elephant effigy was nothing more nor less than a buffalo, and represented the totem of the region. We have this to contend with, however,—it was maintained by Dr. J. W. Phene, that he discovered in Campbell coolie, three miles north of Prairie du Chien, the effigy of a camel, and that the camel and elephant were associated in the mound-builders' art. The search was in part for this camel effigy, and in part to ascertain whether the theory of game drives, dream gods, and clan totems, could be carried out by the facts. The result was that the clan totem was ascertained and the theory of the game drive was rendered even more probable.

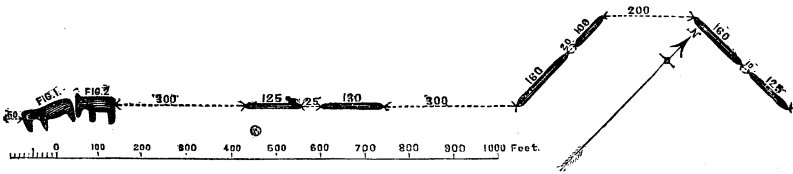
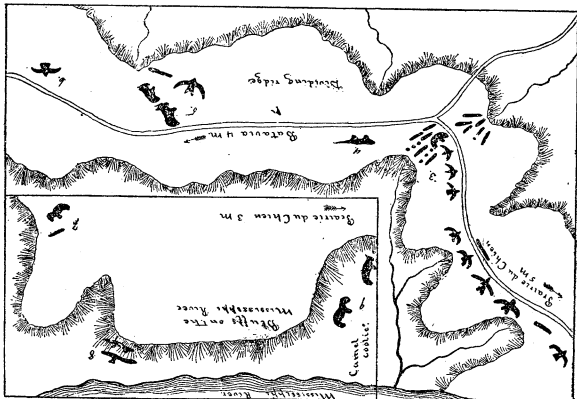


Fig. 7.

We shall illustrate the points. There are seven or eight groups on the bluffs adjoining Prairie du Chien extending along the road from Prairie du Chien to Batavia. In all these groups the swallow is most prominent. In one group, which was composed in part of long mounds, round mounds and effigies, the swallow was associated with the buffalo. (Map No. 2). In another group it is associated with two effigies of bears. (Map 2, No. 5). In a third, situated near the village of Batavia, it is isolated, and yet other effigies



Map 2.

may have been at one time near it. The groups were all situated on a ridge, but at points where the ridge was the narrowest, and where the impression was that the different kinds of game made their way across the ridge from the Mississippi river to the Kickapoo. In passing down to the val-

ley of the Mississippi other effigies were discovered. Two wolves on the side of the bluff, five miles north of Prairie du Chien (Map 2, No. 9), on the Brush place, and two effigies nearly obliterated, on the Dousman place.

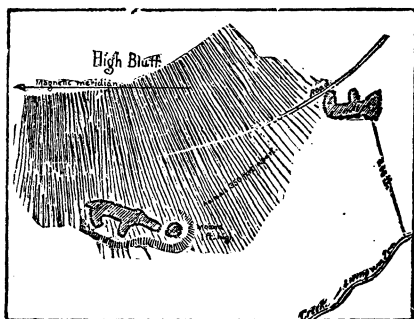


Fig. 8.

One of these we took to be the effigy of the camel, concerning which Dr. Phene and Mr. L. H. Lewis, had spoken, but we could discover no resemblance to that animal. The hasty exploration of all these groups was made in company with Dr. Cyrus Thomas, of the Ethnological Bureau; Washington, D. C., and two of his assistants. Their attention was called to the location of the groups and the theory of the game drives seemed to commend itself as a good explanation of the reasons for their erection. On the way back the party passed a group of large conical mounds, situated on the bottom lands, near the Courliss Bayou. Dr. Cyrus Thomas advanced a theory in reference to these, which seemed very plausible. It was that the mounds were made large and flat so that they could be places of refuge in times of high water. These mounds were arranged in a large circle enclosing an area of about twenty or thirty acres. The impression made upon the writer was, that it was a village site, possibly the site of the village of the very people whose game drives had been discovered upon the hill-tops. The gorges and roadways from the bottom lands to the bluffs and the summit of the ridges, seemed to concentrate near this point. Other groups of large mounds, were, however, visited subsequently, and one of them was found to have an effigy near it. It is probable that several villages existed on this prairie at different times. Which one belonged to the effigy-builders is uncertain.

The discovery of the clan totem was subsequent to this. At a point, three miles south of Prairie du Chien, there is an effigy of a swallow (Fig. 9) situated on the edge of the bluff and overlooking the Wisconsin river. The swallow has its wings spread, but the peculiarity of the effigy is that where the wings are spread to the widest fan, the bluff itself assumes the shape of the wing. Where the body is, the ridge is sharp and narrow, so sharp and narrow that the head and tail of the bird are built out from the sides of the ridge, making it seem as if the body were dropped down below the wings.

It was a singular freak for the people to have erected the effigy in such a place! but no doubt the shape of the bluff or rocky spur suggested the effigy. The clan totem found its embedment in the rock, or at least it was so imagined to be by the builders.

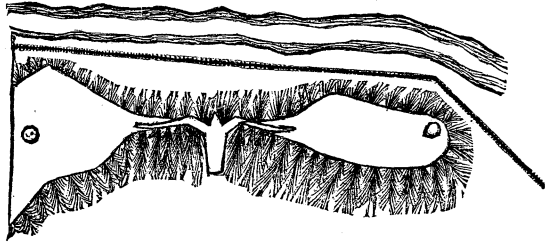


Fig. 9.

Confirmatory of this theory of the clan totem was a discovery made a few days after on the Kickapoo river. At the mouth of this river near the village of Wazeka, there is a group of long mounds and effigies, one of them the effigy of a weasel. Five miles north of Wazeka two other effigies were discovered, both of them swallows. One of these was situated on the top of a very high hill, which overlooked the valley of the Kickapoo and which commanded a view of nearly all of the groups which were previously visited, especially those on the summit of the ridges near the village of Batavia or Eastman. It was a lone swallow and seemed to mark the border line of the swallow clan. The other effigy was situated in a very retired and lonely spot, down near the the water's edge at a bend of the river and hidden away among the surrounding hills. This also was a lone bird. Its wings stretched from bank to bank across the bend of the river, and it covered the bottom-land. The impression formed from these two effigies was that the Kickapoo river was occupied by the swallow clan.

In all these groups which were situated north of the Wisconsin river there were no effigies which resembled in any way an elephant. There were effigies of bear, buffalo, wolves, birds and weasels, but the most numerous and common was this effigy of the swallow. This completes the report of the survey of the effigies in the vicinity of the so-called elephant mound of Grant county. There were, however, about this time various reports published concerning the discovery of elephant effigies in other parts of Wisconsin, and the writer took pains to visit these localities.

The following facts are presented as supplementary to this description of the survey. The place which was visited by the writer to ascertain the facts about a rumored elephant effigy was in Green Lake county, not far from the city of Ripon. It should be said the discussion about elephant pipes which was conducted between Mr. Chas. E. Putnam, Esq., President of the Davenport Academy of Science, and Mr. Henry W. Henshaw, of the Ethnological Bureau, during the year 1885, gave additional interest to the

survey of the effigy mounds and led many of the archæologists, to notice every report of the discovery of new elephant effigies. When, therefore, Mr. Theodore F. Wise, who was at the time publishing a monthly paper, called "The Young Mineralogist and Antiquarian," made the announcement that he had discovered an elephant effigy in the vicinity of Green Lake county, it seemed desirable to the writer that the place should be visited and the facts about the effigy be ascertained. The extension of the survey and a report of it will therefore be excusable. The trip resulted in some very interesting discoveries, but in the refutation of everything which was announced by Mr. Wise in reference to the effigy. The neighborhood of Green Lake is very interesting on account of the number and variety of its effigies. Here on the west side of the lake, situated on the summit of the bluffs and overlooking the water, the writer discovered many beautiful effigies a large majority of them being in the shape of squirrels. The squirrels were in every conceivable attitude, some of them of large size.

On the south end of the lake a group was discovered which contained the effigies of two bears and a deer in the attitude of running. There were also various groups of effigies on the southeast side of the lake. Some of these were birds, some panthers and a few turtles, but many of them were squirrels. (See Fig. 10.) The impression formed by the survey was that here was a clan residence, and that the reason for the erecting of these effigies on the various bluffs, was because the totem of the clan was that of the squirrel. The trip was extended to the shores of Lake Puckaway. Here on the south side of the lake, there are many mounds and effigies. One long row of mounds was followed for the distance of three miles; the row was situated on the edge of the bluff overlooking the lake, and consisted of long mounds, round mounds and various effigies, among which were the bear, and a fox represented as running with his head turned around and looking behind him, a very interesting effigy. A number of groups were discovered also upon the north side of the lake, one of them near the Chicago club-house. This was also in the shape of a squirrel, but a squirrel in a peculiar attitude. There were no effigies resembling the elephant, anywhere on either of the lakes. A gentleman who attended the writer in his explorations at Lake Puckaway (Mr. A. Aldrich, of Green Lake) gave information in reference to the so-called elephant effigy, and volunteered to be a guide to the spot. Accordingly, on the return trip, we went in search of the effigy, and in a field which had been plowed for many years, discovered a number of round mounds, and one that looked as if it might have been an effigy at one time, but it was so far obliterated that no shape whatever could be made out. This was at Dautz Tavern, half way between Green Lake and Lake Puckaway. Mr. Aldrich informed the writer that he was with Mr. Theodore S. Wise when he examined this mound, and that at that time it was in the same condition that it was when we visited it. The resemblance to an elephant was wrought out of the imagination of Mr. Wise, but had no existence. In fact it was im-



Fig. 10.

possible to trace a single outline that would give the idea that it was an elephant effigy. This finished the search, for it was evident that the effect of the discussion was to create these imaginary figures, and it did not seem worth while to follow up uncertainties. The theory in reference to the clan emblem was confirmed, and the impression was made all the stronger that the effigies of Wisconsin were imitations of the animals which were once common in the region, and that no extinct animal is to be found represented by them.

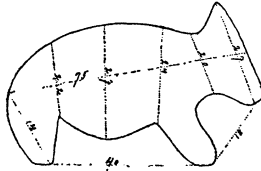


Fig. 11.

A few words more in regard to the effigies, which might be easily mistaken for the elephant. There are two effigies at Merrill Spring, near Madison (see Fig. 11), which have been by some supposed to represent elephants. They are probably effigies of buffalo. They are placed around a large conical burial mound, or lookout station, in the midst of a group which was designed to guard the camping place at the spring. There is also an effigy on Peck's place near the city of Beloit (see Fig. 12),

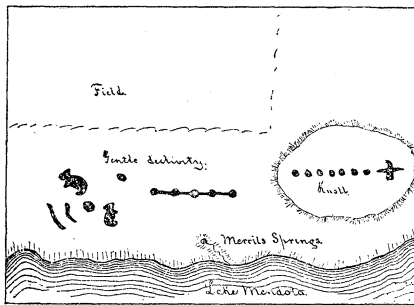


Fig. 12.

which at first sight resembles an elephant. It has the sloping rump and large, heavy body of the elephant, but lacks the proboscis. There is a projection above the head which is probably designed to represent horns. This is in the midst of a buffalo game drive, and represents the dream god, or game god, or fetish, of the hunters. There was formerly a large effigy on the Downe place, east of Beaver Dam. It is nearly obliterated now, but formerly represented some four-footed animal, such as bear, buffalo or moose. It might have been mistaken for an elephant. There is a mound which Mr. T. H. Lewis discovered on the bluffs on the west side of



the Mississippi river, opposite Prairie du Chien, which he says "resembles an elephant." It is probably a buffalo. Other mounds might be mentioned, and among them the group which was one of the earliest discovered in the state, namely, the group described by Mr. S. Taylor, and situated near Blue Mound. (See Figs. 13 and 14). One of these resembles the figure which



Fig. 13.

we have drawn out of the so called elephant effigy, and we therefore give it as a specimen. Our conclusion after all this exploration is that there are no

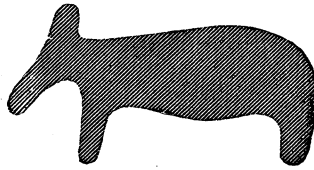


Fig. 14.

elephant effigies in the state, and that the so-called elephant mound was designed to represent either the bear, the wild-cat, the buffalo, or the moose, every one of which contains the same elements of a heavy body, a large head and a protruding snout, and any one of which might be made to represent an elephant if we would cut off certain parts of the head, and add to other parts.

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SPIDERS OF THE SUB-FAMILY LYSSOMANÆ.

BY

G. W. AND E. G. PECKHAM AND WM. H. WHEELER.

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## INTRODUCTION.\*

Up to the present time there have been formed in the sub-family Lyssomanæ, six genera, in the following order of time:

- 1844. Lyssomanes Hentz.
- 1869. Asamonea Cambridge.
- 1872. Jelskia Taczanowski.
- 1877. Evenus †Simon, Athamas Cambridge.
- 1885. Simonella Peckham.

Some time ago M. Eugén Simon, with great generosity, placed a number of his unpublished species at our disposal; we have also an undescribed species of Lyssomanes from a collection of Attidæ belonging to the Berlin Museum, which was loaned to us through the courtesy of Dr. Ferd. Karsch; these additions to our own collections have enabled us to add seventeen new species to the thirteen already known in this sub-family.

We wish to express our gratitude to Dr. L. Taczanowski for specimens of all of his species of *Jelskia*, and to to the Rev. O. P. Cambridge for a specimen of *Athamas whitmeei*.

We have endeavored to separate the species into natural groups and to define the groups as closely as possible. The genus *Jelskia* we have included as a sub-genus under *Lyssomanes*, giving the new sub-generic name *Maroussa* to the other species of the genus. The sub-divisions of *Maroussa* and *Jelskia* are merely for practical convenience.

It seems probable that many of the spiders of the Lyssomanii group are adorned, in life, with delicate and brilliant colors which disappear in alcoholic specimens. This we know to be the case with *Lyssomanes viridis* which is in reality of a tender grass-green color but which appears in collections to be of the light yellowish tint which is common to many related species as known to us. The only way to define spiders of this group satisfactorily is by their anatomical proportions and by their epigynes and palpi, which should always be referred to in determining species.

Our measurements have been made in accordance with the following rules:

To determine the length of the cephalothorax, measure from the anterior edge of the eyes of the second row to the posterior edge of the thorax.

To determine the length of the cephalic part (or of the quadrangle of

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\*The plates for this article were contributed by the authors.

† Afterwards changed to *Epeus* Peckham.

eyes), measure from the anterior edge of the eyes of the second row to the posterior edge of the eyes of the fourth row.

Where the expression "width of the quadrangle of the eyes" is used, the greatest width is always meant.

The position of the eyes of the third row is determined by measuring from the posterior edge of the eyes of the second, and the anterior edge of the eyes of the fourth row.

#### DISTRIBUTION OF THE LYSSOMANII.

The distribution of the species of *Lyssomanii* presents some interesting facts. The genus *Asamonea* falls very naturally into two divisions. The two species constituting the first division, *A. gracilis* and *A. flava*, are confined to South America; the four species forming the second division are restricted to Southern Asia and South Africa. At first sight it would seem well to have formed two genera, allotting to each the *Asemoneæ* of a hemisphere. Careful study of the species, however, has convinced us that such a proceeding would have been unadvisable, as the morphological characteristics of either group could not be raised to generic importance.

All ten species of *Lyssomanes* belonging to the sub-genus *Jelskia* are confined to Central and South America. The sub-genus *Maroussa* resembles *Asamonea* in that its species are divided between two hemispheres. One species only, *M. modestus*, is reported from the old world, occurring in Madagascar; of the remaining seven new world forms, five occur in South America, one in the island of San Domingo and one in the southern states of the Union.

Regarded as an isolated fact, this distribution of the members of a genus over the tropics of two hemispheres seems anomalous. But analogous cases in the distribution of other organisms are by no means rare. Among plants especially such cases are common. Among animals we may cite the case mentioned by Wallace of the four species of *Megacephala* (a genus of the Cicindelidæ, or tiger beetle family) two of which occur in Africa and two in South America. In like manner four species of another genus, *Peridexia*, of the same family, are equally divided between South America and Madagascar. Then again when we consider the great antiquity of the existing genera of spiders, we can see nothing difficult of explanation in the wide and discontinuous distribution of the *Asamoneæ* and *Maroussæ*. We have only another instance confirmatory of the truth of Wallace's remarks that "Insects exhibit in a very marked degree in their actual distribution the influence both of very ancient and very modern conditions of the earth's surface. The effects of the ancient geographical features of the earth are to be traced in the large number of cases of discontinuous and widely scattered groups which we meet with in almost every family, and which, to some extent, obscure the broader features of distribution due to the period during which the barriers which divide the primary regions have continued to exist."\*

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\* A. R. Wallace, *Distribution of Animals*, Vol. I, p. 503.

The absence of *Lyssomanii* in Europe and northern Africa would seem to indicate that the ancestors of this group of spiders during the miocene tertiary ranged through northern Asia and what is now British America. The connection existing between Alaska and northeastern Asia, as shown by the flora of that epoch, would present no obstacle to a group of spiders originating on one of the continents passing over into the other. The advent of the Glacial Epoch, we may suppose, drove the *Lyssomanii*, which even then had separated into two genera corresponding to our *Asamonea* and *Lyssomanes*, members of both of which occurred on either continent, southward, on the one hand through Asia and on the other hand through North America. The distance which the species are driven is considerable, as none seem to have remained on what is now the Asiatic Continent, but all passed over to Ceylon and the neighboring Madagascar, whence some probably wandered to South Africa. Similarly in North America the species were forced southward to Central America, whence some migrated to South America. Here the conditions were most favorable to the development of species as the majority of existing forms is reported from this continent. It is still doubtful whether or not the single species in the island of San Domingo and the single species in the southern United States are to be regarded as forms which were left behind in the wholesale migration of the group or whether they are species which have migrated northward from South America since the close of the Glacial Epoch. We incline to the latter supposition, since it is more probable that a limited number of species would undertake a northward migration than that such a limited number would be spared under conditions which were fatal to the existence of a whole group in the eastern hemisphere. It is, of course, also possible that the Central American species have migrated northward since the close of the Glacial Epoch.

It is interesting to note a somewhat similar distribution in another family of spiders, the *Archaeidæ*. This family includes four genera; one of these is extinct, and is represented by fossils in the Baltic amber of the Tertiary period; of the three genera that are represented by living species; one is found in Madagascar, one in western Africa, and one in the southern part of South America.\*

## FAMILY ATTIDÆ.

### SUB-FAMILY LYSSOMANÆ.

Eyes in four transverse rows.

Group I. *Lyssomanii*. Cephalothorax low or moderately high, rather elongated, longer than wide.

Group II. *Athamii*. Cephalothorax high, short, quadrate.

Group III. *Simonellii*. Cephalothorax nodose; spiders ant-like in form.

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\* E. Simon, *Ann. Mus. Civ. di Storia Naturale di Genova*, V. XX, 1884.

GROUP I. LYSSOMANII.

Quadrangle of eyes never more than one-third wider than long ..... *Lyssomanes*.  
 Quadrangle of eyes at least twice as wide as long..... *Asamonea*.

GENUS LYSSOMANES HENTZ.

Cephalothorax moderately high, sloping downward behind and on the sides from the caput; about one-third longer than wide. General form oval. Caput occupying one-half or nearly one-half of cephalothorax.

Eyes arranged in four transverse rows of two each. Eyes of first row close together, from two to three times as large as those of second row, occupying the entire face. Second row just behind first and about as wide (sometimes a little wider or narrower). Third row composed of two very small eyes, plainly nearer the second than the fourth row; narrower than second and wider than fourth row. Eyes of fourth row about as large as those of the second and nearer together; quadrangle formed by second and fourth rows as wide as long or from one-fourth to one-third wider.

Sternum somewhat heart shaped; length and width about equal.

Coxæ separated by the width of the labium and part or all of the maxillæ.

Maxillæ slightly enlarged at extremities.

Labium about as wide as long or a little longer than wide.

Abdomen long, slender, tapering, spinnerets short.

Legs usually long and slender. Relative length variable. Long and slender femoral, tibial, metatarsal and usually patellary spines on the four pairs.

Sub-genus *Maroussa*.\* Second row of eyes always wider than first. Eyes of second row frequently only about one-third as large as those of first.

Sub-genus *Jelskia*. Second row of eyes not wider than first (equally wide or a little narrower). Eyes of second row relatively larger than in *Maroussa* and often placed directly above those of first row, looking forward.

SUB-GENUS MAROUSSA.†

A. Quadrangle of eyes not more than one-fourth wider than long.

Femur of the first as long as femur and patella of the second; metatarsus of the first bent..... *antillanus*.  
 (San Domingo).

Femur of the first scarcely longer than femur of the second; metatarsus of the first not bent..... *unicolor*.  
 (Ceru).

\*Russian proper name.

†All the species of the sub-genus *Maroussa* have the leg formula 1 2 3 4, excepting *modestus*, Madagascar (4 1 3 2), and *antillanus*, San Domingo (1 4 3 2); while in the sub-genus *Jelskia* the formula 1 2 3 4 occurs in only three species, *amazonicus*, *nigropictus* and *landus*.

## LYSSOMANES ANTILLANUS N. SP.

Plate XI, figure 1.

♂. Length of cephalothorax 2.4 mm; of abdomen, 4 mm.

Legs 12.5, 9.5, 8.5, 7.4.

Cephalic and thoracic parts equally long. Quadrangle of eyes one-fourth wider than long. Eyes of first row nearly three times as large as those of the second. Clypeus one-fifth as high as anterior eyes. Falces rounded, horizontal, diverging, four or five times as long as face; fang as long as falx. Maxillæ rounded and a little enlarged at their extremities. Labium a little longer than wide, a little narrower, and blunt at the tip, one-half as long as maxillæ. Legs 1, 2, 3, 4; femur of the first as long as femur with patella of the second; metatarsus of the first elongated and curved.

*Coloration* (dry): Upper surface of cephalothorax light-yellowish brown, with some bright red hairs on the eye region, and a dark brown central band from the fourth row of eyes to the posterior margin. Clypeus bright red with a whitish line above the insertion of the falces. Abdomen above dark brown with a white band around base and sides. Falces dark brown, fang black. Legs, palpi, mouthparts and coxæ light brown. Sternum and venter drab, with short white hairs.

*Habitat*: San Domingo.

From the collection of M. Simon.

## LYSSOMANES UNICOLOR TACZ. 1874.

Plate XI, figure 2; plate XII, figure 21.

*Jelskia unicolor* Tacz. 1874. Les Aranéides de la Guyane Française  
Horæ Soc. Ent. Ross., T. VIII, p. 131,

“ “ “ 1879. Les Aranéides du Pérou, Bull de la Soc. Imp.  
des. Nat. de Moscou. T. LIII, 1878, No. 4,  
p. 373.

♂. Length of cephalothorax 2.7 mm; of abdomen 4.2 mm.

Legs 12, 10.9, 10.8, 10.7.

♀. Length of cephalothorax 3 mm; of abdomen 5.2 mm.

Legs 12, 11, 10.5, 10.5.

Cephalic and thoracic parts equally long. Quadrangle of eyes scarcely one-fourth wider than long. Eyes of first row but little more than twice as large as those of second. Second row wider in ♂ than in ♀, a little wider than the first row in both sexes. Clypeus about one-third as high as anterior eyes. Falces weak, vertical, parallel, about as long as face; fang weak. Maxillæ rounded and a little enlarged at their extremities. Labium about as wide as long, blunt,

(♂) one-half, (♀) a little more than one-half as long as maxillæ. Coxæ of the first not so widely separated as usual, *i. e.*, by scarcely more than the width of the labium. Legs 1, 2, 3, 4; femur of the first but little longer than femur of the second; metatarsus of the first not curved.

*Coloration* (dry): ♂. Upper surface of cephalothorax pale yellow; eye-region nearly covered with bright red hairs; white hairs on the clypeus, in circles around the anterior eyes, and in patches outside the second and third rows of eyes. Upper surface of abdomen pale yellow with two divergent brown bands from base to apex, which are enlarged at three points to form as many pairs of opposed dots, one pair at each end, and one in the middle. Legs pale yellow with black spines and tips and dark brown bands at the joints. Palpus pale; bulb brown with pale tarsus projecting beyond. Falces and under surface pale yellow.

The same description answers for the female, excepting that the bands and dots on the abdomen are indistinct, and that there are no brown bands on the legs.

*Habitat*: French Guiana, Peru.

By the relatively larger eyes of the second row, and the relatively greater length of the quadrangle of the eyes this species approaches the sub-genus *Jelskia*.

B. Quadrangle of eyes one-third wider than long.

MALES.

- |   |   |  |                        |                    |   |
|---|---|--|------------------------|--------------------|---|
| 1 | { | Femur of the first as long as femur and patella of the second..  | (South United States). | <i>viridis</i> .   | 2 |
|   |   | Femur of the first not so long as femur and patella of the second  |                        |                    |   |
| 2 | { | Tarsus of palpus less than twice as long as tibia.....   |                        | <i>bi-teniatus</i> | 3 |
|   |   | Tarsus of palpus more than twice as long as tibia .....  |                        |                    |   |
| 3 | { | No fringe of hairs on tibia of the first.....  |                        | <i>placidus</i> .  | 4 |
|   |   | Tibia of the first with fringe of hairs.....   |                        |                    |   |
| 4 | { | Tibia of the first with fringe of hairs on proximal half of upper side and on distal half of under side; tibia of the second with fringe of hairs throughout its length on under side..... |                        | <i>miniaceus</i> . |   |
|   |   | Tibia of the first with fringe of hairs on under side nearly throughout its length; no fringe on tibia of the second.....  |                        |                    |   |
|   |   |  |                        | <i>austerus</i> .  |   |
|   |   |  |                        | (Rio Janeiro).     |   |

FEMALES.

- |   |   |  |                        |                   |   |
|---|---|--|------------------------|-------------------|---|
| 1 | { | Legs 4 1 3 2.....  |                        | <i>modestus</i> . | 2 |
|   |   | Legs 1 2 3 4.....  |                        |                   |   |
| 2 | { | Eyes of first row three times as large as those of second; falces twice as long as face, moderately stout..... | (South United States). | <i>viridis</i> .  |   |
|   |   | Eyes of first row only twice as large as those of second; falces as long as face, weak .....                   |                        |                   |   |
|   |   |  |                        | (Brazil).         |   |



LYSSOMANES VIRIDIS WALCK. 1837.

Plate XI, figure 3. Plate XII, figures 6, 6a, 6b.

- Altis viridis Walck. 1837. Hist. Nat. des. Insectes. T. I, p. 469.  
 Lyssomanes viridis Hentz. 1844. Jour. Bost. Soc. Nat. Hist., IV., pp.  
 386-396.  
 “ “ “ 1875. Occ. Pap. Bost. Soc. Nat. Hist., II,  
 Spiders of U. S., p. 48.

♂. Length of cephalothorax 2.5 mm; of abdomen 4.5 mm.  
 Legs 12, 9.5, 8.5, 8.2. Falces 2.3 mm.  
 ♀. Length of cephalothorax 3 mm; of abdomen 5.2 mm.  
 Legs 10, 9, 8, 7.8. Falces 1 mm.

Cephalic part not quite so long as thoracic. Quadrangle of eyes one-third wider than long. Eyes of first row three times as large as those of second row. Clypeus one-fourth as high as anterior eyes. Falces (♂) horizontal, diverging, rounded, four times as long as face; on the distal end of each falx, on the inner edge, are two stout projections; fang as long as falx, curved. Falces (♀) rather stout, nearly vertical, twice as long as face; fang one-half as long as falx. Maxillæ rounded and a little enlarged at their extremities. Labium a little longer than wide, more than one-half as long as maxillæ, blunt; in ♂ narrow at the base. Legs 1, 2, 3, 4. Femur of the first (♂) quite, (♀) nearly equal to femur with patella of the second. Metatarsus of the first (♂) bent, with fine fringe of hairs at distal end. Spines rather long.

*Coloration* (under alcohol): Upper surface of cephalothorax and falces light yellow (♂) with tinge of red; a short dark median longitudinal line on anterior thoracic part. Sternum, coxæ, mouthparts and upper and under surface of abdomen pale yellow. Legs pale with slightly darker spines and black tips, (♂) tibia of the first darker toward extremity with some short dark hairs; matatarsus of the first brown at distal end with fringe of short brown hairs.

*Habitat*: Southern United States.

Hentz describes this species as follows: “Tender grass-green; cephalothorax with some orange-colored hairs near the eyes, and a little black line on the disk; abdomen with six or eight black dots, sometimes wanting.” The green color evidently fades to a light yellow in alcohol. Hentz probably never had a mature male, as he makes no reference to the long horizontal falces.

LYSSOMANES BI-TÆNIATUS N. SP.

Plate XI, figure 4.

♂. Length of cephalothorax 2.5 mm; of abdomen 4 mm.  
Legs 11.5, 9.4, 9, 8.8. Falces 1.5 mm.

Cephalic and thoracic parts equally long. Quadrangle of eyes nearly one-third wider than long. Eyes of first row about three times as large as those of second row. Clypeus one-fifth as high as anterior eyes. Falces horizontal, diverging, three times as long as face; fang bent, as long as falx. On the front face of each falx, just above the insertion of the fang, are seven or eight stout hairs which form a triangle with the apex up. Maxillæ rounded and a little enlarged at their extremities. Labium as wide as long, one-half as long as maxillæ, truncated. Legs 1, 2, 3, 4. Femur of the first nearly as long as femur with patella of the second. Metatarsus of the first elongated, bent, with a fringe of hairs occupying distal third. Palpus with femur elongated, and patella plainly shorter than tibia. Tibia with a row of stout hairs on upper and outer side of distal half.

*Coloration* (under alcohol): Upper surface of cephalothorax pale yellow with a dark line around lower margin, and a central longitudinal dark line on thoracic part. Upper surface of abdomen pale yellow with two parallel longitudinal brown bands throughout its length, on which are three pairs of spots, formed by enlargements of the bands. Falces pale yellow, with an oblique band of darker reddish yellow arising at the proximal end, above, and passing downward and inward to the inner side of the insertion of the fang. Legs pale yellow with dark bands at joints, brown spines, and black tips. Palpus and entire under surface, light yellow.

*Habitat:* Venezuela. (Caracas).

From the collection of M. Simon.

LYSSOMANES PLACIDUS N. SP.

Plate XI, figure 5.

♂. Length of cephalothorax 2.8 mm; of abdomen 4 mm.  
Legs 12, 9.3, 9, 8.8.

Cephalic and thoracic parts equally long. Quadrangle of eyes one-third wider than long. Eyes of first row more than twice as large as those of second. Clypeus nearly one-half as high as anterior eyes. Falces weak, vertical, parallel, as long as face; fang weak. Maxillæ truncated and a little enlarged at their extremities, cut obliquely on their inner edges. Labium longer than wide, rounded, slightly more than one-half as long as maxillæ. Legs 1, 2, 3, 4; femur of the first

shorter than femur with patella of the second; metatarsus of the first long, slightly bent; tarsus of the first with fringe of hairs. The tibial and metatarsal spines are long and slender, and are arranged in inferior rows.

*Coloration* (dry): Upper surface of cephalothorax light brown with a dark line around the lower margin; eye-region and clypeus pale, covered with white and red hairs. Upper surface of abdomen blackish, with a white central longitudinal band extending through two-thirds of its length; this band suddenly contracts a little behind its middle point, its posterior end being thus made narrower than its anterior portion. The posterior end of the venter is blackish, the color being continuous with that of the upper surface, and extending forward in a gradually narrowing band, to about the middle; on either side of this band, and at the anterior end, the venter is white. Legs and palpi pale with dark bands and black tips, the first and second pairs of legs being darker than the third and fourth; tarsus of the first black with a fringe of black hair. Other parts all pale.

*Habitat:* Mexico.

LYSSOMANES MINIACEUS N. Sp.

Plate XI, figure 6.

♂. Length of cephalothorax 3 mm; of abdomen 4 mm.

Legs 10.8, 8.8, 8, 7.8.

Cephalic and thoracic parts equally long. Quadrangle of eyes one-third wider than long. Eyes of the first row twice as large as those of second. Clypeus nearly one-half as high as anterior eyes. Falces weak, nearly vertical, about as long as face; fang short. Maxillæ rounded and a very little enlarged at their extremities, excavated on their inner sides for the labium. Labium a very little longer than wide, more than one-half as long as maxillæ, widest in the middle, blunt at tip. Legs stouter than is usual in this genus, 1, 2, 3, 4. Femur of the first but little longer than femur of the second. Fringes of hair on upper and under sides of tibia of the first, on under side of tibia of the second, and on outer distal half of femur of palpus.

*Coloration* (dry): Upper surface of cephalothorax pale brown with a dark rim around the lower margin. Eye region covered with bright yellowish red hairs, which surround the anterior eyes. Clypeus light brown, with lower margin black. Upper surface of abdomen dark drab, with a wide, pale central band extending through half of its length; under surface dark brown with a curved, white, longitudinal band on each side. Falces light reddish. Sternum and coxæ light red, coxæ of the first, deeper in color than the others. Mouthparts brown, tipped with pale. Legs of first pair red; of second, third and fourth pairs red mingled with white, the fourth pair being almost en-

tirely white. Palpus red, excepting proximal half of femur which is pale. Tips of legs, spines and fringes of hair on legs and palpi, black.

*Habitat:* South America (near Rio Janiero).

From the collection of M. Simon.

LYSSOMANES AUSTERUS N. Sp.

Plate XI, figure 7. Plate XII, figure 17.

♂. Length of cephalothorax 2.7 mm., of abdomen 4.5 mm.

Legs 11.5, 9.5, 9.3, 9.3.

♀. Length of cephalothorax 2.8 mm; of abdomen 4 mm.

Legs 9, 7.8, 7.3, 6.9.

Cephalic part not quite so long as thoracic. Quadrangle of eyes one-third wider than long. Eyes of first row three times as large as those of second. Clypeus one-third as high as anterior eyes, (♂) projecting forward over the falces. Falces nearly vertical, parallel, as long as face, (♂) moderately stout, (♀) weak. Maxillæ rounded and a little enlarged at their extremities. Labium longer than wide, rounded, narrowing slightly toward its base, and a little more than one-half as long as the maxillæ. Coxæ of the first separated (♀) by a little more than width of labium, (♂) more widely. Legs 1, 2, 3, 4; femur of the first nearly as long as femur with patella of the second; tibia of the first with a fringe of stout hairs.

*Coloration* (dry): ♂. Upper surface of cephalothorax light brown, pale on the anterior side; eye-region with bright red hairs. Abdomen blackish with a pale central longitudinal band above, and two white longitudinal lines on the venter. Falces brown. Sternum and coxæ pale. Mouthparts dark tipped with white. First and second pairs of legs with first three joints dark brown and the others pale; third and fourth pairs dark brown with pale rings; tarsi tipped with black. Palpus brown with proximal end of femur pale. (♀) light yellow; eye region covered with bright red hairs. Spines and tips of legs black.

*Habitat:* South America (near Rio Janeiro.)

From the collection of M. Simon.

LYSSOMANES MODESTUS N. Sp.

Plate XII, figure 10.

♀. Length of cephalothorax 2 mm; of abdomen 3.3 mm.

Legs 7, 6.5, 6.8, 8.

Cephalic and thoracic parts equally long. Quadrangle of eyes one-third wider than long. Eyes of first row a little more than twice as large as those of second. Clypeus one-half as high as anterior eyes. Falces

weak, vertical; parallel, scarcely as long as face; fang weak. Maxillæ rounded and a little enlarged at their extremities. Labium as wide as long, rounded, almost one-half as long as maxillæ. Coxæ of the first separated by but little more than the width of the labium. Legs 4,  $\overline{1, 3}$ , 2; femur of the first scarcely longer than femur of the second.

*Coloration* (dry): Upper surface of cephalothorax, light yellow; eye-region surrounded above by a band of bright-red hairs covered in the middle with white hairs. Clypeus with thick white hairs. Abdomen above light brown or yellow, with silvery white hairs; two parallel longitudinal bands of red hairs extend throughout its length, and these are connected by transverse bands of red hairs in three places, at the anterior and posterior ends, and in the middle. Legs light yellow with brown spines and black tips. Other parts all light yellow.

Most of our specimens have all the hair rubbed off from the abdomen, which then presents a plain light colored surface with a few dark dots.

*Habitat:* Madagascar.

#### LYSSOMANES TRISTIS N. Sp.

Plate XII, figure 12.

♀. Length of cephalothorax 2.5 mm; of abdomen 5 mm.

Legs 8.5, 7.4, 7, 5.

Cephalic part not quite so long as thoracic. Quadrangle of eyes one-third wider than long. Eyes of first row twice as large as those of second. Clypeus a little less than one-half as high as anterior eyes. Falces weak, vertical, about as long as face; fang short. Maxillæ rounded, and a little enlarged at their extremities, excavated on their inner sides for the labium. Labium about as wide as long, blunt, and narrowing a little at the tip, and a little more than one-half as long as maxillæ. Legs 1,  $\overline{2, 3}$ , 4; femur of the first shorter than femur with patella of the second.

*Coloration* (dry): Upper surface of cephalothorax yellowish-brown; eye-region and clypeus covered with snowy white hairs. Abdomen, above and beneath, very light brown, probably covered with white hairs, which in the specimens which we have examined are almost entirely rubbed off. Legs pale, darkening somewhat toward the proximal ends, with brown tips, and light colored spines. Other parts all pale.

*Habitat:* Brazil.

From the Berlin collection, through the courtesy of Dr. Ferd. Karsch.

## SUB-GENUS JELSKIA.

## A. Quadrangle of eyes as long as wide, or barely wider than long.

## MALES.

1	{	Tarsus of palpus five times as long as tibia.....	<i>tenuis.</i>
		Tarsus of palpus only twice as long as tibia.....	(Brazil). 2
2	{	Falces very long (3 mm); fang as long as falx.....	<i>jemineus.</i>
		Falces short; fang plainly shorter than falx.....	(South America). <i>nigropictus.</i> (Amazon). 2

## FEMALES.

3	{	Metatarsus of the first elongated and bent.....	<i>jemineus.</i>
		Metatarsus of the first neither elongated nor bent.....	(South America). <i>parallelus.</i> (South America).

## LYSSOMANES TENUIS N. SP.

Plate XI, figure 8.

♂. Length of cephalothorax 2 mm; of abdomen 2.9.

Legs 13, 9, 8, 10.

Cephalic part as long as thoracic. Quadrangle of eyes as long as wide.

Eyes of first row twice as large as those of second. Second row narrower than first. Clypeus one-fifth as high as anterior eyes. Falces nearly horizontal, diverging, a little longer than face; fang as long as falx. Maxillæ rounded and slightly enlarged at their extremities, excavated for the labium. Labium as wide as long, one-half as long as maxillæ, narrowing at base, blunt at extremity. Legs 1, 4, 2, 3; femur of the first longer than femur with patella of the second; femur, tibia and metatarsus of the first, much elongated. Legs all slender. Spines growing gradually weaker from first to fourth, being scarcely more than hairs on tibia and metatarsus of the fourth. Palpus with patella and tibia more than two-thirds as long as tarsus. Spines on palpus as follows: femur, two spines at distal end, one just behind these, and a fourth in the middle; patella, one long spine at distal end; tibia, one in the middle and one at distal end; tarsus, two spines, or long hairs, on dorsum of enlarged part, one placed behind the other.

*Coloration* (dry): Upper surface of cephalothorax, clypeus and abdomen black with thin, white hairs, the abdomen having a faintly indicated transverse band of a lighter shade behind the middle. Falces and palpi dark brown. Sternum, coxæ and mouthparts, light brown. Legs light reddish brown, with brown spines and black tips.

*Habitat*: South America (near Rio Janiero.)

From the collection of M. Simon.

See remarks under *Jelskia velox*.

## LYSSOMANES JEMINEUS N. Sp.

Plate XI, figure 9. Plate XII, figure 14.

♂. Length of cephalothorax 2.5 mm; of abdomen 5 mm.

Legs 16.3, 12, 11.4, 11.8. Falces 3 mm.

♀. Length of cephalothorax 3 mm; of abdomen 5 mm. (Legs too badly broken to be measured.)

Cephalic part not quite so long as thoracic. Quadrangle of eyes about one-fifth wider than long. Eyes of first row three times as large as those of second. Second row slightly narrower than first. Clypeus nearly one-third as high as anterior eyes. Falces (♂) stout, horizontal, three times as long as face, diverging; fang as long as falx, with a double curve; (♀) stout, nearly vertical, about twice as long as face, bulging in front, nearly parallel; fang short. Maxillæ blunt, and a little enlarged at their extremities. Labium longer than wide, a little more than one-half as long as maxillæ, widest in the middle. Legs 1, 2, 4, 3; (♂) femur, tibia and metatarsus of the first all much elongated, metatarsus curved; a wide fringe of hairs on each side of tibia and metatarsus of the first, less marked on tibia of the second, and much less on metatarsus of the second; (♀) metatarsus of the first long, curved, without hairs, but with longer and stouter spines than ♂. (♂) Palpus with femur as long as falx; patella but little shorter than tibia; patella and tibia two-thirds as long as tarsus; a bunch of hairs on outer side of distal half of tibia; two spines at distal end of femur and one at extremity of patella.

*Coloration* (under alcohol): Cephalothorax, reddish yellow; cephalic part with a band of yellowish white hairs on each side below the eyes; a large bright red spot behind the eyes of the fourth row which extends forward between them; and a red spot on the outer side of each anterior eye; eyes of third row surrounded by reddish hairs. Thoracic part with a dark brown central longitudinal band extending from just behind fourth row of eyes to posterior margin. Falces reddish yellow. Mouth parts, sternum and coxæ pale yellow; abdomen above, mottled brown; sides pale yellow; venter with dark brown, median, longitudinal band. Legs pale yellow or light brown; (♂) black fringes of hair on tibiae and metatarsi of the first and second. (♂) Palpus pale yellow excepting tibia and tarsus which are brown.

*Habitat*: South America.

From the collection of M. Simon.

The male of this species is easily distinguished by its elongated falces, and by the double fringes of hair on the first and second pairs of legs.

## LYSSOMANES NIGROPIGATUS N. Sp.

Plate XI, figure 10.

♂. Length of cephalothorax 2.8 mm; of abdomen 4 mm.

Legs 12.5, 11.5, 11.3, 10.8.

Cephalic part as long as thoracic. Quadrangle of eyes scarcely wider than long. Eyes of first row twice as large as those of second row. First and second rows equally wide. Clypeus nearly one-half as high as anterior eyes. Falces weak, parallel, vertical, as long as face; fang weak. Maxillæ rounded and slightly enlarged at their extremities, excavated on their inner sides for labium. Labium longer than wide, about one-half as long as maxillæ, blunt at tip, widest in the middle, and narrowing toward both ends. Coxæ separated by but little more than width of labium. Legs 1, 2, 3, 4. Femur of the first scarcely longer than femur of the second. Palpus with patella and tibia three-fourths as long as tarsus. Spine: on palpus as follows: femur, two on dorsum at distal end; patella, one long spine at extremity; tibia, one behind middle on inner side, and one at distal end; tarsus, two long spines on dorsum of enlarged part, placed side by side.

*Coloration* (under alcohol): Upper surface of cephalothorax with eye-region white, and the remainder very light brown; there is a black line around the lower margin and a central dark brown band from the fourth row of eyes to the posterior edge. Upper surface of abdomen white with four pairs of brown spots; the first pair is on the anterior face of the abdomen and is not plainly visible from above; the third pair is just behind the middle point of the dorsum; the fourth pair is just in front of the white spinnerets, and the two spots are connected by a brown band. Legs white with brown rings and spines and black tips. Palpus white with a dark line on each side of the femur, and having the bulb light brown, and some dark hairs at the extremity of the tarsus. Other parts all white.

*Habitat*: South America (Amazon).

From the collection of M. Simon:

The tarsus of the palpus of this species has an arrangement of the spines which is only duplicated in *Jelskia velox*, the palpus differing from that of this species in having no fringes of hair on the patella and tibia. It has, moreover, the first two pairs of legs more nearly equal in length than any species excepting *Jelskia robusta*, from which it is quickly distinguished by its much lighter color.



## LYSSOMANES PARALLELUS. N. Sp.

Plate XII, figure 15.

♀. Length of cephalothorax 1.9; of abdomen 3 mm.

Legs 9, 7, 7, —. (Fourth leg missing.)

Cephalic part as long as thoracic. Quadrangle of eyes scarcely wider than long. Eyes of first row a little more than twice as large as those of second. Second row narrower than first. Clypeus scarcely one-fifth as high as anterior eyes. Falces moderately stout, somewhat inclined forward, diverging, as long as face. Maxillæ excavated on inner sides for labium; extremities rounded, near together, but little enlarged. Labium but little longer than wide, truncated, a little more than one-half as long as labium. Legs 1, 2, 3, —; femur of the first as long as femur with patella of the second.

*Coloration* (dry): Eye region covered with mixed red and white hairs; upper surface of thoracic part brown, glabrous, with a pale transverse band just behind the fourth row of eyes; sides pale excepting lower margin, which is brown. Clypeus covered with white hairs. Abdomen pale with two longitudinal brown bands originating separately at the base and meeting at the apex. Falx yellowish brown with a fringe of red hairs at extremity. Mouthparts light brown. Sternum, coxæ, and venter pale yellowish. Legs pale; first leg and femur of second with a dark line on each side; spines brown, tips black. Palpus pale excepting tarsus, which is light brown.

*Habitat*: South America.

From the collection of M. Simon.

B. Quadrangle of eyes from one-fifth to one-third wider than long.

## MALES.

1	{	Tarsus of palpus five times as long as tibia.....	<i>velox.</i>
		Tarsus of palpus only twice as long as tibia.....	(Brazil). 2
2	{	Femur of the first as long as femur and patella and one-half tibia of the second.....	<i>longipes.</i>
		Femur of the first scarcely longer than femur of the second.....	(French Guiana). 3
3	•	Legs 1 3 4 2.....	<i>robustus.</i>
		Legs 1 2 3 4.....	(Peru). <i>amazonicus.</i> (Amazon).

## FEMALES.

1	{	Eyes of first row three times as large as those of second; eyes of fourth row a little smaller than those of second.....	<i>amazonicus.</i>
		Eyes of first row only twice as large as those of second; eyes of fourth row as large as those of second.....	(Amazon). <i>blandus.</i> (Guatemala).

## LYSSOMANES VELOX N. Sp.

Plate XI, figure 11.

♂. Length of cephalothorax 2.7 mm.; of abdomen 4 mm.

Legs 14, 13.2, 15, 15.5.

Cephalic part plainly shorter than thoracic. Quadrangle of eyes a little more than one-third wider than long. Eyes of first row three times as large as those of second. First and second rows equally wide. Clypeus one-fourth as high as anterior eyes. Falces weak, nearly vertical, parallel, a little longer than the face; fang weak. Maxillæ slightly enlarged beyond the middle, rather pointed, very little excavated on their inner edges. Labium a little longer than wide, one-half as long as maxillæ, a little narrower, and blunt at tip. Legs long and slender, 4, 3, 1, 2; femur of the first about as long as femur of the second. Palpus with patella and tibia one-half as long as tarsus; patella and tibia with fringe of hairs on outer edge; those on tibia pointing downward and outward, those on patella on a higher plane, and pointing forward. Spines on palpus as follows: femur, one spine at distal end, another just behind this one, and a third about in the middle of the joint; patella, one spine at distal end, in the middle; tibia, one at distal end and one in the middle on the outer edge; tarsus two long spines on the dorsum of the enlarged part, placed side by side.

*Coloration* (under alcohol): Inter-ocular region pale, almost white; thoracic part and sides brown, growing much darker toward lower margin. Clypeus brown with a black line above falces. Abdomen, above, with sides white, and a large white spot at anterior end which contracts behind to form a long point; dorsum occupied by a wide brown band which bifurcates in front to surround the white spot. Falces brown with white extremities. Mouthparts dark brown. Coxæ of the first brown; other coxæ, and sternum, white. Venter pale, excepting at posterior end where it is brown. Legs with upper faces of femora and tarsi pale; otherwise brown. Palpus dark brown.

*Habitat*: Brazil.

From the collection of M. Simon.

This species and *Jelskia tenuis* are easily distinguished from other members of this genus by their dark color and elongated legs; while *velox* is distinguished from *tenuis* by the hairs on the patella and tibia of the palpus, and by the position of the spines on the tarsus of the palpus, these being placed side by side in *velox* and one behind the other in *tenuis*.

## LYSSOMANES LONGIPES TACZ. 1874.

Plate XI, figure 12.

*Jelskia longipes* Tacz., 1874. Les Aranéides de la Guyane française, Horae Soc. Entomol. Ross., T. VIII, p. 32-132.

♂. Length of cephalothorax 2 mm; of abdomen 3.2 mm.

Legs 12.4, 8.3, 7.7, 8.

Cephalic part as long as thoracic. Quadrangle of eyes one-fifth wider than long. Eyes of first row a little more than twice as large as those of second. Second row narrower than first. Clypeus about one fifth as high as anterior eyes. Falces very weak, vertical, parallel, as long as face; fang short. Maxillæ rounded, and a very little enlarged at their extremities, excavated on inner sides for labium. Labium as wide as long, one-half as long as maxillæ, blunt. Legs 1, 2, 4, 3; femur of the first very long, equalling femur with patella and half tibia of the second. Palpus with patella and tibia about equal in length; patella and tibia three-fourths as long as tarsus, spines on palpus as follows: Femur, two at distal end, and one in the middle of the dorsum, all short; patella, one at extremity; tibia, one long hair in the middle, and one at extremity; tarsus, one long hair on dorsum of enlarged part.

*Coloration* (under alcohol): Upper surface of cephalothorax deep reddish yellow, with a narrow black line around lower edge and another on the central thoracic region; eyes, as usual, on black spots. Abdomen above, with a blackish region at the extremity in front of which is a white band; the remainder of the dorsum is blackish excepting three white spots, one elongated, large, one on the anterior central part, and two smaller, which come off obliquely from the posterior corners of the first one. Spinnerets white. Ventral surface white excepting at the extremity where it is blackish. Sternum, mouthparts, and falces yellow. Legs light yellow with brownish spines and tips. Palpus pale with the bulb reddish brown.

When dry, the eye-region is seen to be covered with white hairs. The abdomen is also thinly covered with short white hairs.

*Habitat*: French Guiana.

From the collection of Dr. Taczanowski.

This species is distinguished by the great relative length of the first pair of legs, and especially by the elongation of the femora of that pair.

LYSSOMANES ROBUSTUS TACZ. 1879.

Plate XI, figure 13. Plate XII, figure 7.

*Jelskia robusta* Tacz. Les Aranéides du Pérou. Bull. de la Soc. Imp. des Nat. de Moscou, T. L III, 1878, No. 4, p. 373.

♂. Length of cephalothorax 2.3 mm; of abdomen 3 mm.

Legs 9.2, 8.6, 8.8, 8.7.

Cephalic part a little shorter than thoracic. Quadrangle of eyes nearly one-fourth wider than long. Eyes of first row twice as large as those of second. Eyes of second row placed directly above those of first, forming a row equally wide, looking forward. Clypeus only a line. Falces very weak, vertical, parallel, as long as face; fang very short. Maxillæ and labium unusually short. Maxillæ rounded and a little enlarged at their extremities, which are quite close together, excavated on their inner sides for the labium. Labium a little longer than wide, rounded at tip, one-half as long as maxillæ. Legs 1, 3, 4. 2; femur of the first not quite so long as femur with patella of the second. Palpus with patella and tibia equally long; patella and tibia two-thirds as long as tarsus. Tibia with a stout fringe of hairs on the outer edge. Tarsus with one spine on dorsum of enlarged part behind middle.

*Coloration* (dry): Upper surface of cephalothorax jet black, with two indistinct brownish spots on thoracic part, and a few long white hairs on eye-region. Clypeus black. Abdomen above, black, thinly covered with whitish hairs, and having two indistinct brownish spots behind the middle. Falces black with extremities and fangs pale yellow. Mouthparts black; sternum black with a large pale yellow spot in center. Venter pale yellowish, excepting the anterior and posterior ends, which are pale. Legs light yellow, excepting tarsus of the first, and tips of other legs which are black. Palpus black, except that part of the tarsus which projects beyond the bulb which is pale yellow.

*Habitat*: Peru.

From the collection of Dr. Taczanowski.

The jet black body and pale legs of this species quickly distinguish it from all members of this group.

## LYSSOMANES AMAZONICUS N. SP.

Plate XII, figures 1, 16.

♂. Length of cephalothorax 2.5 mm; of abdomen 4.4 mm.

Legs 12.5, 11, 10.8, 10.8.

♀. Length of cephalothorax 2.5 mm; of abdomen 5 mm.

Legs 11.3, 10, 9.4, 9.2.

Cephalic part (♂) as long (♀) not quite so long as thoracic. Quadrangle of eyes one-fifth wider than long. Eyes of first row three times as large as those of second. Second and first rows equally wide. Clypeus one-third as high as anterior eyes. Falces rather stout, diverging, not quite vertical, one-third longer than face; on the front of each falx just above insertion of fang, is a line of three stout hairs. Maxillæ rounded and a little enlarged at their extremities. Labium longer than wide, blunt and slightly narrower at extremity, and a little more than one-half as long as maxillæ. Legs 1, 2, 3, 4; femur of the first not so long as femur with patella of the second. (♂) Palpus with tibia plainly longer than patella; patella and tibia plainly less than one-half as long as tarsus. Femur with two spines at distal end and one in the middle; patella with one long hair at extremity; tibia with one stout hair at distal end on inner side.

*Coloration* (under alcohol): ♂. Light yellow. Eye-region covered with white hairs; there is an abbreviated central longitudinal black line on the thoracic region, and a black line around the lower margin. The abdomen has two longitudinal brown bands throughout its length which are enlarged at the middle point and again at the posterior end to form two pairs of spots. The spinnerets are brown. The legs grow darker toward their extremities and are tipped with black. ♀. Yellowish white. Cephalothorax like ♂ excepting that there is no dark marginal line. Abdomen with two pairs of brown spots, and with the spinnerets pale. The color is paler and the marks less distinct than in the ♂.

*Habitat*: South America (Amazon).

From the collection of M. Simon.

The male of this species differs from all others in the greater relative length of the tarsus of the palpus, the tarsus being more than twice as long as the patella and tibia together.

LYSSOMANES BLANDUS N. Sp.

Plate XII, figure 13.

♀. Length of cephalothorax 2.8 mm.; of abdomen 4.6 mm.

Legs 12, 3, 10, 9, 6, 9, 6.

Cephalic part as long as thoracic. Quadrangle of eyes one-fourth wider than long. Eyes of first row twice as large as those of second. First and second rows equally wide. Clypeus one-half as high as anterior eyes. Falces robust, nearly horizontal, one and one-half times as long as face. Maxillæ a little enlarged and rounded at their extremities, slightly excavated on their inner sides. Labium longer than wide, a little more than one-half as long as maxillæ, widest in the middle, blunt at extremity. Legs 1, 2, 3, 4; femur of the first shorter than femur with patella of the second.

*Coloration* (under alcohol): Cephalothorax light yellow; eye-region surrounded with red and white hairs; anterior thoracic part with a dark central longitudinal line. Abdomen white with scattered light brown hairs; on the posterior part of the dorsum are two abbreviated, longitudinal, light brown bands, and there are some irregular, light brown spots on the anterior part. Falces, legs, palpi, mouthparts, and sternum all pale yellow.

*Habitat*: Guatemala.

GENUS ASAMONEA (CAMBRIDGE) SIMON.

Cephalothorax low; cephalic plate usually but little higher than thorax, occupying a little more than one-third of the cephalothorax.

Eyes in four transverse rows of two each. Eyes of first row close together, from two and one-half to three times as large as those of second row (relatively larger than in *Lyssomanes*), occupying the entire face. Second row of eyes wider than first. Eyes of third row much nearer the second than the fourth and much nearer together than those of second row; third row narrower than second, and sometimes wider, sometimes narrower than fourth. Eyes of fourth row about as large as those of second and nearer together. Quadrangle formed by second and fourth rows, at least twice as wide as long.

Sternum little, if any, longer than wide, truncated in front.

Coxæ separated by the width of the labium and part or all of that of the maxillæ.

Labium at least as wide as long.

Abdomen long, slender, tapering.

Legs slender; (♂) 1 4 3 2 or 1 4 2 3; (♀) fourth leg longest, others nearly equal.

Femoral, tibial, metatarsal and sometimes patellary spines on the four pairs.

A. Eyes of third row but little smaller than those of the fourth.

MALES.

General color light; integument covered with silvery hairs.....	<i>puella.</i> (South Africa).
General color dark.....	<i>tenuipes.</i> (Ceylon).

FEMALES.

1 {	First and third legs equal.....	<i>tenuipes.</i> (Ceylon).
	First and third legs not equal.....	
2 {	Legs 4 1 2 3.....	<i>puella.</i> (South Africa).
	Legs not 4 1 2 3.....	
3 {	Legs 4 3 2 1.....	<i>punctata.</i> (Madagascar).
	Legs 4 2 3 1.....	

ASAMONEA PUELLA SIMON. 1885.

*Asamonea puella* Simon. Bull. de la Soc. Zool. 1885, T. X. p. 27.

Having no mature specimen of this species we translate the following description from Simon:

- ♂. Length 6 mm. Cephalothorax yellowish testaceous narrowly bordered with brownish, with the cephalic part covered with yellow hair, and having on each side a large black three-lobed spot which surrounds the eyes; the thoracic part, above, with two lines covered with thin red hairs which come together posteriorly. Clypeus very high, smooth behind the falces, above the eyes densely pubescent, in the middle silvery, on each side reddish. Abdomen steeply elongate, covered with hairs which are whitish testaceous and silvery white, adorned above with two lines, prettily interrupted with red. Spinnerets testaceous, upper ones brownish. Falces yellow testaceous, cut transversely by a black band in front. Sternum testaceous. Legs testaceous, femora with brownish lines below; tibia of fourth from base to apex, minutely dotted with brown; abundantly armed with long and delicate spines. Palpi testaceous with the stout femur armed below, back of the middle, with an obtuse tubercle; patella short; tibia not longer than patella, slightly thicker on the outside and enlarged into a keel-shaped laminate apophysis which is a little thickened and obtuse in the middle and very sharply prolonged above; the large tarsus longer than the femur and much thicker, convex and attenuated longitudinally with a large convex bulb.
- ♀. Length 7 mm. Cephalothorax with no lines on thoracic part. Clypeus, behind falces smooth, above eyes covered all over with silvery hair. Falces and legs uniform yellow testaceous without lines or spots. Region of epigynum, anteriorly, with a transverse pit obtusely triangular and much broader than long; posteriorly, a shining reddish transverse spot.

ASAMONEA TENUIPES CAMB. 1869.

Plate XII, figures 5, 19, 19a, 19b.

LYSSOMANES tenuipes Camb., Ann. and Mag. Nat. Hist. S. 4, vol. 3, p. 65.

♂. Length of cephalothorax 1.5 mm; of abdomen 2 mm.

Legs 6, 5, 5, 5.3.

♀. Length of cephalothorax 1.7 mm; of abdomen 3 mm.

Legs 5.5, —, 5.5, —. (Second and fourth wanting.)

Cephalic part scarcely more than one-half as long as thoracic, in ♂ with front and sides projecting like carapace of turtle. Quadrangle of eyes twice as wide as long. Eyes of first row two and one-half times as large as those of second row. Clypeus about one-half as high as anterior eyes. Falces very weak, ♂ inclined backward, ♀ vertical, ♂ scarcely as long as face, almost quadrate, ♀ as long as face; fang very weak. Maxillæ short, truncated, ♂ a little narrower, ♀ a little wider at their extremities. Labium wider than long, wider in ♂ than in ♀, ♂ one-third, ♀ a little less than one-half as long as maxillæ, blunt at extremity. Legs, ♂ 1, 4, 3, 2; ♀ first and third equal. Coxæ of the first separated by the width of maxillæ and labium. Femur of the first plainly shorter than femur with patella of the second. Superior spinnerets elongated, in ♂, curved upward.

*Coloration* (dry): ♂. Cephalothorax dark brown, covered with whitish iridescent scales; a pale central band extends from the anterior eyes to the posterior border, and from this, curved white bands extend around the outer sides of the eye-region; the anterior part of the eye-region is covered with long white hairs. Clypeus covered with highly iridescent scales. Palpi, dark brown. Sternum and coxæ, pale. Abdomen, above and below, dark brown, shading to blackish on the sides, with a wide irregular pale ring near the posterior end; apex and curved spinnerets jet black; the whole abdomen is thinly covered with iridescent scales like those on the cephalothorax. Legs pale yellow; those of the first and second pairs have three black spots on the posterior side, one at the distal end of the femur, one at the proximal and one at the distal end of the patella; the tips of all the legs are black. Spines yellow.

♀. Light yellow with thick snowy white hairs on eye region and clypeus.

Legs tipped with black.

*Habitat*: Ceylon.



## ASAMONEA PUNCTATA N. Sp.

Plate 12, figure 20.

♀. Length of cephalothorax 2.8 mm; of abdomen 5 mm.

Legs 8.7, 9, 9.5, 10.5.

We have also an immature ♂ of this species.

Cephalic part a little more than one-half as long as thoracic. Quadrangle of eyes more than twice as wide as long. Eyes of first row three times as large as those of second row. Clypeus fully one-half as high as anterior eyes. Falces weak, vertical, parallel, as long as face; fang weak. Maxillæ rounded, a little enlarged at their extremities. Labium rounded, ♂ wider than long, ♀ as wide as long; less than one-half as long as maxillæ. Legs 4, 3, 2, 1; femur of the first shorter than femur of the second. Spines unusually long and stout.

*Coloration* (under alcohol): ♀. Pale yellow, with an indistinct dark median line on the thoracic part of the cephalothorax, and three equi-distant pairs of dark brown dots on the abdomen arranged in two lines of three dots each, the posterior pair of dots being only a little behind the middle of the abdomen. The tips of the legs are black, but the spines are light colored. When the spider is dried a small tuft of black hairs becomes visible at the anterior end of the abdomen. ♂. Upper surface of cephalothorax light brown, excepting on eye-region and anterior thoracic part, where it is pale yellow; on each side of the posterior thoracic part are two dark brown dots. Abdomen with four pairs of dark brown dots at equal distances between the two ends, the first three pairs converging toward the posterior end, the two dots of the fourth pair being placed further apart than any of the others. Probably a fourth pair of dots has been effaced from the abdomen of our female specimen.

*Habitat*: Madagascar.

## ASAMONEA ORNATISSIMA N. Sp.

Plate XII, figure 22.

♀. Length of cephalothorax 2 mm; of abdomen 3 mm.

Legs 6.2, 6.6, 6.4, 7.

Cephalic part a little more than one-half as long as thoracic. Quadrangle of eyes twice as wide as long. Eyes of first row about two and one-half times as large as those of second row. Clypeus nearly one-third as high as anterior eyes. Falces weak, parallel, vertical, as long as the face, fang weak. Maxillæ rounded and very little enlarged at their extremities. Labium rounded, wider than long, less than one-half as long as maxillæ. Legs 4, 2, 3, 1; femur of the first about as long as femur of the second. Spines growing more slender from the first leg to the fourth.

*Coloration* (dry): Eye region covered with hairs of a rich brownish red color, with a wide central band of silver hairs extending between the eyes of the third row; thoracic part pale, without hairs. Clypeus with a band of silver hairs. Falces, and entire under side, pale yellow. Upper surface of abdomen covered with hairs of a rich brownish red, encircled by a band of silvery hairs, and having three spots of silvery hairs on the dorsum, the anterior one being the smallest, and the second and third broader. Legs pale, with light brown spines and black tips.

*Habitat*: Madagascar.

B. Eyes of third row much smaller than those of fourth (not more than one-third as large.)

Under this head we have only two individuals of different sexes. The male is *gracilis*, French Guiana, and the female *flava*, Central America.

ASAMONEA GRACILIS TACZ. 1875.

Plate XII, figure 2.

*Jelskia gracilis* Tacz., Les Aranéides de Guyane française, Horæ Soc. Ent. Ross., T. VIII, pp. 32-132.

♂. Length of cephalothorax 1.8 mm.; of abdomen 4 mm.

Legs 11, 9, 10.8, 10.4.

Cephalic part not quite so long as thoracic. Quadrangle of eyes more than twice as wide as long. Eyes of the first row three times as large as those of second row, projecting. Clypeus nearly one-half as high as anterior eyes. Falces very weak, vertical, as long as face; fang weak. Maxillæ rounded and a little enlarged at their extremities, slightly inclined toward labium. Labium as wide as long, about one-half as long as maxillæ. Maxillæ and labium unusually short. Legs 1, 4, 3, 2, very long and fine. Coxæ of the first more widely separated than usual — by fully the width of maxillæ and labium. Femur of the first about as long as femur with patella of the second.

*Coloration*: Cephalothorax and abdomen, both above and beneath, polished black, with bluish iridescent reflections. Legs very pale yellow with pale spines and hairs; on the upper surface of the first leg a black line begins on the trochanter and extends throughout half the length of the femur; there is a similar line on the upper surface of the second leg, but here it is much shorter and finer. Falces pale yellow with a black spot on the anterior face of each. Mouthparts pale yellow. Palpus black excepting the tarsus, which is light reddish yellow.

*Habitat*: French Guiana.

From the collection of Dr. Taczanowski.

## ASAMONEA FLAVA N. SP.

Plate XII, figure 18.

♀. Length of cephalothorax 1.8 mm; of abdomen 3.8 mm.  
Legs 11.8, 10.8, 11.6, 13.

Cephalic part a little more than one-half as long as thoracic. Quadrangle of eyes twice as wide as long. Eyes of first row two and one-half times as large as those of second row. Clypeus one-third as high as anterior eyes. Falces weak, shorter than face, slightly inclined backward. Maxillæ truncated, and a little enlarged at their extremities. Labium a little wider than long, less than one-half as long as maxillæ, rounded. Legs 4, 1, 3, 2. Femur of the first scarcely longer than femur of the second. Spines very few in number, and extremely weak, scarcely more than hairs. The abdomen, which is somewhat injured, seems to have been cylindrical in shape and truncated behind. Superior spinnerets not so much elongated as is usual in this genus.

*Coloration* (under alcohol): Light yellow; on all the legs the tibial joints have two dark brown spots at each end; the metatarsi have two brown spots at the proximal end and the metatarsus of the first has one brown spot at the distal end; the tarsi of all the legs have the distal fifth dark brown. Spines matching the legs in color.

*Habitat*: Central America.

## LYSSOMANES PALLENS BLACKWALL. 1887.

*Lyssomanes pallens*, Blackwall, Proc. Royal Irish Acad., 1877, Vol. III, Ser. 2, p. 6.

Having no specimen of this species, we are unable to determine its genus, although, to judge from the drawings, it belongs to the second division of *Asamonea*. We quote the whole description as given by Blackwall:

“Length of an immature male (not including the spinners), one-fifth of an inch; length of the cephalothorax, one-sixteenth; breadth, one-sixteenth; breadth of the abdomen, one-twentieth; length of a posterior leg, one-fourth; length of an anterior leg, five-twenty-fourths. The color of this spider is white tinged with yellow, particularly on the sides and base of the cephalothorax. The eyes are disposed on the anterior part of the cephalothorax; two, which are situated in front, are much the largest, and are prominent, pellucid, and almost in contact; on each side of the upper part of the cephalic region these eyes are placed in the form of an irregular triangle, on small tubercles seated on confluent black spots, the intermediate eye, constituting the vertex of an obtuse angle, being the smallest of the eight. The cephalothorax is somewhat quadrate, convex, glossy, slightly

rounded on the sides and at the base, and moderately elevated in the cephalic region. The falces are small, sub-conical, and inclined toward the sternum, which is broad, convex, and heart-shaped; the maxillæ are short, rounded at the extremity, and inclined toward the lip, which is somewhat quadrate, being broader at the base than at the apex. The legs are slender, and provided with hairs and long spines, two parallel rows of the latter extending along the inferior surface of the tibia and metatarsus of the first and second pairs; each tarsus is terminated by two minute, curved claws, below which there is a small black scopula. The abdomen is long, sub-cylindrical, and has a few short, pale hairs distributed over its surface. The superior spinners are the longest, and their terminal joint, which is pointed, has the spinning-tubes arranged on its inferior surface. The palpi of the specimen from which the description was made were very tumid, but the palpal organs were not developed, indicating that it probably had to undergo its final change of integument before it arrived at maturity; the radial was stronger than the cubital joint, and prominent in front."

## GROUP II. ATHAMII.

## GENUS ATHAMAS CAMBRIDGE.

Cephalothorax high, short, quadrate, very convex above, sloping steeply behind and on the sides. Caput occupying at least one-half of cephalothorax. Eyes arranged in four transverse rows of two each. Eyes of first row large and close together. Eyes of second row two-thirds as large as those of first, forming a wider row. Eyes of third row half way between second and fourth rows, and about one-third as large as those of fourth row. Eyes of fourth row smaller than those of second and nearer together. Quadrangle formed by second and fourth rows as long as wide. Labium about as wide as long.

## ATHAMAS WHITMEEI CAMBRIDGE. 1887.

Plate XII, figures 3, 11.

*Athamas whitmeei* Camb., Proc. Zool. Soc. of London, 1877, p. 576.

♂. Length of cephalothorax 1.6 mm; of abdomen 1.4 mm.

♀. Length of cephalothorax 1.25 mm; of abdomen, 1.75 mm.\*

Legs 3.5, 2.5, 2.5, 3.

♂. Cephalic part a little longer than thoracic. Clypeus one-half as high as anterior eyes. Falces vertical, short. Maxillæ rounded and enlarged at extremities. Labium as wide as long, one-third as long as maxillæ. Sternum heart-shaped. Legs rather long and slender, those of the first pair stoutest and furnished with strong spines; relative length

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\* These are the measurements given by Koch. We have no female of this species.

1, 4, 3, 2. Abdomen small and short, slanting from the anterior part to the spinnerets.

*Coloration.* As our specimen is considerably rubbed we quote the color description given by Cambridge. "The *cephalothorax* of this very pretty and distinct spider, is of a yellow brown color, with a large pale patch on each side of the hinder extremity, and the ocular area black, thinly clothed with short white hairs, and shining, in some lights, with a strong, metallic, dark violet hue; a pale stripe densely clothed with bright white squamose hairs runs through the middle of the hinder half of the ocular area to the beginning of the posterior slope; there is also a spot of similar hairs on each side towards the hinder part, and another on each side near the hinder part of the ocular area, just below the eyes of the third row. \* \* \* The legs are yellow, the femora and the two other basal joints of the first pair being much stronger than the rest, and brownish black on each side. This, however, is apparently not a constant character; or at any rate it does not always exist at the first coming of the spider to maturity, but probably is acquired later; for in one of the examples before me the first pair are of the same color as the rest, and the femora of only ordinary comparative strength, and the legs themselves shorter and weaker. \* \* \* The *palpi* are pale yellow. \* \* \* The *falces* \* \* \* are of a brownish yellow color with a broad rather oblique dark yellow-brown longitudinal stripe on the fore side. The *maxillae* are yellow-brown, paler at their extremities. The *labium* is also yellow-brown, palest at the apex. The *sternum* is \* \* of a pale yellow color. The *abdomen* is of a palish yellow hue; on the fore half of the upper side a clearer yellow elongate-oblong central marking is indicated by a dark-brown dentated marginal line, and terminates posteriorly with a short transverse curved dark-brown stripe, behind which, again, are two longitudinal curved dark-brown markings inclosing a circular area covered densely with white squamose hairs which extends forward also to the transverse stripe above described. The sides are marked with a few dark-brown spots and markings; and on each side of the fore extremity of the oblong central marking is a large patch of white squamose hair. In front, below the fore margin, are some coarse, bristly, black, upturned hairs. The spinnerets are of a blackish hue, tipped with pale yellowish. \* \* \* There is evidently some variety in the abdominal markings of this species, since in the other example before noted the upper side of the abdomen is generally suffused with dark blackish brown, showing faintly the longitudinal oblong central, yellowish marking on the fore part; the posterior and two anterior large patches of white squamose hairs however, are even more conspicuous in this than in the other example."

As we have no female of this species we translate the description given by L. Koch, *Arachniden Australiens*, p. 1076, T. xciv.

♀. The cephalothorax is brownish with a narrow, black marginal band which is broadened in some places and a brownish, interrupted longitudinal stripe on the lateral declivity; the space between the eyes black with faint, blue iridescence. A median longitudinal stripe composed of brilliant yellow hairs begins on the posterior declivity and extends to the front row of eyes; the remaining hair of the cephalothorax is white mixed with pale yellow. The hair-rings around the eyes of the first and second rows orange-yellow and white, those of the first row above and below orange-yellow, without and within white. Falces dark brown; maxillæ, labium and sternum dirty brownish-yellow. Palpi and legs pale yellow; femur of the palpus with a black longitudinal stripe before and behind. Femur of the first with a black longitudinal stripe in front, and two black spots behind; femur of the second with two black spots in front and behind; femora of the third and fourth with a black ring on the basal half, and a small black spot on the terminal half before and behind. Patellæ with a black spot before and behind. The tibiæ and metatarsi have a black ring at the base and the tarsi are suffused with black at the base. Abdomen black above, with white and pale yellow hairs; from the base to a point in front of the middle runs a longitudinal band covered with deep yellow hairs, back of this, and again just in front of the spinnerets, a long spot covered with similar hair; specimens in alcohol show also the following markings which almost disappear completely in the dry animal; from the end of the longitudinal band above mentioned two undulating pale bands run first to the sides and thence in an arc back to the base, enclosing a space which is covered with pale reticulating veinlets; the posterior half of the upper surface is marked with small blue spots and streaks; the spinnerets brownish-yellow suffused with black.

Cephalothorax about one-sixth longer than broad, considerably longer than patella and tibia of the fourth, high, abrupt on the posterior edge, falling almost perpendicularly, faintly convex on the lateral perpendicular declivity, above, only slightly arched as far as the third row of eyes, but from these strongly convex, dull, covered with short hairs; the median, longitudinal stripe with hair-shaped scales; lateral margin with long black bristles which project outward; one very long anteriorly directed bristle between the eyes to the first row; clypeus as high as the radius of an eye of the first row. Eyes in four rows; quadrangle of the eyes longer than broad, narrowed behind; eyes of the fourth row as far again from the lateral borders as from each other, overhung by the lateral walls of the cephalothorax.\* Eyes of the first row very large, close together and abutting on those of the second row; eyes of the second row placed above and slightly

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\* " . . . von der Seitenwand des Cephalothorax überragt."

projecting over those of the first, with their outer peripheries distant from one another by the diameter of one of the eyes of the first row. Eyes of the third row nearer to those of the second than to those of the fourth; those of the fourth smaller than those of the second row. Falces only a little longer than the breadth at the base, very glistening, smooth, slightly convex anteriorly, diverging on the inner side from the base. Maxillæ with outer and anterior margins straight, and inner margins also straight as far as the labium; the inner corners, consequently rather rectangular; the maxillæ are excavated along the labium; labium very short, broader than long, rounded anteriorly. Sternum cordate, slightly convex, dull, sparsely overgrown with projecting, long, yellowish hairs. Abdomen only slightly longer than broad, truncate in front, strongly convex laterally, acuminate toward the spinnerets, dull, covered with short adpressed and longer projecting hairs in many layers; the deep yellow markings formed by hair like scales. Legs short; femora convex above, underneath overgrown with long projecting hairs, with two spines above, those of the first pair with one spine above at the end. Tibiæ and metatarsi underneath beset with long spines. Spines of the patellæ, tibiæ and metatarsi of the third and fourth short. On tibiæ and metatarsi of the third and fourth above, long projecting hairs. Patella and tibia of the third as long as patella and tibia of the fourth; metatarsus and tarsus of the fourth longer than patella and tibia of the fourth.

*Habitat:* Tahiti, Upolu, Samoa.

#### GENUS EPEUS\* PECKHAM.

1876. *Evenus* Simon, Ann. Soc. Entomol. de France (5), pp. 58-59.

1885. *Epeus* Peckham, Genera of Fam. Attidæ, p. 334.

Cephalothorax rather elongated; thoracic part scarcely the longer, sensibly dilated and rounded; cephalic part plane, elevated behind, inclined in front, longer than wide; superciliary projections pronounced. Median anterior eyes very large, almost touching, occupying the entire width of the face; the lateral eyes much smaller, separated, placed further back, forming a second line. Dorsal eyes as large as the laterals, a little nearer together since the sides converge behind. Clypeus almost as wide as the radius of the median anterior eyes. Falces short, vertical, not ridged. Sternum scarcely wider than the intermediate coxæ. Labium twice as long as wide, rounded at the tip. Coxæ of the first separated by at least the width

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\* In 1885, in our work on the Genera of the Attidæ, we substituted the name *Epeus* for Simon's name *Evenus*, this latter being preoccupied. It seems very probable that *Epeus* and *Athamas* should form but one genus, but we have no specimen of *Epeus*, and are unable, from the description given by Simon, to decide the point. The generic and specific descriptions of *Epeus* are translated from Simon.

of the labium, of the same length as the others. Legs: 3, 1, 2-4, long, the three first pairs equal in thickness, the fourth more slender; patella and tibia of the first longer than the cephalothorax, tibia much longer than patella; patella and tibia of the fourth much longer than patella and tibia of the third, and more slender; metatarsus and tarsus of the fourth at least as long as patella and tibia; on the two first pairs two rows of very long inferior tibial and metatarsal spines; tibiæ and metatarsi of the two posterior pairs furnished with slender spines throughout their length. Tarsal claws long, regularly curved; the external one provided with a series of five broad, short, conical teeth; the internal one with ten teeth which are longer, more slender, equal, close together.

EPEUS TENER SIMON. 1876.

♀. Cephaloth.: length 3.6 mill., width 2.6 mill. Abd.: length 4.5 mill., width 1.5 mill. Legs: first 9 mill., second 8.4 mill., third 10 mill., fourth 8.4 mill.

White testaceous, with the circumference of the eyes black. Clypeus ornamented with thick, very white hairs. Cephalic square ornamented above with scaly pubescence of a brilliant, slightly gilded yellow, and on the sides with red pubescence. Abdomen bright red above, with two fine lateral yellow lines. Legs and palpi glabrous.

Malamoy, Bassilan Island (Philippine Islands).

GROUP III. SIMONELLII.

GENUS SIMONELLA PECKHAM.

Body long, slender, nodose. Cephalothorax more than twice as long as wide, convex above, constricted near the middle; thoracic part twice as long as cephalic. Eyes very unequal in size, placed in four transverse rows of two each, those of the anterior row nearly touching; quadrangle formed by the second and fourth rows of eyes, equally wide in front and behind or wider behind than in front, and wider than long. Eyes of the third row very small, sometimes halfway between the second and fourth rows, sometimes nearer the second than the fourth.

Legs slender, differing but little in thickness; relative length 4, 3, 1, 2.

Abdomen long and slender, sometimes constricted in the middle.



## SIMONELLA AMERICANA PECKHAM. 1885.

Plate XII, figure 4.

*Simonella americana* P., Proc. Nat. Hist. Soc. of Wisconsin, p. 24.

♂. Total length 8.5 mm. Width of abdomen 1.1 mm.

Length of cephalothorax 3.5 mm; width 1.4 mm; height 1.2 mm.

Legs 3.8, 3.6, 4, 5.3.

Cephalothorax nearly as high as wide; cephalic and anterior thoracic parts higher and more convex than the remaining portion of the thoracic, from which they are separated by a well-marked constriction; that part of the thorax posterior to the constriction is highest in the middle, and slants off to form the narrow pedicle by which it is united to the abdomen. The cephalic and anterior thoracic parts are jet black and glabrous; the posterior thoracic part is pale yellow. Eyes of first row more than twice as large as those of the second; second row wider than the first; third row nearer the second than the fourth; eyes of fourth row about as large as those of second and further apart.

Clypeus less than one-half as high as anterior eyes, retreating; ridged above; color black. Palpus black, long and slender, having on outer side of tibia a stout apophysis. Falces robust, narrowing toward the tip, long, vertical, slightly diverging; fang as long as the palpus, slender, yellowish black in color. Maxillæ yellowish black, half as long as palpus, more than twice as long as labium; widest at their extremities. Labium as wide as long, truncated at tip.

Sternum yellowish, long, truncated in front, narrowing to a point behind.

Legs with weak tibial and metatarsal spines on the first pair; second, third and fourth pairs unarmed. Patella and tibia of the third, shorter than patella and tibia of the fourth; metatarsus and tarsus of the fourth, shorter than patella and tibia of the fourth. Patella, tibia and metatarsus of the first black on the inner side; otherwise all the legs are yellowish with a darker shading toward the distal ends of those of the fourth pair. Abdomen made up of three parts, the middle part being a narrow neck which joins the anterior and posterior portions. The anterior is twice as long as the middle, and half as long as the posterior part.

*Habitat:* Guatemala.

This species was found running on the ground among leaf-cutting ants.

SIMONELLA MYRMECIÆFORMIS\* TACZANOWSKI. 1874.

Plate XII, figure 8.

*Janus myrmeciæformis* Tacz., Les Aranéides de la Guyane française, p. 94.

Eyes in four rows; cephalothorax in two parts, abdomen with a marked constriction in the middle; general color ochre yellow, four black spots on the head, two pale rings on the abdomen. Length ♂ 7 mm.

♂. The cephalothorax is very slender and much elongated, with the head a little longer than wide, distinctly separated by a marked constriction across the back and throughout the height of sides; the thoracic part considerably longer than the head, a little narrower and composed of three distinct portions of which the anterior represents a short slightly contracted neck, which is followed by a convex knob, behind which is a rather long pedicle which is more slender than the neck; the cephalic plate is lightly arched and inclined forward; the lateral contours of the head are arched; behind it is terminated by a facet with a gentle slope. Eyes in four rows, in a quadrangle a little longer than wide;† those of the first row very large, in contact, and occupying the entire height and width of the face; those of the second pair behind on the lateral border of the back at a considerable distance from the preceding ones, and directed upward; eyes of the third pair halfway between those of the second and fourth; external border of the anterior eyes in a straight line and parallel with those of the other pairs. Falces short, thick and vertical. Abdomen longer and more slender than the cephalothorax, strongly constricted in the middle so as to form three distinct parts, of which the anterior is cylindrical, almost horizontal, the second very slender and strongly bent and the posterior elliptical, of the same breadth, but much longer than the anterior, that is to say the whole resembles an S faintly bent and enlarged at the two extremities. The spinnerets are short. The legs are slender and of moderate length, in the order 4, 3, 1, 2. Palpi short, thicker than the legs, with the tibæ short and stouter than the femora. The body is entirely bare, only a few hairs being found around the anterior eyes, on the tarsi of the palpi, and some which are almost imperceptible on the legs.

*Coloration:* The general color is a pale ochre yellow; two large black spots are found on each side of the head at the base of the eyes, the anterior one of which extends between those of the second and third

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\*The descriptions of this species and of *lucasi* are translated from Dr. Taczanowski.

†This is true when the quadrangle is understood to include the first row of eyes; when we use the expression "quadrangle of the eyes" in relation to the *Lyssomanæ* (as in defining this genus) we refer to the quadrangle formed by the *second* and *fourth* rows of eyes.

pairs; two wide rings clearer than the general color are found around the abdomen, the first being in the middle of the anterior part, the second on the constriction. In the individual from Saint Laurent de Maroni the posterior part of the abdomen is grayish, much deeper than the rest of the body. The legs are of the color of the body but a little paler. The anterior eyes are amber yellow, the others blackish.

Two males from Cayenne and St. Laurent de Maroni; female unknown.

SIMONELLA LUCASII TACZANOWSKI. 1874.

Plate XII, figure 9.

Janus lucasii Tacz., Les Aranéides de la Guyane française, p. 96.

Eyes in four rows; cephalothorax in two parts, abdomen with a constriction near the base; color of cephalothorax reddish yellow; four black spots on the head; abdomen grayish. Length ♀ 4 mm.

- ♀. Cephalothorax slender and elongated, with the head square, distinctly separated from the thoracic part by a strong constriction, terminated behind by an inclined slope. The sides parallel and perpendicular; the thoracic part longer but not so wide as the head, is composed of a much contracted but short neck, followed by a globular knob, which is terminated behind by a short pedicle which is more slender than the anterior constriction. The eyes are in four rows, but are arranged a little differently from those of the preceding species; the ocular quadrangle is a little longer than wide;\* the anterior eyes are large, in contact, occupying the entire front of the vertical inclination of the face; the second pair is placed on the back behind the eyes of the first pair, but they are a little further from each other than the distance between the external borders of the first ones, and are directed sideways; the posterior eyes are larger, but are separated by the same distance as those of the second row, the eyes of the third pair halfway between the second and fourth. The palces are short, thick and vertical. The abdomen is of the same length as the cephalothorax, thicker, commencing by a short pedicle which appears to constitute a prolongation of that of the thoracic part; behind this it suddenly grows larger up to the middle of its length and then grows smaller again so as to terminate in a point. The legs are slender and not very long, in the order 4, 3, 1, 2. All the body is glabrous, with some sparse hairs, which are rather long on the upper part of the head, and on the posterior part of the back of the abdomen.

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\*The quadrangle is wider than long if the second row of eyes is taken as its anterior line. See note under preceding species.

*Coloration:* The color of the cephalothorax is reddish yellow, two black spots on each side of the head of which the anterior one includes the base of the eyes of the second and third pair. The abdomen is grayish yellow. The legs are pale yellow; the femora and the patellæ in the two posterior pairs are of a brownish gray, so as to form a wide clear ring at the origin of the leg. The anterior eyes yellow, the others black.

A single female from Uassa.

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DESCRIPTION OF PLATES.

PLATE XI.

1. *Lyssomanes antillanus*, palpus of ♂.
2. “ *unicolor*, palpus of ♂.
3. “ *viridis*, palpus of ♂.
4. “ *bi-tæniatus*, palpus of ♂.
5. “ *placidus*, palpus of ♂.
6. “ *miniaceus*, palpus of ♂.
7. “ *austerus*, palpus of ♂.
8. “ *tenuis*, palpus of ♂.
9. “ *jemineus*, palpus of ♂.
10. “ *nigro-pictus*, palpus of ♂.
11. “ *velox*, palpus of ♂.
12. “ *longipes*, palpus of ♂.
13. “ *robustus*, palpus of ♂.

PLATE XII.

1. *Lyssomanes amazonicus*, palpus of ♂.
2. *Asamonea gracilis*, palpus of ♂.
3. *Athamas whitmeei*, palpus of ♂ (after Keyserling).
4. *Simonella americana*, palpus of ♂.
5. *Asamonea tenuipes*, palpus of ♂.
6. *Lyssomanes viridis*, epigynum; 6a, eyes; 6b, falces of ♂.
7. *Lyssomanes robustus*, eyes.
8. *Simonella mymecieiformis*, cephalothorax (after Taczanowski).
9. *Simonella lucasii*, cephalothorax (after Taczanowski).
10. *Lyssomanes modestus*, epigynum.
11. *Athamas whitmeei*, epigynum (after Keyserling).

12. *Lyssomanes tristis*, epigynum.
13.       “       *blandus*, epigynum.
14.       “       *jemineus*, epigynum.
15.       “       *parallelus*, epigynum.
16.       “       *amazonicus*, epigynum.
17.       “       *austerus*, epigynum.
18. *Asamonea flava*, epigynum.
19.       “       *tenuipes*, epigynum; 19a, eyes; 19b, falces.
20. *Asamonea punctata*, epigynum.
21. *Lyssomanes unicolor*, epigynum.
22. *Asamonea ornatissima*, epigynum.

## O. M. CONOVER.

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BY WM. F. ALLEN.

In the spring of 1884, the Academy experienced the loss of one of its most valued members, in the death of Obediah Milton Conover, which occurred in London, April 29 of that year. He was at the time on his way home from a two years' sojourn in Greece and Germany. His remains were brought to this city, and were committed to the earth in Forest Hill Cemetery, on the 28th of May.

Dr. Conover was of Dutch origin, being the seventh in the line of descent from Jacob Wolfertson van Kouwenhoven, who came to this country at its first settlement, in company with the Patroon van Rensselaer. On what occasion the name was changed to its present form is uncertain. His mother, Sarah Miller, was of a Kentucky family. He was born in Dayton, Ohio, October 8, 1825; prepared for college in that city, and graduated at Princeton in 1844, afterwards studying theology in the same institution (graduating in 1849), without, however, entering the profession of the ministry. In the interval of two years between his graduation and his theological course, he taught school near Lexington, Ky., and in Dayton. While at Dayton he also studied law in the office of Gen. Robert C. Schenck; and this was the profession he finally adopted, being admitted to the Dafe county bar in 1859.

In 1849 he was married and came directly to Madison, where he resided the remainder of his life; his wife died in 1863. At first he was engaged in the publication of *The Northwestern Journal*, a literary and educational monthly, of which only a few numbers were published. In 1850 he was made professor of ancient languages in our University; an office which he held until 1858. It was the day of small things for the University, but no institution could be insignificant, or could fail to exert a strong and lasting influence, whose faculty consisted of three such men as Chancellor Lathrop, Professor Sterling and Dr. Conover. In 1859, as has already been said, he was admitted to the Dane County bar; two years later he became assistant reporter to the Supreme Court, and in 1864 was appointed reporter, which office he held until his death, a term of twenty years. During some years he held also the office of State Librarian. In 1879 he received from the University the degree of Doctor of Laws. In September, 1882, he was married to Mrs. Sarah Fairchild Dean, and they immediately went to Greece, where they spent the ensuing winter.

Mr. Conover was not a man of showy parts, and neither his disposition nor his taste led him to seek publicity. Besides this, in the later years of

his life the condition of his health did not permit him to undertake any but necessary routine labors. For these reasons he was seen but little except by his nearest friends, or in the performance of his public duties; and it was only those who were closely associated with him who were able to estimate him at his true worth. The community, however, did not fail to appreciate his high qualities. He was equally characterized by accuracy of information, soundness of judgment, and a high standard of conduct; and these qualities combined gave him an influence the strength and extent of which he was himself probably far from suspecting. It may be said that no man among us inspired more universal confidence, or was regarded with more universal esteem. Always courteous and unassuming, he was a man of strong convictions, and held to his opinions with great tenacity, although without intolerance.

In his public duties, as reporter to the Supreme Court, all his best intellectual qualities found room for exercise. His published reports, if I am rightly informed, rank among the best of their class. But while performing his professional duties faithfully and with high intelligence, he found his truest enjoyment in the study of literature — using this word in its highest significance. He was familiar with the best that has been said by the great creative minds of the world, and his fine taste and correct judgment were nowhere more marked than here. It was the chief happiness of his life that at its very close he was enabled to gratify this taste without stint, and in the most congenial companionship. The master spirits of Greek literature had always been his favorite writers; and the winter spent by him in Athens, where the American School of Classical Studies had just been established, brought him into direct and loving communion with the choicest memories of classical antiquity. Much as his friends in Madison regret that he was separated from them during the last two years of his life, they recognize that this experience was to him the greatest happiness that he could have wished. His relations to literature were, however, for the most part those of enjoyment and culture. He wrote very little himself, but that of a quality which one would wish to see more common. The members of the Madison Literary Club will remember with high appreciation the few papers which he read before them; and to most of us it was no doubt an unexpected, although by no means a surprising revelation, when he came to be known as being possessed of a poetic faculty, genuine, although rarely exercised.

As a member of our Academy there is little to be said of him. He had not the physical strength to do any work for it. I do not remember that he ever took an active part in its proceedings; but its members always felt it as a privilege and an honor to count him as one of themselves.

PROCEEDINGS OF THE ACADEMY SINCE DECEMBER, 1883.

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REPORT OF THE SECRETARY.

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FIFTEENTH REGULAR ANNUAL MEETING.

*Held at Madison, Wisconsin.*

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ROOMS OF WISCONSIN ACADEMY OF  
SCIENCES, ARTS AND LETTERS,  
CAPITOL, MADISON, WISCONSIN.

FIRST SESSION.

MONDAY EVENING, December 29, 1884.

The reports of President, Secretary and Treasurer were presented.

Messrs. Lamb, Allen and Blackstone were appointed a committee on Treasurer's report.

Dr. Hoy, Profs. Daniells and Sprague were appointed a committee on nominations for membership.

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SECOND SESSION.

December 30, 1884.

Academy met at 9 A. M.

The report of the Treasurer, showing a balance in the Treasury of \$742.38, was reported back from the Auditing Committee, and its adoption recommended. The report was adopted.

The following members were elected:

Mr. F. E. Short, Madison; Mr. G. H. J. Douglass, Madison; Prof. F. B. Power, Madison; Mr. Carl Doerflinger, Milwaukee; Prof. A. J. Rogers, Milwaukee.



Voted: That a credit of \$3.00 on his annual dues be allowed to Rev. S. D. Peet for his American Antiquarian for 1884.

Voted: That Prof. W. F. Allen be requested to prepare a memorial of Prof. O. M. Conover for the next volume of the Academy Transactions:

Dr. P. R. Hoy, of Racine, gave an interesting address on "How did the Indians make their stone implements?" The statements made by the doctor were somewhat startling to the gatherers of these ancient implements. Specimens of some of these very ancient implements were exhibited by the doctor, that had been made within the past six months, by a resident of our state, and not an Indian either.

Rev. S. D. Peet, of Clinton, addressed the Academy on recent investigations of the Indian mounds in this section of the state, particularly near the banks of Lakes Koshkonong and Mendota.

Mr. Peet also read a paper on the "Antiquity of Man in America," and the conclusion reached was that those who claimed the great antiquity of man in America had failed to prove their claims, and that the whole matter was still an open question.

The discussion of the question was continued by Prof. Birge, Dr. Hoy and Prof. Irving.

Prof. W. F. Allen read a paper on the "Changes in the Local Condition of the English Serfs during the Feudal Period."

#### AFTERNOON SESSION.

The first paper read was by Dr. P. R. Hoy, of Racine; on "Science and Society." The discussion of the subject was continued by Prof. J. S. Butler, Prof. E. A. Birge, Prof. Hoy, Prof. Peckham, Rev. S. D. Peet, and Prof. W. W. Daniells.

Prof. L. Heritage read an interesting paper "On the Date of the Dialogus de Oratoribus." The question was further discussed by Prof. W. F. Allen, Prof. E. S. Holden, Prof. Heritage and Prof. Butler.

Prof. C. A. Van Velzer gave an address on the "The Rapid Decomposition of Rotinal Fractions."

The question of the organization of affiliated societies came up for consideration, and was discussed by Prof. Birge, Prof. Peckham, Prof. Sprague, Prof. W. F. Allen, Prof. E. G. Smith, Dr. Hoy, Rev. S. D. Peet, Prof. Holden, A. O. Wright and Prof. Van Velzer.

Before acting upon the matter the meeting adjourned until 8 o'clock in the evening.

EVENING SESSION,

Academy called to order by Prof. T. C. Chamberlin, Vice-President.

The president, Prof. R. D. Irving, addressed the Academy on the subject of Geology in a most able and interesting manner.

The Academy then proceeded to the election of officers for the ensuing three years, which resulted as follows:

President — Prof. T. C. Chamberlin, Beloit.

Vice Presidents —

Department of Sciences — Prof. G. W. Peckham, Milwaukee.

Department of Arts — Prof. A. R. Sprague, Racine.

Department of Letters — Prof. W. F. Allen, Madison.

Secretary — Prof. E. A. Birge, Madison.

Treasurer — S. D. Hastings, Madison.

Curator of the Cabinet — Prof. C. R. Van Hise, Madison.

Librarian — Prof. E. A. Birge, Madison.

The matter of affiliated societies was again taken up and settled by the adoption of the following: Any local, scientific or literary society may apply for affiliation with the Academy, submitting its constitution, etc., to the inspection and approval of the Academy. If affiliated, it may propose for membership in the Academy such of its members as it shall select. These persons will be considered as nominated for membership in the Academy, and, if elected, will be entitled to all privileges of regular members. The society shall pay to the Academy one-half of the regular annual dues of the Academy for each person so elected, and will be entitled to as many copies of future volumes of the trans-

actions of the Academy as it contains members of the Academy. In case of the discontinuance of a local society, these persons can continue as members of the Academy on payment of the regular dues.

A list of the officers, and the names of the members and a copy of the minutes of the meetings of affiliated societies shall be forwarded to the Academy, and the whole or such portion as the council shall think best shall be published in the report of the transactions of the Academy.

SIXTEENTH REGULAR ANNUAL MEETING

Held at Madison, Wisconsin.

FIRST SESSION.

ROOMS OF THE AGRICULTURAL SOCIETY,

MONDAY, December 28, 1885, 8 P. M.

President T. C. Chamberlin in the chair.

The report of the Treasurer was read as follows:

Balance at opening of year.....	\$742 38
Receipts.....	92 00
	<hr/>
	\$834 38
Payments.....	48 30
	<hr/>
Balance, December 29, 1885.....	<u><u>\$786 08</u></u>

Referred to committee consisting of Prof. Butler, Prof. Peckham, and Prof. Salisbury.

Professors Allen, Van Hise and Higley were appointed a committee on new members.

Professors E. S. Holden and Wm. Trelease having removed from the state were made corresponding members.

SECOND SESSION.

TUESDAY, December 29th, 9 A. M.

Paper: "On Darwin," Prof. E. A. Birge.

Paper: "The Village Community and Serfdom in England," Prof. W. F. Allen.

THIRD SESSION.

TUESDAY, 2 P. M.

Paper: "Overproduction," Pres. A. L. Chapin.

Paper: "James Bridges," Prof. J. D. Butler.

The Treasurer's report was, on report of auditing committee, approved.

E. Simon, of Paris, France, was made an honorary member.

Annual members elected:

H. W. Hilyer, Madison; H. H. Powers, Madison; L. M. Hoskins, Madison; M. A. Miner, Green Lake; Prof. A. W. Burr, Beloit; C. E. Eschweiler, Milwaukee.

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FOURTH SESSION.

TUESDAY, 8 P. M.

One hundred dollars was appropriated for cuts.

One hundred dollars was appropriated for library.

President's address:

Paper: "Drift Phenomena of Dakota, Montana, Idaho, and Washington Territories."

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FIFTH SESSION.

WEDNESDAY, December 30, 9 A. M.

Prof. A. R. Sprague in chair.

Paper: "Principles of Hydraulics not yet incorporated in Water Wheels," D. P. Blackstone.

Paper: "Northern Pitcher Plant," W. K. Higley.

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SIXTH SESSION.

WEDNESDAY, 2:30 P. M.

Paper: "Process of Determining Nitrogen," H. P. Armsby.

SEVENTEENTH REGULAR ANNUAL MEETING,

*Held at Madison, Wisconsin.*

ACADEMY ROOMS, CAPITOL BUILDING,

DECEMBER 28, 1886, 8 P. M.

Reports of President and Secretary were given verbally.

Treasurer's report:

Balance at commencement of year.....	\$786 08
Receipts.....	60 00
Interest.....	40 00
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	\$886 08
Expenditures .....	132 94
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	\$753 14
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Examined by auditing committee, found correct, and adopted on report of committee.

WEDNESDAY, 10:00 A. M.

“The Basal Conglomerate of the Huronian,”

Professor R. D. Irving, - - - Madison.

“Constitution of the Residuary Clays,”

Professor R. D. Salisbury, - - - Beloit.

“Glacial Phenomena about the Head of Lake Michigan,”

President T. C. Chamberlin, - - - Beloit.

2:30 P. M.

“Boulder Trains of Dodge, Dane and Rock Counties,”

Professor I. M. Buell, - - - Madison.

“Disinfection,”

Professor F. B. Power, - - - Madison.

“Science and Society,”

Dr. P. R. Hoy, - - - Racine.

“The Genesis of the Town,”

Professor W. F. Allen, - - - Madison.

7:30 P. M.

“Limitations of Political Economy,”

President John Bascom, - - - Madison.

“The Methods of Science,”

Professor J. J. Blaisdell, - - - Beloit.

Dr. Chapin and Prof. Allen were appointed a committee on new members.

Business.

Elected to membership:

Prof. T. B. Pray, Whitewater; Prof. J. J. Blaisdell, Beloit; Dr. C. O. Whitman, Milwaukee; Mr. E. P. Allis, Jr., Milwaukee; Mr. Chas. A. Carr, Madison; Mr. C. H. Sylvester, Boscobel.

*Resolved*, That the President and Curator be directed to provide for the proper care of the type set of fossils in the possession of the Academy.

*Resolved*, That the thanks of the Society be tendered to the Governor of the State, for the room which the State has given the Academy, in the Capitol Building.

EIGHTEENTH REGULAR ANNUAL MEETING,

*Held at Madison, Wisconsin.*

SENATE CHAMBER,  
DECEMBER 29, 1887, 8 P. M.

President Chamberlin in the chair.

The reports of the officers were made, and that of the Treasurer was referred to the usual auditing committee.

Professors Wright, Pray, and Birge were appointed a committee on nomination of officers.

President T. C. Chamberlin then gave an address on "The Origin of the Extra-Moraine Drift."

Prof. W. F. Allen read a memorial of the late Dr. O. M. Conover.

Officers for the term of three years were then elected as follows:

President—W. F. Allen, Madison.

Vice-Presidents—Department of Sciences, F. H. King, River Falls; Department of Arts, A. J. Rogers, Milwaukee; Department of Letters, J. J. Blaisdell, Beloit.

Librarian—E. A. Birge, Madison.

Treasurer—Hon. S. D. Hastings, Madison.

Curator—C. R. Van Hise, Madison.

The election of Secretary was postponed for one day.

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FRIDAY, December 30, 9 A. M.

The following persons were elected to membership:

Prof. C. R. Barnes, Prof. S. J. Browne, Prof. J. W. Stearns, Prof. G. C. Comstock, Prof. W. A. Henry, Dr. J. M. Dodson, Dr. H. B. Favill, R. G. Thwaites, F. J. Turner, L. M. Hoskins, F. G. Short, F. W. A. Woll, all of Madison; G. H. Balg, Mayville; Pres. E. D. Eaton, Beloit; Prof. J. R. Emery, Ft. Atkinson; Emory McClintock, Milwaukee; C. E. McLenegan, Milwaukee; W. H. Metcalf, Milwaukee; Dr. N. Senn, Milwaukee; Dr. J. T. Reeve, Appleton; Prof. J. W. Stump, Whitewater.



On motion, the report of the Auditing Committee, recommending the acceptance of the Treasurer's report, was adopted.

Professor W. F. Allen read a paper:

The Economic Disturbance in Rome, A. D. 33.

Professor Lucius Heritage on the reading:

*Aliquid Quam* in Tacitus De Oratoribus.

Professor J. D. Butler:

The Imagery of Dante.

The retiring Secretary, E. A. Birge, was made a life member.

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FRIDAY, 2:30 P. M.

Papers.

Professor J. E. Davies:

Interpretation of certain Symbolical Facts in Mathematical Physics.

Also:

A Possibly New View of the Nature of the Electric Current.

Professor E. A. Birge:

Certain Zoogloaeas described by Prof. Wm. Trelease.

Prof. G. W. Peckham, of Milwaukee, was elected Secretary.

Voted: That the Academy express its interest in the studies of Prof. W. K. Higley, of Chicago on "The Distribution of plants in Wisconsin."

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FRIDAY, 8 P. M.

Papers read:

"Terminal Moraines in North Germany,"

Prof. R. D. Salisbury.

"The Raised Beaches of Lake Michigan,"

Mr. Frank Leverett.

Voted: That the expenses for the ensuing year be regulated by the council.

Adjourned *sine die*.

E. A. BIRGE,

*Secretary.*

# WISCONSIN ACADEMY OF SCIENCES, ARTS AND LETTERS.

## LIFE MEMBERS.

Birge, Prof. E. A.  
Case, Hon. J. I.  
Dewey, Hon. Nelson  
Delaplaine, Gen. Geo. P.  
Davies, Prof. J. E.  
Hill, James L.

Hoyt, Hon. John W.  
Lawler, Hon. John  
Mitchell, Hon. John L.  
Paul, Hon. Geo. H.  
Thorpe, Hon. J. G.

## CORRESPONDING MEMBERS.

Cavenor, Rev. Chas.  
Fallows, Bishop Samuel  
Holland, Rev. F. May  
Holden, Prof. E. S.  
Knapp, Judge J. G.

Peet, Rev. S. D.  
Steele, President G. M.  
Sawyer, Prof. W. C.  
Shipman, Col. S. V.  
Trelease, Prof. Wm.

## ACTIVE MEMBERS.

Allen, Prof. W. F.  
Armsby, Prof. H. P.  
Balz, Prof. G. H.  
Barnes, Prof. C. R.  
Blaisdell, Prof. J. J.  
Burr, Prof. A. W.  
Beatz, Hon. Henry  
Buell, Prof. Ira M.  
Bartlett, Dr. Edwin W.  
Butler, Prof. J. D.  
Beach, Prof. W. H.  
Blackstone, Prof. D. P.  
Conover, Mrs. Sarah F.  
Cass, Prof. J. E.  
Chapin, President A. L.  
Chamberlin, Pres. T. C.  
Carr, Chas. F., Esq.  
Chandler, Prof. C. H.  
Desmond, H. J., Esq.  
Danley, Prof. J. H.  
Draper, Hon. Lyman C.  
Daniells, Prof. W. W.  
Doyle, Hon. Peter  
Day, Dr. F. H.  
Emerson, Prof. Joseph  
Fiske, Prof. E. O.  
Foye, Prof. J. E.  
Frankenburger, Prof. D. R.  
Gordon, Mrs. Geo.  
Greene, Thomas A., Esq.

Hutchinson, Hon. B. E.  
Hastings, Hon. Sam. D.  
Heritage, Prof. Lucius.  
Hoy, Dr. P. R.  
Holton, Hon. E. D.  
Higley, Prof. W. K.  
Hillyer, Prof. H. W.  
Hoskins, Prof. L. M.  
Kerr, Prof. Alex.  
King, Prof. F. H.  
Lamb, F. J., Esq.  
Lapham, Mary J.  
Morgan, Prof. D. H.  
Morris, W. A. P., Esq.  
Meacham, Dr. J. G., Sr.  
Meacham, Dr. J. G., Jr.  
Marks, Solon, M. D.  
Maxon, Rev. H. D.  
Nader, Capt. John  
Mills, Hon. Simeon  
Norton, R. G., Esq.  
Orton, Hon. H. S.  
Olin, Mrs. D. A.  
Perkins, Prof. H. B.  
Peckham, Prof. G. W.  
Parkinson, Prof. J. B.  
Pray, Prof. T. B.  
Power, Prof. F. B.  
Rogers, A. J., Esq.  
Smith, Prof. E. G.

ACTIVE MEMBERS—Continued.

Smeiding, Prof. Henry E.	Van Velzer, Prof. C. A.
Sprague, Prof. A. R.	Van Hise, Prof. C. R.
Salisbury, Prof. R. D.	Whitford, Hon. W. C.
Sylvester, Prof. C. H.	Wright, Prof. A. O.
Stump, Prof. J. W.	Weyburn, Prof. L. A.
Somers, Rev. A. N.	Wheeler, Prof. W. M.
Tatlock, Prof. John, Jr.	Whitman, Prof. C. O.
Viebahn, Prof. C. F.	Young, Rev. A. A.

