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ANNALS

OF THE

NEW YORK ACADEMY OF SCIENCES,

VOLUME IX.

I.—*The Craspedosomatidæ of North America.*

BY O. F. COOK AND G. N. COLLINS.

Read October 7, 1895.

Introductory Note on the Families of Diplopoda.*

Since the completion of the paper on North American Craspedosomatidæ many dissections and drawings of representatives of other families of Diplopoda have been made, resulting in the apprehension of more light on the affinities of the group here treated. Among the forms studied are Striaria, Stemmatoiulus, Cambala, Cambalopsis, Nannolene, Pseudonannolene, Lysiopetalum, Pæromopus, Siphonophora, Siphonotus, Siphonorhinus, Spirostreptus, Spirobolus, Paraiulus, Pseudoiulus, and numerous representatives of the Polydesmoidea. The result of this examination is opposed to the opinion of Pocock, Latzel and Berlese, that the present family is allied most closely to the Iulidæ. It seems more reasonable to place the Craspedosomatidæ next to the Polydesmidæ and to arrange the families of Diplopoda as follows:

Class **DIPLOPODA.**

Subclass **PSELAPHOGNATHA.**

Order **Ancyrotricha.**

Family Polyxenidæ,—genera Polyxenus and Lophoproctus.
Distribution: Cosmopolitan.

* By O. F. Cook.

Order **Lophotricha.**

Family PALÆOCAMPIDÆ,—genus Palæocampa.

Distribution: A fossil from the carboniferous Mazon Creek beds, Illinois.

Subclass **CHILOGNATHA.**

Order **Oniscomorpha.**

Suborder GLOMEROIDEA.

Family GLOMERIDÆ,—genera, Glomeris, Latzelia (preoccupied by a fossil chilopod.)

Distribution: Europe, Asia and North Africa.

Family GERVAISIIDÆ,—genus Gervaisia.

Distribution: Europe.

Suborder ZEPHRONIOIDEA.

Family ZEPHRONIIDÆ,—genera Zephronia, Sphæropœus, Sphærotherium.

Distribution: South Africa and Southern Asia.

Order **Limacomorpha.**

Suborder GLOMERIDESMOIDEA.

Family GLOMERIDESMIDÆ,—genus Glomeridesmus.

Distribution: South America and the West Indies.

Family ZEPHRONIODESMIDÆ,—genus Zephroniodesmus.

Distribution: Sumatra.

Order **Colobognatha.**

Suborder POLYZONOIDEA.

Family POLYZONIIDÆ,—genera Polyzonium, Platyzonium, type *P. getschmannii* (Cryptodesmus getschmannii Karsch.)

Distribution: North temperate regions of both hemispheres.

Family SIPHONOTIDÆ,—genera, Bdellotus, type *B. formosus* (Siphonotus formosus, Pocock), Rhinotus, type *R. africanus* (Siphonotus africanus, Cook), Siphonotus.

Distribution: Tropics of both hemispheres.

This and the previous family may constitute a superfamily Polyzonoidæ, equivalent to the superfamily Siphonophoroidæ:

Family SIPHONOPHORIDÆ,—genera Bactrois, type *B. vittatus* (Siphonophora vittata, Pocock), Siphonophora.

Distribution: Tropics of both hemispheres.

Family SIPHONORHINIDÆ,—genus Siphonorhinus.

Distribution: Tropics of both hemispheres.

Suborder PLATYDESMOIDEA.

Family PLATYDESMIDÆ,—genera, Androgonathus, Brachycybe, Dolistenus, Platydesmus, Pseudodesmus.

Distribution: North America, Europe and Asia.

Suborder SIPHONOCRYPTOIDEA.

Family SIPHONOCRYPTIDÆ,—genus Siphonocryptus.

Distribution: Sumatra.

Order **Monocheta.**

Suborder STEMMATOIULOIDEA.

Family STEMMATOIULIDÆ,—genus Stemmatoiulus.

Distribution: Tropics of both hemispheres.

Suborder XYLOIULOIDEA.

Family XYLOIULIDÆ,—genus Xyloiulus (*Xylobius* Dawson).

Distribution: A fossil from the Sigillarian stumps of the carboniferous beds of Nova Scotia.

Order **Merocheta.**

Suborder LYSIOPETALOIDEA.

Family LYSIOPETALIDÆ,—genera, Callipus, Megastrephon, Eurygyrus, Lysiopetalum, Spirostrephon.

Distribution: North Temperate Zone.

Suborder CRASPEDOSOMATOIDEA.

Family CRASPEDOSOMATIDÆ,—genera, Aporogona, type *A. crenulata* (Craspedosoma crenulatum, Latzel), Atractosoma, Attemsia, type *A. stygia* (Latzel), Aulacosoma, Bactropus, Basigona, type *B. athesina* (Fedrizzi), Bomogona, type *B. lombardica* (Brolemann), Branneria, Chelogona, type *C. carpathica* (Latzel), Caseya, Chordeuma, Cleidogona,* Conotyla, Craspedosoma, Grypogona, type *G. latzeli* (Atractosoma latzeli, Verhœff), Haasia, Haplogona,† type *H. oculodistincta* (Verhœff), Mastigona,† type *M. mutabilis* (Latzel), Melogona, type *M. rhenana* (Chordeuma gallicum var. rhenanum, Verhœff), Mycogona, type *M. germanica* (Chordeuma germanicum, Verhœff), Nanogona, type *N. polydesmoides* (Leach), Ochogona, type *O. pusilla* (Atractosoma pusillum, Verhœff), Phanogona, type *Ph. bohemica* (Rosicky), Pseudotremia, Rhiscosoma, Scoterpes, Trachygona,‡ Trichopetalum, Underwoodia, Xiphogona,† type *X. flavescens* (Latzel), Zygonopus.

Distribution: North Temperate regions and New Zealand.

*Cleidogona is proposed for Cryptotrichus Packard, preoccupied in Coleoptera.

† These three names take the places respectively of Latzelia, Poratia and Haasea, proposed by Verhœff in recent numbers of the Zoölogischer Anzeiger, but all preoccupied in Diplopoda,—Latzelia twice.

‡ For Trachysoma, recently proposed by Attems but preoccupied in Crustacea.

Family HETEROCHORDEUMIDÆ,—genera Heterochordeuma, Pocockia.

Distribution: Ceylon and Sumatra.

Family STRIARIIDÆ,—genus Striaria.

Distribution: Temperate North America.

Suborder POLYDESMOIDEA.

Family AMMODESMIDÆ,—genera Ammodesmus Doratodesmus (*Doratonotus* Pocock, pre-occupied).

Distribution: Tropical Africa and Asia.

Family AUGODESMIDÆ,—genera Augodesmus, Euryurus, Polylepis.

Distribution: Tropical America.

Family CAMPODESMIDÆ,—genera Campodesmus, Cyrtodesmus.

Distribution: Tropical Africa and America.

Family CHELODESMIDÆ,—genera Chelodesmus,* Leptodesmus, Odontopeltis, Odontotropis, Priodesmus, Rhachodesmus (*Rhachis*, is pre-occupied), Strongylodesmus.

Distribution: Tropical America.

Family CRYPTODESMIDÆ,—genera Aporodesmus, Cryptodesmoides, Cryptodesmus, Poratia, Trichopeltis.

Distribution: Tropics of both hemispheres.

Family CYCLODESMIDÆ,—genus Cyclodesmus.

Distribution: Tropical America. There seems to be little ground for supposing that the Malayan genus Doratonotus is related to the Mexican genus Cyclodesmus.

Family GOMPHODESMIDÆ,—genera Astrodesmus, Aulodesmus, Gomphodesmus, Harmodesmus, Marptodesmus, Sphenodesmus, Tycodesmus.

Distribution: East Tropical Africa.

Family HAPLODESMIDÆ,—genus Haplodesmus (*Haplosoma* Verhœff, pre-occupied).

Distribution: Amboina.

Family ONISCODESMIDÆ,—genera Cyphodesmus, Oniscodesmus, Sphæriodesmus.

Distribution: Tropical America.

Family OXYDESMIDÆ,—genera Anisodesmus, Isodesmus, Mimodesmus, Orodesmus, Oxydesmus, Scytodesmus, Tylodesmus.

Distribution: Tropical Africa.

* Pores 13, on segments 5, 7, 9, 10–19, latero-inferior; sternum of fifth segment of male with four processes, that of the sixth with two; male legs with a large process from the apex of the penultimate joint. Type *Chelodesmus marxii*, U. S. National Museum.

Family PARADOXOSOMATIDÆ,—genera Paradoxosoma, Trachydesmus.

Distribution: Corfu.

Family PHATYRRHACHIDÆ,—genera Acanthodesmus, Odontodesmus, Platyrrhacus, Trachelodesmus.

Distribution: Tropics of both hemispheres.

Family POLYDESMIDÆ,—genera Brachydesmus, Chætaspis, Goniodesmus, type *G. fissilobus* (Polydesmus fissilobus, Brolemann), Polydesmus, Scytonotus.

Distribution: Temperate Europe, Asia and North America.

Family STRONGYLOSOMATIDÆ,—genera Anoplodesmus, Centrodesmus, Cnemadesmus, Cylindrodesmus, Eudasypeltis, Icosidesmus, Iulidesmus, Ophiodesmus, type *O. verhœffi* (Strongylosomum verhœffi, Brolemann), Orthodesmus, Prionopeltis, Rhachidomorpha, Strongylosoma, Tetracentrosternus, Trogodesmus.

Distribution: Cosmopolitan, mostly Tropical.

Family STYLODESMIDÆ,—genera Cynedesmus*, Lophodesmus, Pyrgodesmus, Stylodesmus.

Distribution: Tropics of both hemispheres.

Family XYSTODESMIDÆ,—genera Eurydesmus, Fontaria, Pachydesmus, type *P. crassicutis* (Wood), Rhysodesmus, type *R. limax* (Sauss.), Stenodesmus, Xystodesmus, type *X. martensii* (Peters).

Distribution: North America and Eastern Asia.

Order **Diplocheta.**

Suborder SPIROSTREPTOIDEA.

Family SPIROSTREPTIDÆ,—genera Alloporus, Archispirostreptus, Ctenoiulus, Odontopyge, Plusioporus, Rhynchoproctus, Spirocyclistus, Spiropœus, Spirostreptus, Thyropygus.

Distribution: Tropics of both hemispheres and South Africa.

Family TRACHYSTREPTIDÆ,—genera Trachystreptus, type *T. cambaloides*,† Lophostreptus, type *L. magnus* (Karsch).‡

Distribution: Tropical Africa.

* Type *Cynedesmus formicola*, U. S. National Museum; the genus also includes *C. ornamentatus* (Cryptodesmus ornamentatus, Karsch).

†*Trachystreptus cambaloides* sp. n.—Nearly black; antennæ strongly clavate, lying in lateral concavities of the first segment; head, first and last segments closely punctate; other segments with numerous irregular cariniform longitudinal ridges. Segments 37–39. Length 25 mm.; width 2.2 mm. Habitat, Liberia.

‡ I have examined the type of *Glyphiulus magnus* Karsch, in the Berlin Museum.

Suborder CAMBALOIDEA.

Family PSEUDONANNOLENIDÆ,—genus Pseudonannolene.

Distribution: South America.

Family NANNOLENIDÆ,—genera Nannolene, Iulomorpha.

Distribution: Western North America and South Africa.

Family CAMBALIDÆ,—genus Cambala.

Distribution: Eastern North America.

Family CAMBALOPSIDÆ,—genera Cambalomorpha, Cambalopsis, Glyphiulus, Trachyiulus, Trichocambala.

Distribution: Southern Asia.

Family ARCHIIULIDÆ,—genera Archiiulus, Archicambala, type *A. dawsoni* (Xylobius dawsoni, Scudder).

Distribution: Fossils from the Sigillarian stumps of the carboniferous beds of Nova Scotia.

Suborder IULOIDEA.

Family IULIDÆ,—genera Allaiulus, Anaulaciulus, Brachyiulus, Chromatoiulus, Cryptoiulus, Cylindroiulus, Diploiulus, Hemipodoiulus, Iulus, Mesoiulus, Micropodiulus, Pachyiulus, Palæoiulus, Tachypodoiulus, Typhloiulus, Unciger, Xestoiulus.

Distribution: North Temperate Zone.

Family PARAIULIDÆ,—genera Paraiulus, Pseudoiulus, Ptyoiulus, type *P. pennsylvanicus* (Brandt).

Distribution: Temperate North America.

Family PÆROMOPIDÆ,—genus Pæromopus.

Distribution: California.

Family BLANIULIDÆ,—genus Blaniulus.

Distribution: Europe.

Family ISOBATIDÆ,—genus Isobates.

Distribution: Europe and Temperate North America.

Suborder SIPHONOIULOIDEA.

Family SIPHONOIULIDÆ,—genus Siphonoiulus.*

Distribution: Sumatra.

*This most remarkable form is probably worthy of ordinal rank and might be called Rhinognatha. The absence of legs from the third and fourth segments indicates want of affinity with the Colobognatha, while the form of the head and antennæ will doubtless exclude it from the Diplocheta.

Order **Anocheta.**

Suborder SPIROBOLOIDEA.

Family SPIROBOLIDÆ,—genera Acanthiulus, Rhinocricus, Spirobolellus Spirobolus, Thyroproctus, Trigoniulus.

Distribution: Tropics of both hemispheres.

Subclass **ARCHIPOLYPODA.**

Family EUPHOBERIDÆ,—with numerous genera.

This group is an assemblage of widely different fossil forms, some of which will probably prove to be true Chilognatha; thus the genus Amnilyspes bears striking resemblance to certain genera of Polydesmoidea. The species of Euphoberia and Acantherpestes, however, are types apparently very distinct from the Chilognatha. The six dorsal setæ are located as in Craspedosomatidæ, while the setæ and unpaired seminal duct are both present in Stemmatoiulus, the representative of an order equal in antiquity to the Archipolypoda, so that the derivation of the Chilognatha from the Archipolypoda is not indicated by present evidence, though a common origin is most probable.

The orders and families of Chilognatha are in need of careful description which will make the labor of characterizing species and genera less difficult. In all the suborders, except the Polydesmoidea, the assignment of the genera to the different families is made with some confidence. The classification of the Polydesmoidea is in a backward state, owing to the fact that the older writers neglected many of the more important characters and the arrangement of some of the genera may prove to be more or less artificial and provisional.

The character which during our study of the Craspedosomatidæ we supposed to be unique among recent Diplopoda—the dorsal setæ—is shared by Stemmatoiulus, which has even the curious setiferous papillæ of the last segment, though there are four in Stemmatoiulus, and only two in Craspedosomatidæ. The co-existence in Stemmatoiulus of pores and setæ show that the presence or absence of either of these structures is not of itself evidence of close affinity or wide diversity. The supposition that the spines are in some way a substitute for the repugnatorial apparatus is also shown to have no foundation.

The presence of external seminal ducts in Iulidæ and their absence in Craspedosomatidæ is at once an important and an easily

stated diagnostic character, and has been used in the following synopsis of orders. So various are the adaptations of legs in different parts of the body to assist in copulation, that the weight of the principal distinction on which the group Oniscomorpha rested has its relative importance somewhat diminished. Others of its characters are evidently coördinations with its habit of rolling into a sphere, and are not necessarily to be interpreted as evidences of a diversity of origin.

Synopsis of Orders of CHILOGNATHA.

Body composed of not more than 13 distinct segments; male copulatory organs several-jointed, situated at the posterior end of the body.
Order **Oniscomorpha**

Body composed of at least 19 segments.
Males with the legs of the seventh segment unmodified; external seminal ducts long, divaricate, beset with whorls of setae...Order **Limacomorpha**
Males with one or both pairs of legs of the seventh segment transformed into copulatory organs.
Males with eight pairs of legs in front of the 4-5-jointed copulatory organs, which replace the posterior pair of legs of the seventh segment and the anterior pair of the eighth; segments 1–5 each with a single pair of legs.....Order **Colobognatha**
Males with seven pairs of pre-copulatory legs; copulatory organs not more than 2-jointed, replacing one or both pairs of legs of the seventh segment.
External seminal apertures appearing as perforations of the coxæ of the second pair of legs.....Order **Merocheta**
Coxæ of second male legs imperforate.
Labrum with a median sinus; segments 1–5 with one pair of legs each; external seminal ducts wanting, the apertures located at the base of the second pair of legs.....Order **Anocheta**
Labrum with a median tooth; segment 3 or 4 footless; external seminal ducts present.
Pleuræ entirely obliterated; legs 7-jointed; external seminal apertures through paired, unjointed; external ducts inserted at the base of the second male legs.....Order **Diplocheta**
Pleuræ nearly free; legs 8-jointed; external seminal aperture single, through a 2-jointed external duct inserted at the base of the second male legs.....Order **Monocheta**

NOTES ON SPECIMENS AND TYPES.

As Lysiopetalidæ and Chordeumidæ the American species of this family have been subject to more revision than those of any

other. We concluded, however, after attempting a study of the forms occurring in central New York, that more complete descriptions of the known species would be necessary for their identification and an understanding of their generic relationships. Especially undesirable would be the projection of the new species into the existing confusion.

Through the kindness of Drs. Riley and Gilbert we were permitted to examine the types in the National Museum and the collection of the University of Indiana. These, with our own collection, gave us examples of nearly all the described species.

Unfortunately the types of the species described by Wood, Packard, Cope, Ryder and Harger are not accessible, and may be no longer in existence. Drs. Cope and Ryder expressed their regret at being unable to assist us, as their specimens could not be found. Dr. Packard favored us with a vial of specimens of Pseudotremia and stated that his material may have been deposited in the Museum of Comparative Zoölogy, at Cambridge. Owing to the illness of Dr. Hagen we could not get access to the specimens, nor ascertain whether they are in the Museum. The Museum of the Philadelphia Academy of Sciences contains but one species of this family, a Cryptotrichus, but not Wood's type.

A study of the material at hand soon showed us that we had entirely underestimated our task; it purported to consist of twelve of the fourteen species then known, but from it we have been compelled to erect seven additional species. Collections made by ourselves added four more, and when this paper was nearly finished Captain Casey presented a bottle of California Myriapoda among which we found still another novelty, increasing to twenty-eight the number of species known from North America. From this it may be inferred that many species are still to be discovered, especially since the distribution is usually very local. Individuals are scarce, and require the most careful collecting in very moist habitats where species of other families are not commonly found, and which are therefore not visited except in special quests for Craspedosomatidæ.

Our thanks are due to Mr. R. Innes Pocock, of the British Museum, for many kindnesses in the way of opportunity of examining the collections under his charge, and for specimens of European Craspedosomatidæ which have enabled us to verify our opinion of their generic distinctness from American forms.

Notes on Habits and Structure.

The habits of living Craspedosomatidæ show considerable difference from those of other families, and emphasize the importance of some structural characters which have, we think, not received proper weight in classification.

Reference is made chiefly to Trichopetalum,* which on account of its abundance, small size and transparent exo-skeleton is well suited for observation. But so much alike are all the members of this family, that there is probably little difference with regard to considerations of habits or structure, with the exception of lack of eyes in cave forms.

In central New York Trichopetalum is one of the most common and generally distributed of Diplopoda, though liable to be overlooked on account of its small size. Like the other members of this family it inhabits rather wet places, but does not seem particular in other respects, living among mosses and rotting leaves, and under sticks and pieces of bark.

When undisturbed the gait of Trichopetalum is quite leisurely, but when frightened it never attempts to protect itself by coiling up, relying on its powers of flight. This course is warranted by the fact that the Craspedosomatidæ are more fleet of foot than other Chilognatha, though some species of Iulidæ are able to progress at a very respectable pace. It is also noteworthy that the fleeter species of Iulidæ (Paraiulus) are not inclined to coil up when frightened, but attempt to run, and even when captured and held they do not at first employ the ruse of coiling up and feigning death, but attempt to escape by vigorous wriggling. All Iulidæ seem, however, to have the power of coiling up, and will sooner or later exercise it for protection.

The ability to coil up depends on a certain form and structure of the segments. The dorsal part must be longer than the ventral, and the amount one segment overlaps the next must be greater in the form that is able to coil up. There is also necessitated a larger amount of flexible integument between the segments.

The Iulidæ manifest all these characters, even to the flattening of the pedal laminæ and the basal joints of the legs; other Chilognatha have them, usually in a less degree.

* The species described in this paper as *Trichopetalum album.*

In the Craspedomatidæ, however, the dorsal and ventral portions of the segments differ less in length, and although the pedal laminæ have no chitinized connection with the pleuræ, the body is not coiled in a close spiral. Even when tightly contracted in alcohol, Trichopetalum and its allies are able to do little more than form a circle, a position of doubtful use as a means of defense, especially when compared with the close spirals which Iulidæ assume. The Craspedosomatidæ lack, besides, the strong exo-skeleton and repugnatorial secretion of the other families, so that for them coiling up would not have much advantage as a means of defense.

As might be inferred from the preceding statements the instinct of feigning death is not developed in Craspedosomatidæ. While they are able they attempt to run away, but if held in the hand the heat and drier atmosphere are soon fatal. This was noticed especially in *Underwoodia polygama.* If held in the hand and exposed to sunlight they were soon unable to run in the ordinary way, wriggled convulsively a few times and died. This would happen in a minute or two, while the specimen was being examined with a lens to determine the sex. In such cases care was taken to see whether the animals would recover, but they did not do so.

Individuals of Trichopetalum are also of very delicate organization. They will not endure captivity to any such extent as other Chilognatha, and will speedily die under conditions apparently favorable to the other families. Dryness of the atmosphere is quickly fatal, and the animals seem to suffer if the ventilation is insufficient, even though the moisture is adequate.

On the other hand, it should be mentioned that a specimen of *Conotyla fischeri* was found running about on a log one morning in February, when the ground was frozen and the cold severe enough to have covered with ice-crystals both the ground and the under side of the log. Such ability to withstand the cold appeared very strange at the time, and on investigation it was found that beetles and spiders under the log were incapable of motion, though they recovered after being warmed in the hand. The Conotyla was not, however, under the log, but on the upper side of it, apparently quite as lively and vigorous as during the warmer parts of the year, showing that he had been able to withstand the cold of the February night and either keep lively

through it or recover his powers at a temperature considerably below the freezing point. This can be understood if we may suppose that these animals have means of obtaining and using larger amounts of oxygen than other tracheata, and are more warm-blooded. In accord with this supposition is the following observation on Trichopetalum by Dr. John A. Ryder, several times verified by ourselves.

"While examining some living specimens of *Trichopetalum lunatum* under the microscope, about a year since, I observed that the respiration of the animal appeared to be conducted in a most singular manner. The air seemed to be drawn in under the labrum, and in some way to enter the dorsal cardiac sinus as bubbles, which could be traced for some distance, more than half the length of the animal, as they traveled slowly backwards, until they disappeared over the opaque mass of ingested food contained in the intestine. These bubbles of air always passed backwards. It may be that they passed backwards inside of the intestine, but the impression that I got was that they were traveling through the cardiac sinus or dorsal heart of the animal. This circumstance may explain why it is that there are no pores on the side of the body, though it is true that the lateral pores af millipeds are usually 'foramina repugnatoria,' and have nothing to do with the trachea or respiratory apparatus. This raises the question whether our Lysiopetalidæ are not distinguished from other forms in some more important way than has been hitherto supposed."

In connection with this ability to withstand cold should be mentioned the fact that in Europe the Alpine species affecting the highest altitudes are Craspedosomatidæ.

The eyes are well developed in Trichopetalum, though the ocelli are only moderately numerous. That is, the individual ocelli are large, prominent and convex, as is usual in the family, which has eyes apparently better developed than in other Diplopoda, and not flat or merely pigmented spots as in other cases. But the type of eye seems to be the same as in the Iulidæ and other families, and the animals take no notice of anything in front until the antennæ are in contact with the object, indicating that in all probability, the eyes are unable to form definite images, but are merely spots sensitive to light. Yet the animals do not appear to have as decided objection to light as members of other

families. When a specimen of Trichopetalum is uncovered no perturbation is apparent unless the animal is actually touched.

Not only do the antennæ come in contact with an object, but also as a usual thing, the front of the head. The creatures are not able to overcome their momentum with sufficient quickness, or else their mental operations are too slow. They are not, however, worse off than many animals of higher organization, and better developed sense-organs, for many reptiles and mammals do not, as a rule, turn out for an obstacle until they have come into actual contact with it.

That the eyes of the Diplopoda are incapable of forming images is, however, chiefly to be inferred from their plan of structure, as Lubbock has pointed out. And with the flattened eyes of Iulidæ and Polyzonidæ this is at once plain; but the eyes of Craspedosomatidæ are much more convex, regular and well-defined than those of the others, and approach more nearly the condition where effective vision might be possible.

One of the most noteworthy characteristics of Trichopetalum exists in the great freedom of motion enjoyed by the head. In other families the head is set more or less deeply into the first segment which is hollowed out in front to receive it, and is consequently incapable of more than a slight motion. In such cases the head is smaller, that is, narrower than the first segment; but in the Craspedosomatidæ the head is much broader than the first segment, against which it is fastened as to a neck, and upon which it moves with considerable liberty in any direction.

In like manner the mandibulary stipes are in this family exceptionally developed, and capable of rapid movement in the process of chewing. The movement of the stipes in chewing has not been noticed in other Diplopoda, though its absence we have in some cases observed.

The antennæ are, in most species of the family, exceptionally slender, but do not noticeably differ from the diplopod type. In Trichopetalum, however, they are shorter and somewhat clavate. They are manipulated in the usual manner, though their motions are more than ordinarily quick.

If the antennæ are dipped into a liquid or touched against any thing that sticks to them they are at once cleaned in the mouth. How the animals manage to keep the other parts of their bodies clean is an interesting question, for although they live in places

where they would be likely to become soiled they are always clean to a degree. But when not to be cleaned the antennæ are frequently bent at the fourth joint and the end held near the mouth, for no reason apparent.

In males the posterior pair of legs of the seventh segment are two-jointed, the distal joint being thick and clavate, and curved up against the side of the body. In walking, this modified foot which cannot touch the ground, is waved back and forth in unison with the legs on either side. The copulation of these animals has not been observed, but that this structure can have any part in the process is hard to believe or imagine, and that it is to be looked upon as a merely rudimentary structure seems more reasonable. In American Craspedosomatidæ are found the transitional stages between the condition existing in the Polydesmidæ and Lysiopetalidæ, where only the anterior pair of feet of the seventh segment have been modified for copulatory purposes, and the condition present in the Iulidæ and Polyzonidæ, where both pairs are thus modified. As might be expected, the modification in form and the modification in function are apparently taking place gradually, and in the present case a part of the leg aids in copulation while the rest waves idly, "from force of habit."

Even in the Craspedosomatidæ which do not have the usual six bristles of each segment well-developed on the anterior part of the body, as in Pseudotremia and Chordeuma, the posterior median bristles of the last segment are well developed and to all appearances alike in all the species. They are curiously modified, consisting of a cylindric, or slightly conic, enlarged base, from the distal end of which projects a long, exceedingly slender, flexible bristle, or in this case more properly a hair. This is sufficiently stiff to remain nearly straight, but is much finer than the bristles of the preceding segments, and not brittle.

Attached to the ends of these bristles have on several occasions been noticed fine threads like spiders' web dragging out behind the animals as they walked, that is in Trichopetalum. And in the living specimens it has also been noticed that these modified bristles were sometimes carried vertically, and in others were nearly horizontal. The peculiar conformation of the bases of these bristles and of the apical portion of the segment suggests the possibility that these bases are articulated with the segment,

and that the animal may have the power of moving them at will, and the desirability of being thus able to move them becomes evident if they are supposed to be spinning organs, while it would be useless if they have no special function.

Sense-Organs and Problematical Structures.

In the course of the systematic examination of the different forms it was necessary to mount above a hundred microscopic slides. These gave opportunity for the examination of the more minute structures of the animals, sometimes under tolerably favorable conditions. Following are noticed briefly the structures which came to our attention. Some of them seem not to have been previously recorded, and our notes may be of use when a histologic study of the group is attempted.

I.—*Antennæ.*

On the antennæ are several types of more or less hair-like structures, all of which may prove to be sense-organs.

1. *The So-called Olfactory Cones* (figs. 61 and 190).—These are well developed in all the species, the number being always four, as is the case in most Diplopoda. We have counted hundreds of specimens, including representatives of all the families, and have never found less than four. There are more than four cones in Glomeridæ, some species of Spirobolus, and a genus of Polydesmidæ from east Africa. The reports of one, two and three cones can be paralleled by the carelessness displayed in counting the segments of Chilopoda.

The cones of Craspedosomatidæ appear to differ from those of other families only in being more slender, more like a wine bottle in shape, and with longer bases.

2. *Hairs of Ordinary Form.*—Such may occur on other parts of the body, and it is possible that all may have more or less of tactile function. According to Sazepin's diagrams of the antennæ of Iulidæ and Polydesmidæ these hairs have neural connection, and the same conditions seem to obtain in sections of the antennæ of *Conotyla fischeri.*

3. At about the middle of the seventh joint, and pointing latterad when the antennæ are extended, is a solitary, rather slender, mammillate-conic, transparent protuberance, narrowed at the tip and produced into a long, very slender, and exceedingly fine-

pointed hair. (figs. 61 and 190.) This structure is about the size of the olfactory cones, but histologically it is different, the contents of the enlarged base being evidently granular, instead of longitudinally fibrillate as in the cones.

Sazepin mentions nothing of this sort, and we have been unable to find anything similar on the antennæ of Iulidæ, Polydesmidæ, Lysiopetalidæ or Polyzonidæ. The structure in question is probably present in all Craspedosomatidæ, and may be looked upon as another evidence of the superior organization of this family. We have had no opportunity of examining the antennæ of Scoterpes, but find it in all the other genera here treated.

4. On the same side of the same joint, just above the previously mentioned organ is a considerable number of long slender cones, differing from ordinary hairs in being thicker, and with a large internal lumen. The base inserted in the chitin is large and bulbous.

5. On all sides of the distal portion of the sixth joint are scattered transparent cones differing from the preceding sort in being somewhat broader, with blunt rounded ends. They are also very thin-walled, the lumen being continued nearly or quite to the end, and are not enlarged at base.

6. On the fifth joint, more numerous toward, but not confined to the distal portion, are structures very similar to the last, but differing in that they are longer, sharp-pointed, and of somewhat denser tissue. They differ from those of the seventh joint in being larger and longer and not enlarged at base.

7. On the distal portion of each joint are hairs two or three times as long and large as the average. Similar hairs of other families are by Sazepin denominated "Schutzhaare," explaining their greater size by supposing them to be a special provision for the protection of the sense organs, near which they are located. They are probably articulated to the antennal surface, being surrounded by a chitinous ring at base. That their role is not confined to what is mentioned above is shown by the fact that they occur on joints where there are no shorter sense-organs. A lumen can be seen extending through more than half the hair, the distal portion of which is very slender and frequently flexuous.

The above structures are described from *Conotyla fischeri*. The same or equivalent seem to exist in other species, which do not, however, offer equal facility of observation.

II.—*A Possible Auditory Organ.*

Between the base of the antenna and the neighboring ocelli is a ring-like elevation of the chitinous surface of the head. We have been able to find this in most of the diplopod families. In the Craspedosomatidæ it is well-developed,—nearly as large as a single ocellus. Sometimes it appears that the surface included in the ring is covered by a delicate membrane, at others the appearance is that of a dark central spot or aperture (fig. 133).

That the structure in question is a sense-organ appears very likely, but its function can only be conjectured. It is not impossible that it may prove to be an auditory organ. Certain species of Glomeridæ, of the genus Sphærotherium are known to have stridulating organs, and in them, at least, an organ of hearing would be expected. That other diplopods stridulate is not known, and would seem unlikely. There have been also no experiments to determine whether they are able to hear, and such experiments would be very difficult and probably unsatisfactory.

III.—*The Labral Hairs.*

On the labrum is a transvere row of long hairs provided in some forms, at least, with neural connections (fig. 194). These hairs do not appear to be especially differentiated in structure. They are placed in depressions, though this is not so much the case in the present family as in the Iulidæ. The best guess would probably be that they have merely tactile function. The number and arrangement of the hairs is very constant.

IV.—*Gnathochilarium.*

1. *Cones similar to those of the Antennæ.*—On the apices of the processes of the stipes, and on the lingual lobes are more or less numerous conical structures resembling in a general way the so-called olfactory cones of the antennæ (fig. 59). The fibrillated structure is still more apparent than in those organs, and the neural connections are very evident. They are also much shorter and proportionally broader than the antennal cones, have thicker walls, and a more evidently hollow apex, the wall there being exceedingly thin. The size is very variable.

There is no inherent improbability in the idea that these are

also olfactory organs. They would enable the animal to detect substances suitable for food, being always near the ground, and directly in front of the mouth. They are found in all Chilognatha, but in Craspedosomatidæ are best developed. They are not so much as usual confined to the apices of the structures on which they are placed, occupying nearly the whole lateral edge of the exterior process of the stipes.

2. *The interior Cone of the Lingual Lobes.*—This is larger and longer than the others, directed mesad and somewhat curved in that direction. It is sharp-pointed and apparently of homogeneous structure, no lumen being apparent. Its special function, if any, must be different from that of the other cones.

3. *The Styliform Processes.*—Near the anterior-interior corner of the lingual lamina is a peculiar, usually more or less tri- or quadri-dentate structure apparently consisting of a solid piece of chitin. This does not appear to exist in the other described families of diplopods, except in some Polydesmidæ (*e. g.*, Scytonotus). We have no notion of any purpose it could serve.

4. *The Bristles of the Gnathochilarium.*—On the lower surface and lateral edges of the gnathochilarium are a few hairs of greater size than the others, and with enlarged bases. They are probably tactile in function.

5. *Probable Taste-pits.*—The chitinous covering of the lingual lobe is on the superior side extended backward over the ends of the lingual laminæ. This extension consists of a chitinous rim enclosing an oval space covered by a transparent membrane in which are scattered numerous pits, each surrounded by a chitinous ring. These are shown in fig. 62 as they appear in *Conotyla fischeri.*

V.—*The Dorsal Setæ.*

These structures characteristic of the family are of transparent chitin, narrowly conic, with an enlarged base which fits into the socket of the setigerous tubercle. Sections show that the setæ are hollow, and that the chitinous exo-skeleton is interrupted by an aperture in the middle of the socket.

The median pair of *setæ of the last segment* are different from the others in that there is a more broadly conic base tipped with a slender hair. The function of these may be different from that of the others, though what the function of either can be is hard

to conjecture, unless they are spinning organs, as suggested in another place.

In common with Polydesmidæ the anal valves of this family are provided with slender bristles, but there are always three pairs instead of two, the constant number in Polydesmidæ.

The preanal scale has two slender bristles, as in Polydesmidæ. These are of the same form as those of the anal valves, have enlarged bases and may prove to be tactile organs; at least this would be a reasonable inference in case neural connection can be proven.

VI.—*Legs.*

The legs are increasingly hirsute distad, some of the hairs being especially long and with enlarged bases, perhaps tactile organs. On the inner edge of the last joint of the first and sometimes of the second legs is a pectinate row of stout hairs or bristles; it may be these are of use in feeding or in cleaning the face and antennæ.

The first legs have the claw large, and two distinct supplementary claws. The other legs usually have one supplementary claw. The other structures of the legs are more properly to be noticed under the head of sexual characters.

On the claw of all the legs of *Conotyla fischeri* is a peculiar hair, which we have not found on other species. The hair in question rises from the inferior groove about midway between base and apex, and lies closely appressed to the claw, beyond which it extends as an exceedingly fine, frequently flexuous filament, needing careful observation to be seen with a quarter-inch objective. When the animal is walking this hair necessarily comes first in contact with the ground and seems conveniently located for a tactile organ. It appears very remarkable that the other species have no similar structure, but a careful search has failed to find it.

VII.—*Secondary Sexual Characters.*

These are, as in other families of Diplopoda mostly confined to modifications of the anterior male legs. We give here a list of such modifications, not including those of the ninth male legs which are described under the different genera and species.

1. Body of males stouter and broader, especially segments six and seven, than that of females. This is not always noticeable, but is very evident in Cleidogona.

2. Second legs strongly crassate, a character appearing only in Underwoodia.

3. Second legs abnormally slender: Caseya.

4. Coxæ of second legs with a conic process: Zygonopus, or with a long curved or hamate process: Caseya, Underwoodia.

5. Third joint of second legs with a cushion-like bunch covered with conic processes: Conotyla.

6. Third joint of second legs tuberculate on ventral face: Caseya.

7. Last joint of second legs with a pectinate row of stout hairs on the inner edge: Conotyla, Cleidogona, and probably the other related genera.

8. Claw of second legs very small, much exceeded by a tuft of long flexuous hairs: Underwoodia.

9. Legs 3–7 strongly crassate: Trichopetalum, less so in most of the other genera.

10. Coxæ of third legs produced into a rounded prominence with a tuft of hairs at apex: Caseya, Underwoodia.

11. Third joint of third legs much crassate: Underwoodia.

12. Last joint of third and many succeeding legs with the ventral face hispid with fine bayonet-like spines: Conotyla, Cleidogona, Pseudotremia.

13. Fourth joint of fourth and fifth legs with a cushion-like bunch covered with conic tubercles: Conotyla.

14. Sixth legs with coxa somewhat enlarged, and with a tuft of long hairs: Caseya.

15. Sixth legs strongly crassate: Zygonopus.

16. Seventh legs with coxa greatly enlarged, bearing a conic process and tufts of hairs: Caseya.

17. Coxæ of seventh legs with a large tuberculate bunch on the posterior side: Conotyla (figs. 70 and 73).

18. Fourth joint of seventh leg with a proximally directed, apically quadridentate process: *Conotyla fischeri* (figs. 70 and 71).

19. Tenth and eleventh legs with the coxæ perforate: Cleidogona, Pseudotremia, Conotyla. Sometimes a shapeless mass of membrane or hardened secretion projects from the aperture; perhaps this is what is described by Latzel as a wart-like process in European Chordeumidæ.

20. Coxæ of tenth male leg greatly enlarged and with a distal aperture: Caseya, Underwoodia (figs. 185, 210, 211). In Ca-

seya there is a rounded projection from the rim of the opening, on the posterior side.

21. Coxæ of eleventh leg with a large conic process: Pseudotremia, Cleidogona. In Pseudotremia the process projects from near the base of the coxa, in Cleidogona from the middle or above.

22. Eleventh and twelfth legs with coxa prominent, tuberculate: Conotyla.

23. Eleventh legs with third joint proximally produced into a large, somewhat curved process: Conotyla.

24. Eleventh and twelfth, and probably the succeeding legs, tuberculate on the third and fourth joints: Caseya.

25. Pedigerous lamina of twelfth legs with a large conic process directed cephalad: Cleidogona Conotyla, Pseudotremia.

In addition there should be noted an aperture near the distal end of the second joint of the ninth legs of Cleidogona Inside the joint may be traced a duct or gland running nearly its whole length. In one mounted specimen this is filled with air and shows very clearly, also very numerous minute tubes opening into it. The opening is on the ventral face of the joint, under the base of the third joint, which is flexed upon the second. In the specimen mentioned an irregular mass, probably a secretion hardened by alcohol, lies in the aperture.

Characters of the Family.

As nothing purporting to be a complete description of the present family has ever appeared in English, we offer the following attempt at supplying the deficiency, although future study will probably necessitate amendments.

Family Craspedosomatidæ Gray.

Todd's Cycl. III., p. 546 (1842).

Chordeumidæ, C. L. Koch, and many recent authors.

Lysiopetalidæ (*pro parte majore*) of Cope, Ryder and Packard.

Body moderately elongate or slender, depressed, convex or cylindric, subfusiform, capable of being spirally coiled.

Head larger and broader than the first segment, which fits into a concavity of the head instead of covering the hind portion of it as in Iulidæ.

Eyes usually well-developed, of numerous (10–30) ocelli arranged in definite patches; entirely wanting in certain cave forms.

Antennæ remote at base, generally elongate, third and fifth joints longest, eighth joint with four olfactory cones.

Mandibles with 8–12 pectinate lamellæ, a molar tooth, a dentate lamella, and a masticatory plate. The stipe has a distinct cardo; exposed surface of stipe (buccal area) very large and prominent, convex, not areate.

Gnathochilarium with stipes separate, cardo small; in front the two coniferous processes common to Chilognaths.

Mentum entire, trapeziform, large.

Promentum evident, triangular, included between the bases of the lingual laminæ, or nearly obsolete.

Lingual laminæ rather long, distinct, anteriorly with or without a denticulate lobe, posteriorly separated by the promentum.

Median lobe well-developed, with a longer or shorter usually tridentate process on each side.

First segment slightly longer, but otherwise smaller than the second.

Segments laterally strongly, moderately or not all carinate; the dorsal face of each provided with six bristles, sometimes rudimentary and very minute, more or less arranged in a transverse row; each bristle usually located upon a smaller or larger tubercle; surface otherwise smooth or roughened with tubercles not setigerous.

Repugnatorial pores wanting.

Pedigerous laminæ all free; pleura completely coalesced with scuta.

First, second, fourth and antepenultimate segments each bearing one pair of legs, the third and last two footless.

Anal segment obtuse or broadly truncate, with two pupillæ at apex, each ending in a long, slender bristle.

Legs seven-jointed, generally long, the third, fourth and last joints longest.

In males any of the legs of the first eight segments are subject to more or less modification.

Genital opening of males in the coxæ of the second pair of legs, as in Polydesmidæ.

Number of segments, 26, 28, or 30, in adults; in young 28, 26, 23, 19, 15, 12, younger stages unknown.

Distribution: Europe, North America, Northern Asia and Northern Africa.

The scarcity of individuals of this family, the small size of the animals, and the fact that few localities outside of Europe and North America have been thoroughly searched, leave it entirely probable that the above distribution will be extended to the mountain regions of Central and South America and Asia. One species is known from the mountains of Mexico. It is a significant fact that not a single form has been reported from the tropical regions, and the writers are confidant, after repeated and care-

ful searches, that the family is not represented in Liberia and the neighboring European colonies of the west coast of Africa.*

The above is substantially the same characterization of this family as that given by Latzel, with a few deviations, two of which are noteworthy. The first is that we credit all Craspedosomatidæ with six bristles to a segment, and the other that we give the number of segments as sometimes 26 and 28, changes which we will later on attempt to justify. The following additional description will apply to all the American species known to us and included in this paper. It has been our intention to omit from it no character common to all the species, no matter how unimportant any might seem to be, and for the sake of brevity, characters given here will not be repeated in generic and specific descriptions.

We consider it probable that most of the statements will be found true, except where noted, for all Craspedosomatidæ, but as many of them have to former writers seemed too unimportant to be included in family descriptions, and others have not been previously recorded at all, it seemed the part of caution not to combine them with the preceding description made to accommodate the European forms, and modified only enough to admit the American.

Body moderately elongate, about ten times as long as its greatest transverse diameter; posteriorly laterally compressed (except Branneria), giving an oval cross-section with dorso-ventral diameter greatest.

Vertex smooth, prominent, broadly and sub-angulately emarginate posteriorly, sparsely hirsute with hairs of moderate length; a short, fine, median sulcus and suture on the posterior portion ending at the point of greatest elevation.

Clypeus not distinct from the vertex by an apparent suture,† rather flat; lower part more hirsute, and with an elevated transverse ridge just above the labrum.

Labrum rather long, somewhat decurved, as least as broad as the lower part of the clypeus; corners broadly rounded, the emargination rather shallow. There are two transverse rows of setigerous punctations as is usual in Iulidæ, the upper row containing four and the lower ten punctations. The lateral bristles of the upper row are farther from the median than the latter are from each other; lower row interrupted behind the emargination.

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* After the above was written Mr. Pocock published his new genus Heterochordeuma from the mountains of Burmah, and we became acquainted with the description of a New Zealand species of the family, *Craspedosoma trisetosum* Hutton (Ann. & Mag. Nat. Hist. Ser. 4, Vol. xx., p. 116, Aug. 1887.

† Differing in this from most Iulidæ and Polydesmidæ.

Antennæ filiform or sub-clavate, moderately pilose, the hairs increasing in length and number on the distal joints. Seventh joint of antennæ with a conic-mamillate sense-organ tipped with a long fine hair. Mandibulary stipe with the exposed surface smooth, more or less hirsute with short hairs.

Hypostoma apparently not a part of the gnathochilarium, in the sense of having any intimate connection with that structure. In all the species examined it appears as a chitinized ridge around the ventral side of the slender neck of the animal.*

The stipes of the gnathochilarium are produced posteriorly far beyond the menturn and embrace the sides of the neck, which lies in the sinus thus formed behind (above) the mentum.

First segment semi-circular to broadly reniform in front; nearly straight behind, except for a broad, shallow emargination in the middle; anterior margin and lateral angles with a fine raised edge; three setæ on each side; surface smooth.

Subsequent segments with three setæ on each side, one close to the posterior angle of the lateral carina, the second slightly farther from the anterior angle, the third about midway from the carina to the median line. On posterior segments the arrangement tends toward a straight transverse line, and the setæ are longer than on anterior segments. Beginning at the middle of the first segment and ending on the penultimate segment is a fine longitudinal sulcus, or rather a pair of sulci with a very fine raised line between (not apparent in Branneria). The surface of the segments, when not otherwise roughened, is finely reticulate, the pattern of the reticulation varying on different species and different parts of the body. When carinæ and tubercles are present the exo-skeleton is scarcely thickened, the body cavity extending out into all prominences.

Supplementary margin not evident.

Anal segment without median furrow, truncate behind or with a broad shallow emargination; broadly sinuate on the sides. On this segment there are eight setigerous tubercles, two located near the middle of the dorsal surface of the segment, the other six near the posterior margin, one on each side by the sinuation, one at each corner of the emargination, and two near the median line, these last with thickened, conic or papilliform bases.

Anal valves not strongly convex, more prominent above the middle, each with three setæ close to the margin.

Preanal scale semi-elliptical, broader than long, broadly truncate posteriorly, with two long bristles directed backward.

Pedigerous laminæ medianly produced into a conic process which lies between the approximated coxæ, and has its anterior face exposed. This ex-

* Judging from the present family it would not be an antecedently improbable theory to regard the hypostoma as the ventral part of the first segment. In that case it would not be necessary to consider the third segment footless, but to suppose that the ventral plates of the second and third segments have been crowded somewhat ahead. This also accords with the opinion of Heathcote, the result of a study of the embryology of Iulus.

posed face may be smooth or roughened, plane or with a longitudinal carina. On the 12th legs of males of some species the apex projects antero-ventrally as a large conic process.

First two pairs of legs 6-jointed, the others 7-jointed, by the intercalation of a very short joint just beyond the coxa.

As the species here described have usually been placed under the Lysiopetalidæ by American students of this group, it may not be superfluous to notice a few considerations regarding the systematic importance of the characters on which this family is based.

The Family Chordeumidæ was erected in 1847 by C. L. Koch, his entire characterization being: "*Der Körper standhaft mit 30 Ringen*," and this would be sufficient, as far as known, to distinguish the European species among Chilognatha. Mature individuals of certain small species of Iulidæ sometimes occur with as low as 30 segments, but in no Iulus is the number of segments constant. We have, however, in America at least four species of Craspedosomatidæ with less than 30 segments in the mature condition, a fact which might seem to militate against the validity of the family.

The number of segments, however, though appearing to be a character of considerable value on account of its supposed constancy, is by no means the most important of the numerous differences between this and other families. The more important distinctions have been neglected entirely or passed with a mere mention because of the easy statement of which the above apparently sufficient character was capable. In many respects the Chordeumidæ are evidently the highest of the helminthomorphous Diplopoda, if not of the whole group.

In the first place, the head is proportionally much larger than in any other diplopod family. Instead of being enclosed or covered by the first segment, this last structure forms a sort of neck, fitting into the posterior concavity of the head, and allowing a much freer motion for that member than is possible for other Diplopoda. All the organs connected with the head are in a comparatively high state of development. The eyes, antennæ and mandibles are all capable of more effective service than the corresponding structures of other families.

The legs are proportionally longer and the animals capable of faster locomotion. This fact is correlated with the absence of re-

pugnatorial pores as a means of defense. There is no reason for supposing that the members of this family have or ever had any thing like repugnatoral pores, notwithstanding such statements as "Annuli with two pores on each side of the median line.—Pseudotremia,"* and the characterization found in some of the more careful European works "Repugnatorial pores obsolete," or "repugnatorial pores evanescent." In the one case the the sockets of the lateral setæ have been taken for pores, while in the other there has been an unwillingness to say "pores wanting," on account of their constant presence in other families.

The six setigerous tubercles of each segment are perhaps the most distinctive family character. In some species the setæ or tubercles or both are microscopic and rudimentary, but this only shows the tenacity of the character, as in no other recent family are there similar bristles.

In common with the Lysiopetalidæ the pedigerous laminæ are all distinct from the otherwise complete segmental rings.

It seems to us that the combination of these last three characters, want of repugnatorial pores, six setæ or spines, and the free pedal laminæ is sufficient ground for the opinion that the Craspedosomatidæ have of all living Diplopoda the greatest resemblance to the carboniferous group Archipolypoda.

That the relationship is very close we do not contend, but merely that the similarities are greater than in other recent forms and are not merely apparent but real.

The spines of existing Chordeumidæ are insignificant in size when compared with those of some of the fossil genera, such as Acantherpestes, but are the same in number, arrangement and method of attachment to the segments, *i. e.*, they stand in socket-like bases. Moreover there were other carboniferous forms which had bristles proportionally not much, if any, larger than those of Trichopetalum and Scoterpes, and of the same shape.

Other minor characters reinforce the above view, such as the large size of the head, prominent eyes, fusiform, somewhat flattened body and long legs.

That Chordeumidæ were probably more abundant in former geologic periods is seen from the fact that a considerable number

* Dr. Cope informed me recently that this statement was the result of accident by which the words "Spirostrephon" and "Pseudotremia" were substituted for each other. [O. F. C.]

of species have been described from the Baltic amber. They are at present probably among the least numerous as far as individuals of each species are concerned. North America is perhaps to be looked upon as the headquarters of the family, on account of the comparatively large number of generic types, though the number of new forms yet to be discovered in Europe is probably very great.

If the Craspedosomatidæ are the highest, in certain senses at least, and at once the most primitive of recent Diplopoda, it follows that the other families are to be looked upon as comparatively degraded, even if more complex, as in the addition of the repugnatorial apparatus.

Generic Classification.

The more recent European writers have seemed inclined to include all the previously described American genera, except Pseudotremia, under the European genera Craspedosoma and Chordeuma. Pseudotremia was kept distinct mainly on account of the misapprehension that it had no dorsal setæ. From deference to the usually more thorough methods of the European investigators we began our study with somewhat of an expectation of the probable correctness of their view, which we still think was more or less justified by the incompleteness of American descriptions. We were soon convinced, however, that among the American forms are natural and compact groups of species meriting generic recognition. Between the species of such groups the characters of the antennæ, eyes, body-segments, gnathochilarium, legs and genitalia agree in indicating close affinities. Especially valuable, by reason of their constancy and ease of expression, are the characters of the ninth* legs of the males, and differences in these have always been reinforced by those drawn from other parts of the body. That these secondary sexual characters have not had their importance generally recognized in classification is no reason why they should not now be made available, and

* These have been referred to by Packard and others as the eighth legs, while Latzel considers them a part of the genitalia and does not count them. We believe it will be found more convenient to think of the eighth legs as replaced by the genitalia, and thus keep the numbers of legs and segments uniform in the sexes.

we believe they are worthy of being put forward as the most satisfactory yet suggested.

Synopsis of **Genera.**

A	Eyes present	B
	wanting	C
B	Segments 26, with numerous dorsal carinæ	**Branneria**
	28 or 30	D
C	Sixth male legs crassate, the ninth unarmed	**Zygonopus**
	normal, claw of ninth large	**Scoterpes**
D	Ninth male legs 2-jointed, without claw	E
	4–5-jointed, with a claw	F
E	Third male legs with coxæ produced	G
	normal	H
F	Ninth male legs embracing a bifid plate; dorsum granular.	**Pseudotremia**
	without plate; not granular	I
G	Second male legs strongly crassate; seventh legs normal.	**Underwoodia**
	very slender; coxæ of seventh enlarged	**Caseya**
H	Last joint of male legs hispid; segments 30	**Conotyla**
	not hispid; segments 28	**Trichopetalum**
I	Ninth male legs distally clavate; second joint slender	**Bactropus**
	hamate; second joint robust	**Cleidogona**

The presence or absence of eyes may not, of itself, be a sufficient generic character, as Latzel has said, though it certainly shows considerable divergence. In the preceding table this character is used merely as a convenient means of separation; the other features we believe to be of diagnostic value.

The external differences between the genera are not inconsiderable and it is possible to separate them without dissection. To facilitate this we add a key in which mere external characters are employed. That new forms will soon be discovered which will interfere with the continued utility of these keys, we can but expect.

Artificial Key to **Genera.**

A	Eyes present	B
	wanting	C
B	Dorsum rough with numerous carinæ or granules	D
	smooth, except the six setigerous tubercles	E
C	Sixth male legs crassate; the ninth unarmed	**Zygonopus**
	normal, claw of ninth large	**Scoterpes**
D	Length 6 mm.; segments 26; dorsum carinate	**Branneria**
	18–30 mm.; segments 30; granulate	**Pseudotremia**

E { Length 6–9 mm.....F
  14–25 mm.....G

F { Setæ long; carinæ large; segments 28.....**Trichopetalum**
  short; carinæ small; segments 30.....H

G { Carinæ large; body outline serrate.....**Conotyla**
  inconspicuous or wanting.....I

H { Ocelli 27; carinæ rounded.....**Bactropus**
  13; carinæ striæform.....**Underwoodia**

I { Sixth and seventh antennal joints equal, slender.....**Cleidogona**
  twice as long as seventh, stout; body striate.....**Caseya**

To judge from the works of Latzel, Haase and Verhoeff, there are also among the European Craspedosomatidæ groups of species agreeing in secondary sexual characters, but there seems to have been no attempt at an arrangement based on homologies of this sort. We notice after the descriptions of the American forms the more striking of this class of characters as exhibited in the European genera and species, the generic descriptions being arranged on lines parallel with those previously given.

Dr. John A. Ryder was the first to use such characters as a basis of generic distinction. In describing Zygonopus he calls attention to the recognized importance of sexual characters in the generic classification of other groups, notably Crustacea, and affirms their availability in the Myriapoda.

In the Polydesmidæ the ninth male legs are unmodified, while in Craspedosomatidæ we have a series of gradations from the five-jointed down to a nearly or quite complete transformation into complex genital apparatus. In America are found the first members of the series, from five-jointed to two-jointed, while the others are found in Europe. It may be that in the European forms these legs have so completely taken on the function of genitalia as to be more susceptible of specific modification and are not of so much value in generic distinction; in the American forms, at least, they seem worthy of all the weight given to rudimentary and secondary sexual characters. Among the species already known the form of the ninth male legs is so constant an index of a whole complex of characters of other kinds that it is possible to distinguish the genera by them alone, as in the following table:—

A { Ninth male legs 4- or 5-jointed.....B
  2-jointed.....C

B { First and second joints thick, subequal in size.....**Cleidogona**
  very large, the second cylindrical, slender.....D

C { Second joint rounded oval, basal joint flask-shaped.....E
  { much longer than wide, the first not attenate.....F

D { Third and fourth joints subequal, narrow.....**Pseudotremia**
  { much longer than fourth, thicker than second.....**Bactropus**

E { First joint gradually attenuate distad.....**Underwoodia**
  { distally broader, notched and toothed.....**Caseya**

F { Second joint with a small chitinous knob, genitalia simple.....G
  { smooth; the first attached to posterior genitalia....**Conotyla**

G { Second joint clavate; eyes present; segments 28.....**Trichopetalum**
  { obclavate; eyes wanting; segments 30.....**Zygonopus**

It should be remembered, however, that these genera rest on other characters, and that for the present, at least, the ninth legs are not a necessity to the generic classification here adopted.

American species of this family have been referred to the following genera not here recognized as valid or as properly applied. It may be worth while to notice briefly the different reasons for such treatment.

Spirostrephon, Brandt (1840) was erected to contain *Lysiopetalum lactarium* (Say), then looked upon as one of the Iulidæ. To use the name for species distinct from *lactarium* by differences of family importance was entirely unjustifiable.

Campodes of C. L. Koch (1847), was referred to this family by its author, and was not heard from afterward until Mr. Bollman identified *Cryptotrichus cæsioannulatus* (Wood) Packard with it. It was clear to us on reading Koch's description with specimens of *cæsioannulatus* in hand that the description could not possibly apply to that species, and the idea suggested itself that Koch's description portrayed an animal astonishingly similar to *Iulus virgatus* Wood. On comparing specimens of that species we found the agreement with the description to be complete, down to the smallest detail mentioned. Both the varieties of coloration which Koch described as species are also common, so that the two can be united. Koch's specific name (1847) antedates that of Wood (1864), and the species must stand as *Iulus flavicornis* (Koch). The genus Campodes never had any reason for its existence, and can be dismissed from the subject. It might be well to add that we have found sexually mature *I. flavicornis* with 30 segments. This species seems to be very nearly allied to the European *I. pusillus* Leach, described long before the time of Koch, but with which he did appear to be familiar.

Craspedosoma of Leach and Rawlins (1814), is the oldest genus of the family and contains a considerable number of European spe-

cies, but none of these seem to have the second pair of feet of the seventh segment with more than one joint, a club-shaped, perpendicular structure, thus differing distinctly from the more closely allied of the American genera: Conotyla, Trichopetalum, Scoterpes and Zygonopus.

Chordeuma, C. L. Koch. Latzel suggested the possibility that *Trichopetalum juloides* Harger would be placed here. Characters drawn from the genitalia, gnathochilarium and secondary sexual characters give ample reason for holding the American form distinct and erecting a new genus for its reception.

Striaria has been recognized as the type of a distinct family.

Cryptotrichus Packard, is replaced by Cleidogona.

In Austro-Hungary are found two genera of Craspedosomatidæ with broad lateral carinæ, Atractostoma closely resembling the Polydesmidæ, and Rhiscosoma the Polyzonidæ. Latzel failed to find bristles on an immature specimen of Rhiscosoma, but as other individuals referred to the same species had bristles we have not lost confidence that the bristles are universal in Chordeumidæ, more especially since finding them on Pseudotremia where Latzel asserted their non-existence.

Humbert and Saussure * proposed to include all the species of this family as here constituted under Craspedosoma, divided into two subgenera, Craspedosoma, in a stricter sense, and Chordeuma, alleging that in Craspedosoma there is a promentum distinct from the mentum, while in Chordeuma the mentum is entire, and rounded anteriorly. Latzel takes no notice of this distinction, and does not describe or figure the gnathochilarium of the only species, *Chordeuma sylvestre* Koch, leaving the implication, however, that there is no important difference in this respect, since the family description states that the promentum is "deutlich entwickelt, dreieckig."

Meinert united Craspedosoma with Polydesmus, but his reasons for so doing do not seem to include a knowledge of the more fundamental relationship, and were matters of generic descriptions based on external characters.

Dissection is an absolute necessity in studying the genitalia of the smaller forms, and the greatest caution must be exercised, for the different views of the same irregularly shaped genitalium will look like entirely different structures. The small size of the

* Etudes sur les Myriapodes, p. 59.

members of this family makes the study and preservation of the dissected parts difficult unless they are mounted on microscopic slides. This method has the further advantage of allowing corresponding parts to be viewed at the same angle, so that fictitious differences are not multiplied. Some genitalia are, however, so irregular in shape as to make it difficult to determine a species from one drawing alone. Descriptions of genitalia are nearly worthless without diagrams to aid in their interpretation.

In describing the antennæ we have adopted the form of a continued ratio for showing the comparative lengths of the joints. The third joint, the longest, is taken as the standard, and given the value 10, thus the ratio of each joint to any other can be readily seen.

We have not attempted to describe the immature stages of the species, since the material was not collected with a view to such study. Young individuals of this family are less commonly found than in the others, and are usually so delicate as to need special care in preservation. Such observations as we have been able to make have been entirely in the line of those of Latzel.

In the direction of describing forms and varieties we have done equally little. This is partly due to the fact that our material has been neither fresh nor very extensive, so that variations of color and external characters have not been seen to advantage. It is also due in part to the fact that we consider that in Diplopoda, as in Arachnida and Crustacea a different plan of male genitalia is to be looked upon as of specific importance. There is not in the habits and habitats of the Diplopoda apparent reason for the multiplication of external differences, but the differences of genitalia and secondary sexual characters are not therefore less important when they occur, but rather more so. Until we have a recognized criterion of what a species is, the matter of specific classification must remain largely a question of convenience. The characters of the genitalia indubitably have important bearing on the question of specific distinctness. The ultimate value of every difference, as a means of specific definition must of necessity be settled by ascertaining the constancy of the particular character in the forms to be separated. As a practical method we have proceeded on the assumption that species with evident and readily assignable differences in the genitalia should be considered distinct until the differences are shown not to be constant.

BRANNERIA Bollman, 1893.

Bulletin No. 46, U. S. Nat. Museum, p. 158.

Eyes of numerous (16) ocelli arranged in triangular patches.

Antennæ of moderate length, subclavate.

Segments depressed, with prominent lateral carinæ; dorsally with numerous longitudinal carinæ.

Male genitalia complex.

Segments of adult 26.

We have seen four specimens of this genus, one being a mature male, but dissection was not attempted, owing to scarcity of material and small size.

This genus does not appear to be closely related to any other, the sculpture of the dorsal surface being unique in the present family, as is also the small number of segments. This last peculiarity is the more interesting from the fact that European writers have insisted that the number of segments in this family is always 30, refusing to believe the statements of American writers to the effect that a less number occurs.

The mature male is in the collection of the University of Indiana, and we did not have opportunity of making drawings or a description of the genitalia. We were, however, able to assure ourselves that their complexity equals or exceeds that of any other species known to us.

Branneria carinata (Bollm.).

Craspedosoma carinatum Bollman: Ann. N. Y. Acad. IV., 109 (1888); Bulletin 46, U. S. Nat. Museum, p. 83; 158.

Eyes triangular, ocelli 16, without regular arrangement.

Antennæ large in proportion to the size of the animal, subclavate, the two distal joints being equal in length, while the fifth and fourth are subequal, each about twice the length of the seventh. Sixth joint thickest, .14 mm. in diameter.

First segment semicircular, anteriorly rugulose and with irregular depressions; along the posterior edge a row of longitudinal ridges; in front of these are several similar ridges not arranged in a regular transverse series, and not placed with regularity in front of those of the posterior row. A setigerous tubercle situated at the posterior angle; another about midway between the anterior and posterior margins, a little closer to the median line than to the lateral corner; a third tubercle midway between the other two. Setæ .1 mm. long, slender, tapering.

Subsequent segments with the anterior subsegment covered with short,

rather irregular, longitudinal, subreticulate ridges; posterior portion anteriorly slightly rugulose, also finely reticulate, the reticulation extending over the entire posterior portion of the segment; on the posterior margin is a row of ridges similar to those of the first segment. Cephalad of these are also irregular ridges which are sometimes in a somewhat definite series and occasionally joined to those of the posterior row. Lateral carinæ well developed, the carinæ and lateral surface evidently reticulate. The three tubercles are situated, one at the posterior angle of the lateral carinæ, the second at the anterior origin of the carina, the third between the anterior and posterior subsegments and about midway between the median line and the lateral carina. On posterior segments the tubercles come to be arranged in a straight line, as is usual in the other species of the family. Dorsal line not evident.

Anal segment rugulose, posteriorly nearly straight, not produced to cover the anal valves. A tubercle on each side close to the median line, near the middle of the segment.

Anal valves margined, rugulose.

Preanal scale, broadly and deeply emarginate; on each side of the emargination is a long, posteriorly directed bristle.

Length 2 mm.; width .4 mm. 26 segments.

Color horn-brown, the feet paler and the antennæ darker than the body.

Habitat: Beaver Creek, Jefferson Co., Tenn., Prof. J. C. Branner; Little Rock, Ark., Mr. C. H. Bollman, U. S. Nat. Museum, No. 164.

The head is proportionally smaller in this species than in the others known to us. The small size, fewer segments and polydesmoid characters seem to indicate a depauperate form.

The pair of large terminal spines with papillate bases were not present, but it is probable that they had been broken off. The small size of the animal makes it impossible to distinguish their sockets.

By "lateral plates distinct" Mr. Bollman probably intended to imply that the lateral carinæ are evident. There is nothing suggestive of the distinct pleuræ of the Glomeridæ.

PSEUDOTREMIA Cope, 1869.

Journ. Am. Philos. Soc., XI, p. 179.

Eyes moderately developed, of numerous (13–27) ocelli arranged in irregular patches.

Antennæ very long and slender, third joint longest.

Mandibles with 12 pectinate lamellæ.

Promentum present, triangular.

Segments with swollen, shoulder-like carinæ, the lateral surface longitudinally striate, the dorsal uneven with rounded tubercles; setæ short, clavate.

First two pairs of legs of male short and slender, the next five pairs longer and much crassate.

Anterior male legs hispid on the interior face of the last joint.

Ninth pair of legs of male four-jointed and clawed, the basal joint large and thick, inferiorly deeply sinuate; second joint slender, cylindrical; distal joints short, the apical conic. The basal joints embrace a bifid lamina (see fig. 6).

Tenth and eleventh legs of male with large coxal apertures; the coxæ of the eleventh legs with a conical process at base.

Pedigerous laminæ with a vertical carina. Segments of adult 30.

The two known species of this genus inhabit caves, and have been collected in Virginia, Kentucky and Indiana. They are not, however, to be looked upon as cave animals in the strictest sense of the word, as they are provided with eyes. The eyes are less numerous and less prominent than in the other large species, and seem sometimes not to be fully pigmented. That the number has been reduced by cave life is an unsafe inference. The Polydesmidæ have no eyes and yet very few are cave species.

The legs and antennæ are proportionally the longest of any Diplopoda known to us. That this is due to cave life cannot be maintained, for such thoroughly cavernicolous species as *Scoterpes copei* and *Zygonopus whitei* do not have longer antennæ than some of the open-air forms.

The proximal three or four pectinate lamellæ of *P. cavernarum* have the apices of the spines bifid. We have not made sufficiently numerous dissections to be confident that this is a constant character, but its occurrence is certainly worthy of note, for such a condition does not seem to have been recorded.

The sculpture of the dorsal surface is also characteristic, none of the subsequent genera being roughened except by very fine areolation, excepting also, of course, the six setigerous tubercles. The carinæ also are somewhat squarer and higher up, making the dorsal surface flatter than in other American genera, although the body as a whole is not depressed.

In a description of this genus, purporting to be drawn from specimens sent by Dr. A. S. Packard, Jr., Latzel * says: "*Die 6 Borsten und die zugehörigen Wärtzchen fehlen ganz.*" The bristles must have been rubbed off in sending, as is usually the case, though some of the bristles of the posterior segments can nearly always be found.

* Myr. d. Öst.-Ung. Mon. Bd. II. pp. 64 and 214.

Pseudotremia cavernarum Cope.

Pseudotremia cavernarum Cope : ~~Journ~~ Proc. Am. Philos. Soc., XI, pp. 179 (1869); Trans. Am. Ent. Soc., May, 1870, p. 67.

Spirostrephon cavernarum Cope : Am. Nat. VI, 1872, pp 409.

P. cavernarum Cope, Ryder : Proc. U. S. Nat. Mus. III, 1881, pp. 526; McNeill, Bull. No. 3, Brookville Soc. pp. 8 (1888); Bollman, Ibid. XI, 1888, pp. 405; Bulletin 46, U. S. N. M., pp. 106.

Body somewhat fusiform, broadest anteriorly at about the fifth or sixth segment, narrowed abruptly cephalad, and gradually caudad to the last two or three segments, which are narrowed very abruptly. Carinæ moderate, situated above the middle line of side.

Clypeus near the middle with two well-pronounced depressions about the size of the antennal sockets; below are two smaller depressions subconfluent with the others.

Eyes more or less triangular in form, sometimes elongate or lunate, ocelli varying from 13 to 17, usually 15 or 16, without regularity of arrangement.

Antennæ filiform, 4–4.5 mm. long, .18–.22 mm. thick, moderately pilose, approximate ratio of lengths of joints to each other, beginning with the seventh, 2: 3: 8: 6: 10: 4: 1:

Mentum subrectangular, twice as broad as long, the anterior and lateral margins convex, the posterior concave.

Promentum without hairs, triangular, broader than long (8:5), sides nearly straight, posterior corners not reaching the stipes.

Stipes with base of inner process more than half the length of outer process; lateral edge of outer process with cones nearly to base.

Lingual lobes subequal to lingual laminæ, with five sense-cones.

Middle lobe nearly square in front, twice as broad as long, subequal to lingual laminæ.

Styliform process deeply trilobed.

First segment anteriorly nearly semicircular, slightly concave behind, medianly broadly emarginate. Anterior margin elevated, as well as the posterior along the emargination. Surface smooth; a fine furrow on each side of a median ridge, beginning about the middle of the segment and extending to the posterior margin. On each side three setigerous tubercles, one situated near the longitudinal middle of the segment near the median line, a second close to the lateral angle, the third on the posterior edge of the corner. The lateral bristles measure .2 mm. in length.

Subsequent segments with the posterior subsegment coarsely tuberculate on its dorsal portion; laterally and ventrally with about 12 longitudinal striations; the superior striation is the largest, being on the portion of the segment laterally most prominent, and is directed obliquely, the posterior end lower down. On the superior edge of the posterior end of the carina is a slight protuberance bearing a short, clavate bristle; on the anterior edge of the elevated portion of the posterior subsegment are two similar slight protuberances the outer of which bears a similar clavate bristle. On the anterior segments the surface of the median portion of the posterior subsegments is smooth, the

tubercles being confined to the sides of the dorsal surface; tubercles become more numerous caudad to about the twentieth segment, where they begin to be gradually obliterated, so that the last few segments are nearly smooth. On the other hand, the bristle-bearing tubercles become larger and the bristles longer on the posterior segments. The tubercles, especially the lateral, are conical or papiliform, and tipped, especially the lateral and posterior ones, with a very short seta. The circular, light-colored bases of the other clavate or long setæ distinguish them at once from ordinary tubercles. On posterior segments the six bristle-bearing protuberances become more and more arranged in a straight transverse row. The fine median ridge located in a shallow furrow is continued from the first segment to the penultimate.

In males the sixth and seventh segments are noticeably larger than the others, being both longer and broader.

Anal segment with surface smooth, very slightly hirsute with short hairs. Posterior margin deflexed, squarely notched in the middle, deeply sinuate on the sides. On each angle of the emargination is a setigerous tubercle.

Anal valves margined, slightly rugulose, the ridges running oblique to the anal opening, three setigerous tubercles at intervals, near the inner margins of the valves.

First pair of legs of male six-jointed, the joints, beginning with the coxa, respectively, .20, .06, .50, .20, .16, and .60 mm. long; width of third joint .14 mm. The joints are not specially modified, nor roughened except by sparse hairs. Two small superior secondary claws.

Second legs of male also six-jointed, the joints, excepting coxa, measuring .08, .50, .22, .16, and .60 mm. long; third joint .16 mm. wide.

Third legs of male seven-jointed, as are all the others (except the ninth), joints measuring .30, .08, .40, .60, .26, .20 and .64 mm. in length; width of first joint .40 mm. The seventh joint has the distal part of the inferior surface beset with fine bayonet-like processes, as described for *Conotyla fischeri*. Two small superior secondary claws.

Fourth legs of male with joints .34, .06, .40 .60, .26, .20 and .60 mm. long; width of first joint .34 mm.; seventh joint as on third legs. Two superior secondary claws.

Fifth legs of male with joints .34, .06, .60 .74, .34, 20 and .66 mm. long; first joint .34 mm. wide; otherwise as for third legs.

Sixth legs of male with joints .40, .06, .54, .72, .30, .20, and .64 mm. long; first joint .30 mm. wide.

Seventh legs of male with joints .40, .06, .56, .74, .30, .20 and .68 mm. long; width of first joint .30 mm. Inferior surface of coxa covered with small rounded knobs. Otherwise as for third legs.

Male genitalia (plate I, figs. 2 and 3) very complex, consisting of four different structures:

1. An irregular, deeply bifid lamina (fig. 2) broad at base, the lobes crossed by a very prominent, rounded, diagonal elevation, projecting mesad, beyond which they are narrowed to bidentate apex, the teeth diverging, one curved laterad, the other caudad. A side view (fig. 3) shows that the mesal edge of the inner tooth is continuous with a broad subvertical lamina,

concave on the outside. This whole structure is probably articulated to a large basal joint which bears a few spines along its lateral margin.

2. An unpaired median, slender curved spine, bifid at the tip, the teeth sharp-pointed, decurved and diverging. Proximally the spine is thicker, somewhat compressed laterally, broader dorso-ventrally, and projects through the fissure of the large lamina described above. Our drawing (fig. 2) might be thought to indicate that this structure comes from one side, but this is not the case.

3. Caudad and laterad is on either side a slender, two-jointed, apically bifid, styliform structure, curved cephalo-ventrad toward the apex. But one of these is shown in our drawing (fig. 3, to the right).

4. Between the enlarged basal joints of the ninth pair of legs is a subplane deeply bifid lamina, the lobes of which are more or less deeply bifid with divaricate subdivisions. Our drawing (plate I, fig. 6) is from a specimen in which the inner edge of the primary lobe is merely emarginate.

Ninth legs of male 4-jointed, the basal joint subequal in length to the others taken together, and of twice the diameter; on the mesal face this joint is deeply excavate near the base and again slightly above the middle, the sinuses separated by a large rounded knob, bearing on its upper side a conical chitinized tubercle. Second joint slender, cylindrical, much longer than two distal joints taken together, sometimes twice as long. Third joint about as long as broad; apical joint somewhat conic, exceeding the third in length. Claw sometimes large and distinctly hooked, at others reduced to a shapeless chitinous tubercle.

Tenth legs of male with joints .34, .06, .54, .74, .26, .20 and .80 mm. long. Distal inferior surface of coxa with a large slightly elevated cushion of small, rounded knobs. Third joint with the inferior surface sparsely covered with rounded knobs somewhat larger than those of the coxa. Fourth joint proximally with a few knobs similar to those of the third joint. Seventh joint and secondary claws as given for third legs. The secondary claws of this species are situated farther distad on main claw than those described in the species of other genera.

Eleventh leg with joints .46, .08, .56, .70, .26, .18 and .78 mm. in length; width of first joint .30 mm. The first joint with a cone .12 mm. long and .08 mm. wide about the middle of the inferior surface; just distad of this a convex area covered with small, rounded knobs, as is also the inferior surface of the third joint. Seventh joint as in the preceding. Two superior secondary claws.

Color, according to Cope, varying from nearly white to a pale red. We have seen only alcoholic specimens and these vary from a dirty white to pale horn-color.

Length of mature specimens 18 mm.; width 1.5 mm.

Habitat: Southern Virginia, first collected by Dr. E. D. Cope in Erhart's Cave, Montgomery Co., and in Spruce Run and Big Stony Creek Caves, Giles Co.; Tennessee, Lost Creek Cave, Granger Co., also Nickajack Cave (Dr. Cope); Indiana, Wyan-

dotte Cave, Bradford and Marengo Caves, Crawford Co. (Drs. Cope and Packard and Mr. Bollman).

We have examined about seventy specimens from Wyandotte and Marengo Caves. The proportions of the sexes are about equal. U. S. Nat. Museum, Nos. 87, 420, 421 and 438.

Dr. Cope remarks: "This animal inhabits the deepest recesses of the numerous caves which abound in Southern Virginia, as far as human steps can penetrate. I have not seen it near their mouths, though its eyes are not undeveloped, or smaller than those of many living in the forests. Judging from its remains, which one finds under stones, it is an abundant species, though rarely seen by the dim light of a candle even after considerable search. Five specimens only were procured from about a dozen caves."

In Indiana, on the contrary, Dr. Packard found specimens in a small grotto, and that these were paler and had more rudimentary eyes than those collected in the Senate Chamber of Great Wyandotte Cave, three miles from daylight.

According to Dr. Packard* the eyes of this species have no neural connection with the brain, or rather, he failed to find an optic nerve after cutting over 400 sections. The origin of the specimens sectioned is not stated, and the conditions may differ in the species, as does the development of the eyes. Dr. Packard considered *P. carterensis* to be a variety of the present species, but we are unwilling to believe that its well-developed eyes are functionless.

As might be expected in a species limited in habitat, but with an extensive range there seems to be a large amount of variation in nearly all the characters, even those of the genitalia. It will not be surprising if a further study shows that some of these forms are sufficiently differentiated to merit specific recognition. While our material was abundant it was all alcoholic, and the structure of these animals is so fragile that a thorough examination can scarcely be made without the destruction of the specimen.

The median process separates it from the other American genera, and indeed from all others. The genitalia of *Craspedosoma rawlinsi*, however, have two similarly placed slender processes suggestive of homology.

*The Cave Fauna of North America, p. 113.

Pseudotremia carterensis Bollman, 1888.

P. cavernarum var. *carterensis* Packard: Proc. Am. Philos. Soc. XXI., p. 188 (1883).

P. carterensis Bollman: Proc. U. S. Nat. Museum XI., 1888, p. 405; Bulletin 46 U. S. Nat. Museum, p. 107.

Eyes of 17–25 ocelli, grouped in triangular patches, but usually not in regular rows.

Posterior subsegments dorsally densely and evenly tuberculate with rounded elevations of somewhat equal size.

Male genitalia (plate I, figs. 9, 10) consisting of three structures:

1. A thin subplane lamina, with subparallel sides, one of which turns distally at a sharp angle and is produced into a tapering though blunt-pointed process. The other margin is broadly sinuate, the distal half fimbriate with fine short hairs, the apical corner cut into longer lacineæ.

2. A thin lamina apically curved upon itself and tapering to a point. A duct can be traced from the base to the apex.

3. A bifid subplane lamina, lying between the bases of the ninth pair of legs, similar to that described for *P. cavernarum*.

Color above dark horn-brown, sometimes variously mottled with yellow on the the carinæ; below, and basal joints of legs yellowish in alcoholic specimens, the apical joints and antennæ horn brown. Length 23-30 mm. in mature individuals; diameter 2.5-3 mm.

Habitat: "The Carter Caves, Kentucky, viz.: Bat Cave, X Cave and Zwingler's Cave, besides a cave across the road from the hotel, which is used as an ice-house," (Dr. Packard); Wyandotte Cave (Mr. Bollman). We have seen four individuals from Wyandotte Cave (U. S. N. M. 436).

This species is the largest member of the family yet known from North America, and appears very distinct from *P. cavernarum* in its dark brown color and larger size. A careful examination, however, reveals the closest similarity in minor details, and we have not made our desciption extensive, for beyond the characters noticed above all the statements made for *P. cavernarum* seem to apply to this species. The eyes are more prominent and better pigmented, the segments more evenly tuberculate, the color darker, the size usually larger, and the genitalia entirely different. The antennæ and the relative proportions of their joints are variable in both species and we have been unable to observe any constant difference.

That the species, however, is valid cannot be doubted. The male genitalia have but little similarity of detail with those of *P. cavernarum*. At the same time the legs of the ninth pair are

practically undistinguishable from those of the former species, thus showing that variation in the genitalia proper does not affect these neighboring structures, making their use as generic characters desirable.

According to Dr. Packard this is "what may be called a 'twilight' species, living in small caves in situations partially lighted." In this connection it ought to be remembered that nearly all Diplopoda are nocturnal and lucifugous. It would not be a surprise to us if careful collecting in the neighborhood of the caves should reveal many of the so-called species in dark corners and crevices of rocks along with the open air species. There has been much more careful collecting in the caves than outside.

CLEIDOGONA gen. nov.

Cryptotrichus || Packard, Proc. Am. Phil. Soc. XXI, p. 189 (1883).

Spirostrephon Wood, not of Brandt; *Pseudotremia* Cope *pp.*; *Campodes* Bollman, not of C. L. Koch.

Eyes well developed, of numerous (25–29) prominent ocelli arranged in triangular patches.

Antennæ filiform, very long and slender; third joint longest.

Mandibles with 12 pectinate lamellæ.

Promentum present, triangular.

Segments with lateral carinæ nearly obsolete; setigerous tubercles very small.

First two pairs of legs small and slender, the next five pairs in males moderately crassate.

Anterior male legs hispid on the interior face of the last joint.

Genitalia of male of two pairs of processes, the posterior articulated with the anterior at base.

Ninth legs of male 5-jointed and clawed; two basal joints large, subequal in length; three distal joints small, forming a hook.

Tenth and eleventh legs of male with large coxal apertures; coxa of eleventh leg with a conic process, the third joint unmodified.

Pedigerous lamina of twelfth legs of male produced at apex into a large conic process directed cephalad.

Segments of adult 30.

Distribution: Eastern States; reported from Minnesota and Arkansas; thus far we have been unable to find it in western Ontario, central New York, Long Island, Connecticut and the eastern shore of Maryland.

That the affinities of Cleidogona are with Pseudotremia may be inferred from the numerous characters common to both genera.

At the same time the differences are so great that to unite the genera as several authors have done seems unwarranted. In addition to the above diagnosis, the following description applies to the species noticed in this paper:—

Body fusiform, broadest in the anterior portion, narrowed very abruptly cephalad, very gradually caudad; in cross-section circular, slightly compressed dorso-ventrally in front of the middle, slightly compressed laterally caudad. Carinæ very small, placed near the middle line of side.

Vertex prominent, nearly smooth, shining.

Clypeus sparsely hirsute with short and long hairs; a prominent transverse supralabral ridge, above which are a few more or less evident fine transverse wrinkles. Along the lateral margins a deep, somewhat oblique furrow curving mesad below, above the transverse ridge.

Eyes in a triangular patch, arranged in several transverse rows; as in other genera there is usually one ocellus on the lateral margin above the upper row, with which it is usually counted.

Antennæ moderately hirsute, the distal joints more hirsute than the basal. Approximate proportions of lengths of joints beginning with the seventh, 3: 3: 7: 5.5: 10: 5: 2.

First segment, viewed from above, pointed reniform; surface smooth, excepting three very small light-colored protuberances on each side; the lateral located at the extreme corner of the superior surface of the segment; the second a short distance mesad and cephalad from the first; the third nearer to the median line than to the second. The bristles measure as much as .15 mm. in length.

Subsequent segments with the lateral carinæ more pronounced for six or seven segments, whence they decrease in size. On the anterior segments the lateral bristle-bearing protuberance is close to the posterior margin; on succeeding segments it is not so close, until the antepenultimate is reached. As the carinæ decrease the bristles of the lateral protuberances increase, posteriorly; they are directed horizontally and appressed to the side of the body. The middle pair of protuberances approach the median line on posterior segments, and the six bristles are more and more nearly arranged in a straight transverse row. A fine median ridge placed in a furrow runs from the first to the last segment.

Anal segment without median furrow or ridge; broadly truncate or slightly emarginate posteriorly and deeply sinuate on the sides; with eight bristles, of which two are located on the anterior portion, near the median line; the others are directed more or less horizontally from the posterior margin. The median pair have thickened conical bases nearly as long as the slender bristles rising from them. The other bristles are located at the corners of the truncation and the upper part of the lateral sinuation. Posterior margin very thick and slightly grooved posteriorly.

Anal valves slightly exceeding the anal segment, not strongly convex, more prominent above the middle, and angulate, the margins scarcely raised; above on each side with three bristles at equal distances from each other.

Preanal scale semi-elliptical, broader than long, broadly truncate posteriorly; with two long slender bristles directed backward from near the posterior margin, and appressed to the anal valves.

First two pairs of legs much smaller than the others; next five pairs in male crassate. Legs 10–12 longest, the legs decreasing both in length and thickness caudad, so that the last pairs are very slender.

Second legs of male with a regular row of spines bordering the last joint on the ventral edge.

Legs 3–7 not specially modified, further than being crassate, and hispid on the ventral face of the last joint.

Male genitalia of two pairs of appendages, the posterior jointed at base to the anterior. The anterior pairs larger than the other and curved backward, the posterior is more or less clavate or capitate.

Ninth legs of male 5-jointed, the two proximal joints subequal in size and length; the other three very small; the last joint somewhat longer than either of the two preceding. The shape of the joints differs somewhat in the different species.

Tenth leg of male with a conic process on the ventral face somewhat beyond the middle of the proximal joint.

Tenth and eleventh legs of male with large apertures in the basal portion of the coxæ. Sometimes the apertures have raised rims which alter the outline of the joint when viewed from in front or behind, and sometimes a membrane or hardened secretion projects from the aperture.

Color purplish horn-brown, usually dark, mottled and marbled with pinkish or dirty white.

Cleidogona cæsioannulata (Wood).

Spirostrephon cæsioannulatus Wood: Trans. Am. Philos. Soc. XIII, p. 194 (1865).

Pseudotremia cæsioannulatus Cope: Journ. Am. Philos. Soc. XI, p. 179.

Spirostrephon cæsioannulatus Ryder: Proc. U. S. Nat. Museum III, p. 526 (1881).

Cryptotrichus cæsioannulatus (Wood) Packard: Proc. Am. Philos. Soc. XXI, p. 190 (1883); McNeill, Proc. U. S. Nat. Museum X, p. 333 (1887); Bull. No. 3, Brookville Soc. p. 8 (1888).

Campodes flavicornis Bollman (not C. L. Koch): Entomologica Americana IV, p. 1 (1888) (*Compodes fuscicornis* and *Pseudotremia vudii* are also here placed as synonyms by Bollman) Ann. N. Y. Acad. Sci. X, p. 109 (1888); Proc. U. S. Nat. Museum XI, pp. 340, 344 and 405 (1888); Bulletin 46 U. S. Nat. Mus. pp. 73, 83, 91, 96, 106, 120, 150, 181 and 183.

Eyes more or less triangular in form, of about 25 ocelli, six of which border on the margin of the vertex, and if grouped in rows parallel to these appear to be arranged 6+5+5+4+3+2+ (sometimes) 1=25 or 26. If the rows are looked upon as transverse the numbers are, beginning posteriorly, 1+1+2+3+4+5+5+4=25, or diagonally 1+6+6+5+4+3=25.

Antennæ filiform, 3 mm. long, .16 mm. thick.

Male genitalia (figs. 138, 139, 145–148, 150), with the anterior and larger arm bent abruptly caudad (or dorsad). At apex it is more or less bifid, with the outer lobe longer, so that seen from below the end appears either more or less truncate, or if the animal is tilted so as to look more directly at the apical portion of the genitalia the appearance is that of figures 139 and 146. This last is somewhat of a side view as well. The longer lobe is at apex more or less fimbriate on the posterior side.

Posterior arm of genitalium clavate, the apex curved toward the anterior arm. The shape will be seen to vary considerably in the three figures 138, 147, 150; from the explanation of plates it will be seen that the figures are from different localities, and further study may necessitate another disposition of the different forms.

Ninth legs of male (figs. 144–145) with basal joint moderately emarginate on the ventral side, near the base; toward the apex, on the same side, is a sharp tubercle directed distad. Second joint nearly half as broad as long, the greatest diameter at about two-thirds of its length, gradually narrower below, more abruptly so above. Three distal joints small, together equal in length to about half the second joint. Last joint nearly equal in length to the two preceding, constricted above the middle and obliquely crossed on the anterior side, just below the constriction, by an oblique ridge the edge of which is sharp and spinose-laciniate, giving the appearance of another joint. Two proximal joints with few hairs, the three distal increasingly hirsute. Claw nearly normal, one evident supplementary claw.

Color of alcoholic specimens: Head dark brown, lighter above; the mandibulary stipes areolate, pale lines separating darker areas; antennæ dark brown.

Body usually with a yellowish median longitudinal line of greater or less width, on each side of which is a usually broader dark line, below this a narnower yellow one, and then another dark line or longitudinal row of dark spots. Ventral surface yellow, legs pallid, or the distal joints dark. On each segment the brown color is much darker on the posterior subsegments; that of the anterior portion has sometimes a bluish tinge. The median yellow line is frequently obsolete, and the lateral reduced to a row of transversely oblong spots. In the dorsal dark lines there are, on each segment, two longitudinally oval or circular small yellow spots, in which the small bristle-bearing protuberances are located. Even when the lateral yellow line is present there is, below the outer of these spots a brighter, longitudinally oval spot. The lateral bristle-bearing protuberance is located in the upper part of the lateral dark line and is colored yellow. Length 14–16 mm; width 1.5.

Habitat: In the U. S. Nat. Museum are the following numbers labeled *Campodes flavicornis* by Bollman. While there was supposed to be but one species in the genus determination was comparatively easy, but it is now impossible to assign specimens to the different species without a dissection or at least a

very careful examination of the male genitalia. Hence the determination of the female and young specimens is in the present state of our knowledge impossible, and these and the other reports of the species have value only in showing the distribution of the genus. Sometimes two species were found in the same bottle. Nos. 18 and 28, Bloomington, Indiana, largely young specimens. The whole ones have 26 segments; No. 67, Fort Snelling, Minnesota, a female; No. 159 Little Rock, Arkansas, a female; No. 197, Mossy Creek, Tennessee, a female; No. 247, Chapel Hill, N. C., a male, but not dissected; No. 325, Winona Minnesota, immature; Nos. 16, 442, 444, 448 no localities given, probably from Indiana.

Besides the localities mentioned, specimens of this species have been reported under one or the other of its synonyms, from the following places:

Alleghany county, Pennsylvania (Wood); Culmana, Alabama, or Ocean Springs, Mississippi (Packard); Monroe county, Indiana (McNeill); Beaver Creek, Jefferson county, East Tennessee (Bollman); Washington, D. C. (Bollman); Bloomington, La Fayette and Salem, Indiana (Bollman). We found about a dozen specimens among leaves in rather dry woods near the Catholic University, Washington, D. C., October, 1894. These are represented by figures 138–143.

The above description was made from the U. S. Nat. Museum material (No. 16, no locality given, but probably from Indiana) from which figures 145–148 were drawn. We cannot, however, be confident that either the description or figures apply to the original *cæsioannulatus*. Descriptions under this name have been published by Wood, Packard and McNeill. None of the characters given by the earlier writers are more than generic, with the possible exception of the size. According to Wood's original description the length was "about an inch." The only species known to us to which this is applicable is *C. major*, from Washington, D. C. Wood's type specimen was from Alleghany County, Pa., and is probably no longer in existence. The only specimens of the genus in the museum of the Philadelphia Academy are a female specimen and a half labeled, probably by Dr. Wood, *cæsioannulatus*. They were collected by Dr. Leidy in West Virginia, and are rather large, of light color, and perhaps more fusiform than usual, in which characters they agree with *C. major*.

Packard's material was from Alabama or Mississippi. The length is given as 15 mm., from which facts if we may infer anything it is that the species studied by Dr. Packard is likely to have been different from the type of Wood. The matter is further complicated by the fact that we have found two distinct species in the vicinity of Washington, D. C., and three in the material referred by Bollman, and probably also by McNeill, to *C. cæsioannulata.* One of these Indiana species was described by McNeill, who was the first to give characters available in drawing specific distinctions.

The description was confined to the ninth leg of the male. He says: "The eight * pairs of legs are modified as follows: joints six, *i. e.*, femur and tibia, and four tarsal joints united to form a hook. The basal joint is slightly lengthened and curved upward nearly parallel to the body. The tibia is compressed, and gradually enlarged to a point one-third its length from the distal end; from this point it is abruptly constricted so that the diameter of the proximal and distal ends is about the same. The enlargement of the tibia is on its ventral side and ends in a tubercle which does not bear a seta. The four tarsal joints (with the distal third of the tibia) form a semicircular hook tipped with a normal claw. The two proximal joints of the hook are equal in size, cylindrical, length equal to the diameter. The last joints are conical and very small. The length of the four tarsal joints is equal to the greatest diameter of the tibia. Femur and tibia are white and not pilose, the hook is brown and pilose."

If we interpret this by the light of the accompanying drawing (reproduced as fig. 149), it will be seen that the ninth leg differs considerably from those studied by us (cf. figures 117, 127, 140, 145, 162, 163, 167, 168). The number of distal joints is different,† as well as the shape of the large proximal joint. What appears like a small basal joint is not explained in the description quoted. The description also mentions a tubercle on the tibia, but the figure does not show it. One of the Indiana species, however, has such a tubercle (cf. fig. 163). This suggests that the drawing and the description may not have been made from the same

* Not counting the genitalia.

† This is probably to be explained by the fact that in the specimen represented by fig. 145 there is a somewhat oblique ridge across the last joint (cf. figs. 145 and 145a).

specimens, since it is extremely likely, to judge from the Indiana material we have studied, that Mr. McNeill's numerous specimens represented more than one species.

In addition to that of the ninth leg, Mr. McNeill gives a figure of the genitalia. In his explanation this is said to be plate xii, figure 5. This figure bears no resemblance to the genitalia of Chordeumidæ, but has evidently been transposed with figure 5 of the preceding plate, which we here reproduce (fig. 150). It so far resembles figure 147 as to make its specific distinctness a matter of doubt. The resemblance between figures 150 and 138 is more striking. Figure 138 represents a specimen collected at Washington, D. C., which would give the species a considerable range, leaving it entirely probable that it may be found in Alleghany county, Pa.; thus the question of what *Cleidogona cæsioannulata* really is seems likely to be settled in one of two ways. Either we must retain McNeill's form as representing the species because he was the first to describe it in a tangible way, or we must find by collecting what species is found in the indicated part of Pennsylvania. The only clue seems to be the size. The Indiana material we have seen is only 14–16 mm. long. If there should prove to be *one* species in Alleghany county 'about an inch' in length, we must call it *cæsioannulata.* In the meantime species indicated by McNeill should have the use of the name unless a new one is to be made.

The Washington, D. C. specimens (figs. 138–143) differ somewhat in the shape of the gentitalia and ninth legs of male, especally in that the distal joints of the latter are in the Washington specimens short and thick, while those of figure 145 are the longest we have seen. Notwithstanding, there is not the same necessity of distinguishing the forms specifically as appears in the other species in which the genitalia are so different as to leave no room for doubt.

Cleidogona major sp. n.

Plates VI and VII, figures 110–137.

Eyes triangular, the ocelli in transverse rows as follows: 1+7+6+5+4+3+2+1=29, in oblique rows: 1+1+2+3+4+5+6+7= or in vertical rows: 8+6+5+4+3+2+1.

Male genitalia (figs. 128–130) with anterior arm much curved at base, nearly straight at apex and bilobed, but not deeply as in *C. cæsioannulata;* apical sinus broad and rounded (cf. fig. 129, an apical view). On the anterior

ventral face there is a deep groove, and some distance below the apex a broad lateral emargination. Near the base of the posterior arm are a few long bristles. Posterior arm abruptly capitate, laterally with a rounded projection above.

Ninth legs of male (fig. 127) with basal joint broadly emarginate on the ventral side, very prominent above, sometimes truncate; without tubercle. Second joint three times as long as broad, the line of the ventral side being gently curved, not with a sharp turn at the greatest diameter. Distal joints rather stout, with a similar ridge across the anterior side as described for *C. cæsioannulata*. Claw rather small.

Color horn-brown, mottled with pinkish white. Head dark brown, especially the vertex, more or less mottled with white in fine points arranged in irregular areas, with more or less bilateral symmetry. Lower part of clypeus nearly white. Margin of labrum transparent yellowish.

Segments with exposed portion dark brown above, dirty-white below. Anterior subsegment pale, except where exposed. A pale transverse line is usually present along the suture between the subsegments; dorsally the suture is especially on anterior segments, sinuate, and sometimes the lighter color runs back on the median line. The six setæ of each segment are located in light spots, and between the outer pairs of setæ there is a large transverse area coarsely mottled, bounded in front and behind by a dark line. The posterior line is extended below the outer seta and is broader, so that the animal appears to have a row of lateral spots. Below the spots the color rapidly fades to yellowish white. On posterior segments the dark color of the dorsum is darker than on the anterior, the lighter spots smaller, but more vivid.

Legs with basal joints dirty white, the distal dark brown.

Antennæ very dark, except a short pale ring at the base of each joint.

Length of mature males 18–20 mm., width 2.2–2.4 mm.; length of females 20–24 mm., width 2 mm.

Habitat: Washington, D. C. Nine mature specimens, including three males, were collected among leaves on a wooded hillside in the Zoölogical Park, Washington, D. C., October, 1894.

This species, from its great size, seems likely to have been the original of *cæsioannulata*, and may be taken as the type of the genus Cleidogona. It also seems more related to the species identified by McNeill as *cæsioannulata* than do the three following species. It is possible that this species is among those reported as *Campodes flavicornis*, but we did not recognize it among the specimens from the National Museum.

Cleidogona laminata sp. n.

Plate IX, figures 164–171.

Eyes as in *C. major*, ocelli of the same number, arranged in transverse row: 8+6+5+4+3+2+1.

Genitalia of male (figs. 165, 166) with the anterior arms oblique, deeply bifid at apex, the lobes subequal, but of different shape; the inner somewhat resembling in outline the head of a bird; the outer more or less truncate and fimbriate along the inner edge distad. Posterior arms clavate, somewhat acuminate at apex and with a notch on the median face. Below, attached to the anterior arm, and somewhat embracing the posterior is on each side a thin lamina.

Ninth legs of male (figs. 167, 168) with the basal joint broad below and deeply emarginate above. From the posterior face projects mesad a triangular plate dentate on the proximal edge, partly covering the emargination, and giving the appearance of a deep notch when the leg is viewed from the posterior side. Second joint more slender than in the other species, more than three times as long as broad 7: 2. Proximal joints with scattering hairs, the distal increasingly hirsute. Claw rather small.

Tenth legs of male (fig. 170) with margins of coxal apertures produced, and the inner edge of the coxa somewhat emarginate.

Eleventh legs of male (fig. 171) with the conic process rather short and blunt.

Color of alcoholic specimens, probably faded, horn brown, darker above, gradually changing to dirty white below. The spots described for the preceding species are present, but are less distinct, so that the animal appears nearly concolorous unless more closely examined.

Length of male 15.5 mm.; width 2 mm.

Habitat: Locality unknown, probably Indiana, U. S. Nat. Museum, No. 427, a male and two female specimens. In the form of the genitalia and ninth legs this species seems very distinct.

Cleidogona forceps sp. n.

Plate IX, figures 159–163.

Male genitalia with anterior arms broad below, gradually narrowed, then dilated and again narrowed, deeply bilobed at apex, not decurved; superior lobe broadly notched at apex, one of the divaricate divisions serrate; inferior lobe longer, the apex slightly notched, twisted.

Posterior arm attached at about one-third the height of the anterior, slender, deeply divided, forcipate.

Ninth legs of male with basal joint moderately emarginate below on the ventral face, slightly so above on the dorsal face. Second joint scarcely twice as long as wide, at about the middle on the ventral side swollen into a large rounded prominence; above is a broad sinus into which the distal joints are folded.

The specimen on which this species was founded was taken from the same bottle (U. S. Nat. Museum No. 16, no locality), with those represented by figures 144–148, and not apparently

differing from the others in external appearance. The form of the genitalia and ninth male legs is so distinct and characteristic as to make identification easy.

Cleidogona fustis sp. n.

Plate VIII, figures 151–153.

First legs of male six-jointed, the joints, beginning with the coxa, .20, .06, .30, .12, .10 and .38 mm. long; third and fourth joints .10 mm. Two superior secondary claws and a small inferior one.

Second legs of male also six-jointed, the joints .20, .06, .32, .14, .10 and .32 mm. in length; width of third joint .12 mm.

Third legs of male seven-jointed, .22, .04, .32, .36, .14, .10 and .40 mm. in length; width of third joint .20 mm., somewhat enlarged toward the distal end. Seventh joint with hook-like transparent roughenings like those of *Conotyla fischeri*, but smaller. The third joint with a few conic or knob-like protuberances on the inferior surface.

Fourth legs of male seven-jointed, the joints, beginning with the coxa, .24, .04, .40, .44, .14, .12 and .44 mm. long. Seventh joint roughened as on third legs. The third joint with a few knobs, as on the fifth leg.

Fifth legs of male with joints .24, .04, .48, .46, .18, .10 and .44 mm. in length. Inferior surface of third joint covered with small knobs about .04 mm. in diameter. Seventh joint with inferior secondary claw, apex with process like the twelfth legs.

Sixth legs of male with joints .28, .04, .44, .46, .18, .12, .44 mm. Third joint sparsely covered with cones and knobs. Seventh joint as given for seventh legs.

Seventh legs of male with joints .28, 04, 42, .48, .16, .10, 42 mm. long, .26 mm. wide; coxa with a large transparent rounded protuberance, about as long as wide (.06 mm), covered, like the surface of the coxa, with sparse small knobs, smaller than those of the third joint. Third and seventh joints as for the sixth leg. Distal two-thirds of inferior surface of seventh joint roughened with crowded, appressed, distally directed short, sharp, bayonet-like processes. One superior and one inferior secondary claw.

Tenth legs of male with joints respectively .36, .04, .38, .46, .16, .10, and .48 mm. long, width of third joint .20 mm. First joint thickened distad, and with two large protuberances, one conical, the other larger; and of irregular shape. The first is chitinous, the second membranous, apparently protruded from an aperture. Inferior surface of third joint thickly covered with very flat knobs. Seventh joint with distal half as on seventh legs. The superior apical angle of this joint seems to be produced into a curved, claw-like, chitinized process nearly equalling the true claw in size. A small inferior secondary claw.

Eleventh legs of male with joints respectively .36, .04, .32, .46, .14, .12 and .50 mm. long; third joint .18 mm. wide. Coxa with a large irregular process at about the middle of the inferior surface, directed meso-caudad. Seventh

joint with distal half as on seventh leg; near the apex of the joint, and on the upper side a lanceolate, thin, transparent, twisted process as long as the claw. No secondary claws.

Twelfth legs of male with a large, blunt, conical median process on the pedigerous lamina, directed ventro-cephalad.

Genitalia of male (figs. 151–153) viewed from below (anterior face) with the anterior arms dilated above the middle, suddenly twisted at apex and deeply bifid, one of the divisions long and gently curved, the other broad and in some cases at least, perforate.

Posterior arm simple, clavate, the anterior corner above sharp and somewhat produced; on the same side a short distance below is a tooth-like prominence.

Tenth legs of male with the coxal aperture near the middle of the joint.

We have examined two male specimens, U. S. Nat. Museum, No. 446, no locality given, but probably from Indiana. Externally they did not appear different from the other species.

The measurements of the joints of the legs were made with a view of finding out whether specific differences existed. The relative proportions appear to be maintained, so that it does not seem necessary to introduce measurements for the other species.

Cleidogona vudii (Cope), 1869.

Pseudotremia vudii Cope: Proc. Amer. Philos. Soc., XL. p. 180.

"This species differs from the last (*Pseudotremia cavernarum*) and resembles rather *P. cæsioannulatus* of Wood. The points separating it from the latter will be pointed out below.

"Number of segments the same as in the *P. cavernarum*, twenty-nine, but they are neither convex or rugose nor coarsely striate, but marked with a very minute, irregular longitudinal striation. Segments cylindric, without shoulder, but with a small directed backwards on the posterior margin of the lower part of the annulus, which is enlarged on the front segments. This elevation is furnished on the anterior and posterior regions, and probably everywhere in an uninjured condition, with a bristle. On the anterior segments a hair in front of each pore. Front plane, with finer and coarser hairs sparsely distributed. Lateral margin with an open notch. Antennæ hairy, with a bristle at the distal extremity of each joint. Lengths, 3d, 5th, 4th, 2d, 8th, 7th, 1st; the eighth joint longer than in *P. cavernarum*. Eye patch triangular, not in a depression. Posterior segments considerably compressed, the last segment with four transparent marginal bristles; extremity of body slightly recurved. Total length eleven lines.

"Color pinkish-brown, with a pale band from below to the external pore on each side of each annulus. Top of head black.

"A single specimen, to exact locality not preserved, but probably from Montgomery Co. (Va.), and, I think, not from a cave. I have conferred on it the name of my friend, Dr. H. C. Wood, Jr., to whom we are indebted for a system of the Myriapoda and the means of studying the American species. It differs from the *A. cæsionnulatus* of his monograph in the rounded dorsum without keel or groove, the 29 instead of 32 segments, and the coloration. The eye patches are not in a depression, nor is the labrum deeply emarginate, as Wood describes."

Cleidogona mexicanus (Humb. et Sauss.).

Craspedosoma mexicanum Humb. et Sauss.: Revue et Magasin de Zoologie, 1869, p. 153; Etudessur les Myriapodes (Zoologie du Mexique), p. 59, 1872.

Plate VI, figures 105–109.

Body cylindrical, smooth; shining, slightly attenuate cephalad, strongly so caudad, laterally compressed toward the extremity and terminating in a point.

Head flattened in front, its lateral and superior parts swollen and projecting, the vertex forming an arched prominence concave behind.

Eyes forming a triangular plate behind the antennæ.

Gnathochilarum (see plate).

First segment narrower than the second, forming a constriction behind the head; anterior border sinuate, the middle projecting and arcuate, corresponding to the emargination of the occiput; its lateral lobes sharp and bent downward, bearing a small horizontal carina which is continued along the anterior border as a marginal thread-like elevation.

Subsequent segments gradually larger, truncate below with rounded angles; dorsal line extremely fine. Each segment (the preanal excepted) carrying at half-height a small, pointed tubercle, directed backward, and terminated by a long bristle; and besides, on each side, between this line of tubercles and the dorsal line, two other lines of very small piligerous granules, looking sometimes like piligerous points. On the anterior segments the lateral region situated below the line of tubercles is striated.

Last segment forming a triangular arch, compressed, moderately truncated at the extremity; the truncated border ornamented with small spines (3?).

Anal valves narrow, compressed, forming a crest which projects as far backwards as the extremity of the last segment.

Preanal scale rounded.

Legs long, slender, completely covered by a fine villosity.

Color chocolate brown, paler below, posterior border of segments ornamented by a gray band; the small tubercles forming spots of lighter color surrounded by a pale ring. Feet and antennæ pale.

Length 22 mm.; width 2.5 mm.; number of segments .....?

Habitat: Eastern Cordilleras of Mexico.

The above is a translation, partly rearranged, of the description given in the 'Etudes.' It seems to have been based on one female specimen. The authors add the following remark:

"This species is evidently very nearly related to *Spirostrephon cæsioannulatus*, Wood. But judging from the description and figure, Mr. Wood's species seems not to have upon the sides a row of tubercles larger than those of the dorsal surface. If Mr. Wood had not given thirty-two segments for his species, instead of thirty, we would not doubt that it should be included in the genus Chordeuma or Craspedosoma. Our species approaches Craspedosoma, Leach, in the form of the gnathochilarium, and the development of the piligerous tubercles, and Chordeuma, Koch, in the cylindrical form of the body."

BACTROPUS gen. nov.

Eyes of numerous (27) prominent ocelli arranged in triangular patches.

Antennæ long and slender, third joint longest, nearly equalled by the fifth (10:9), followed by joints 4, 2, 6, 7, 1.

Mandibles with ten pectinate lamellæ.*

Promentum not distinct.

Segments with lateral carinæ represented by a gentle bulging of the surface; not striate; setigerous tubercles obsolete, the setæ short.

Male genitalia simple, hamate.

Ninth legs of male five-jointed and with a small claw; coxa much larger than the other joints taken together.

Segments of adult 30.

This genus resembles Cleidogona in general appearance, but the body is smaller and more slender. It also has characters in common with Pseudotremia, Trichopetalum, and Conotyla. From Pseudotremia it differs in the better development of the eyes, being evidently an open-air creature; also in the lateral carinæ nearly obsolete and the lateral surface not striate. It resembles Pseudotremia and Cleidogona in the slight development of setigerous tubercles and in the number of joints of the ninth male legs. This last resemblance is, however, only apparent, for the form and function is very different. In Pseudotremia and Cleidogona the ninth legs are capable of use as clasping organs, while in Bactropus, as in Trichopetalum, it is difficult to understand how the ninth legs could serve such a purpose. Bac-

* The condition of the specimen was such as to make the number somewhat uncertain.

tropus also differs from the genera mentioned in the number and shape of the joints of the ninth legs, the slight development of carinæ, tubercles, and bristles, and in the want of a distinct prementum.

Bactropus conifer sp. n.

Plate IX, figures 172–176.

Body tapering more gradually behind than in Cleidogona.

Vertex slightly rugulose, sparsely hirsute, sulcus indistinct.

Eyes triangular, arranged in six rows, beginning posteriorly, 7+6+5+4+3+2=27.

Antennæ slighly clavate, approximate ratio of lengths of joints, beginning with the seventh, 3, 4, 9, 5, 10, 4, 1.

First segment rugulose, semi-circular, the tubercles very nearly obsolete. The furrow in which the dorsal ridge is situated runs nearly, if not quite to the anterior margin.

Subsequent segments slightly rugulose, anterior portions finely reticulated, carinæ small, tubercles and hairs very small and indistinct. Posterior margin gently sinuate on each side behind the outer setigerous tubercles.

Last segment, anal valves and preanal scale (fig. 176) much as in Cleidogona.

Male genitalia (fig. 174) simple, with broad base and attenuate apex, curved backward.

Ninth legs of male (figs. 174 and 175) with a few hairs on the two proximal joints; the claw very small.

Color dark brown, the posterior margin of each segment and a very fine median line yellowish. A light spot at each setigerous tubercle, the outer two spots on each side subconfluent, giving the appearance of a light longitudinal line. Ventral parts and basal joints of feet dirty brown; apical joints darker. Antennæ nearly black, darker than those of any other species known to us.

Length about 9 mm.

Habitat: Indiana. We have examined one male and three female specimens collected by Bollman in the vicinity of Bloomington, and deposited in the National Museum (No. 43) under the name "*Craspedosoma lunatum.*"

The material is in poor condition so that many important facts cannot be determined. Further study will probably multiply minor similarities with Cleidogona.

The joints of the ninth legs of male are not, in the specimen examined, easy to distinguish, the second, third and fourth appearing nearly coalesced. This suggests the idea that the second joint of the ninth leg of Scoterpes, Trichopetalum, Zygonopus and Conotyla may have been formed by the gradual coalescence

of the four distal joints. Indeed, this idea becomes reasonably probable when we consider that there is a claw in Scoterpes, and a similarly located chitinous bunch in Zygonopus and Trichopetalum, which may be interpreted as the rudiment of a claw. It should also be noticed that in Pseudotremia and Cleidogona there is evidently a tendency toward the development of two large proximal joints at the expense of the distal.

SCOTERPES Cope. 1872.

Am. Nat. VI. p. 414.

Spirostrephon (*Pseudotremia*) Packard and Ryder, not Brandt.

Craspedosoma (*Scopterpes*) Latzel: Myr. Oest. Ung. Mon. II., p. 209 (1884); Haase: Zeitsch. f. Entom., N. F., XI., p. 60 (1886).

Eyes wanting.

Antennæ of moderate length, third joint longest.

Segments with moderately prominent shoulder-like carinæ.

Ninth pair of legs of male two-jointed, the distal joint with a strong claw.

Segments of adult 30.

The single species of this genus is from Mammoth Cave. It is known to us only from descriptions and figures, but there can be little doubt of its close relationship with Zygonopus and Trichopetalum, from both of which it is distinct in the large claw of the ninth legs of the male. We reproduce Dr. Packard's figures of the genitalia and ninth pair of legs, but it is not possible to get from these or from his descriptions a satisfactory idea of these structures, nor one which will enable us to compare them with allied forms. Indeed, we are not certain that the ninth legs of males ought not to be spoken of as three-jointed. In Dr. Packard's figure they appear entirely detached, and if the two joints are correctly drawn another would seem necessary to connect them with the body.

It is in this genus that the six dorsal bristles peculiar to the present family have their greatest development. According to Drs. Cope and Packard these bristles approximate in length the diameter of the body, giving the animal very much the appearance of a caterpillar.

Scoterpes copei (Packard) Cope.

Spirostrephon (*Pseudotremia*) *copei* Packard: Am. Nat. V., 748 (1871).

Scoterpes copei (Packard) Cope: Am. Nat. VI., p. 414 (1872); Packard: Proc. Am. Phil. Soc. XXI., p. 193 (1883); McNeill: Bull. No. 3, Brookville Soc., p. 8 (1888).

Plate I., figures 12–13.

"Head with rather short, dense hairs; no eyes, and no ocular depression behind the antennæ, the surface of the epicranium being well rounded to the antennal sockets; behind the insertion of the antennæ the sides of the head are much more swollen than in *S. lactarius.**

Antennæ slender, with short, thick hairs; relative length of joints, the 6th being longest; 6th, 4th, 5th, 3d, 8th, 7th. 1st, the 7th being much thicker than the 8th.

Twenty-eight segments behind the head; they are entirely smooth, striated neither longitudinally nor transversely; a few of the anterior segments rapidly decrease in diameter toward the head. The egments are but slightly convex, and on each side is a shoulder, bearing three tubercles in a transverse row, each giving rise to a long stiff hair one-half to two-thirds as long as the segment is thick; these hairs stand up thickly all over the back, and may serve at once to distinguish the species.

No pores.

Feet long and slender, nearly as long as the antennæ, being very slender towards the claws.

Color entirely white.

Length of body .35 inch; thickness .04 inch."

Habitat: Mammoth Cave, Kentucky.

The above description is that originally given for this species. The importance of several of the included statements is questionable, especially since the accompanying diagrams do not agree with the description.

The antennæ are said to have eight joints, while in the diagram but seven appear. In giving the "relative length of joints" the second is entirely omitted, so that we have no ground for supposing that there was a small basal joint not given in the diagram and are obliged to fall back on the fact that in this family the antennæ have, as far as known, but seven joints. It might also be noticed that if "2d" is understood for "3d," "3d" for "4th" and so on, the relative length of joints will be the same as Trichopetalum, 5th, 3d, 4th, 2d, 7th, 6th, 1st.

The drawing of the entire animal also gives thirty segments instead of twenty-eight, as in the description.

At a later date Dr. Packard gives a more extended description† of this species and genus, differing, besides, from the former description in some important particulars, so that it seems desirable to add a transcription of it. These descriptions con-

* Dr. Packard wrote this while believing the present species to be congeneric with *Lysiopetalum lactarium* (Say).

† Proc. Am. Philos. Soc., XXI, p. 177, Sept. 1883.

tain, however, many statements which we look upon as of doubtful import or questionable truth, and such are given in italics, our reasons for doubt being stated later on.

"Body very long and slender, *not fusiform;* consisting of thirty segments besides the head, *with about fifty-two pairs of legs, with the penultimate joint very long.* Head rather large, and unusually broad; no eyes present; the genæ unusually large, but not so globose as in Trichopetalum; *the front is also carried farther up on the vertex than usual, and is much broader than long;* the clypeus flat, slightly bilobed on the front edge. The antennæ are moderately long and hairy, with the sixth segment scarcely longer than in Trichopetalum, but more uniform in thickness, scarcely longer than thick; the terminal joint as long as the sixth, the end conical, more produced than in Trichopetalum or Zygonopus; at the tip are four rather long sense-setæ. *Body segments becoming as usual smaller next to the head;* the *anterior* of each division of the arthromere much swollen high up on the sides; each shoulder with three tubercles, which are arranged in a scalene triangle and bearing much longer setæ than in the other genera, though not quite so long as the body is thick. The legs are long and slender, more so than in Trichopetalum, and somewhat more than in Zygonopus. In the male the eighth pair of legs are rudimentary, being two-jointed, the second joint *only one-fourth longer than the basal,* and ending in a well-developed stout claw. The genital armature minute and very rudimentary, pale, scarcely chitinous; the outer lamina short and thick, with a stout external recurved spine, and two terminal obtuse points; the inner lamina shorter, forming a truncated angular spine, and not much more than half as long as the outer lamina; between the inner and outer lamina, its base next to the inner lamina is a middle spine ending in an irregular tuft of fine spinules.

"This genus is distinguished from Trichopetalum by its want of eyes, its broader head, its long slender body, with long setæ, by the eighth pair of *female* rudimentary legs ending in a claw. From Zygonopus it differs in the shorter sixth antennal joint; its broader head; its slenderer legs, the sixth pair in the *female* not being unlike the others, and by the more prominent shoulders and longer setæ. The species of the two genera are of the same general form and size."

"About 20 ♂ and ♀ examined. Body white, with no dusky discolorations; 30 segments behind the head in specimens 11 mm. in length *and 52 pairs of legs;* in one female individual 8 mm. long there were 49 pairs of legs, including the eighth or rudimentary pair; in another individual 6 mm. long there are 24 segments behind the head. The head is provided with short, fine erect hairs of different lengths, especially on the sides of the genæ."

"Males and females are alike in size and form."

That the body is "not fusiform," but that the segments become, "as usual smaller next to the head," seem to us mutually contradictory statements. In all the Chordeumidæ known to us the last joint of the legs is longest, not the penultimate, though

this is not necessarily the implication of Dr. Packard's statement, What is intended by the front being carried up on the vertex, we cannot imagine. In the species known to us it is practically impossible to make out any definite lines of division between these parts of the head. "Female," is twice used where "male" was evidently intended. Dr. Packard was of course aware that in chilognaths the eighth legs of females are unmodified. 52 legs would be a most unusual number, for allowing one pair of legs each for the 1st, 2d, 4th and 28th segments, and none for the 3d, 29th and 30th, there can be but 50 legs on a female chordeumid, 48 or 49 on a male.

Dr. Packard's figure (see pl. I., fig. 13) of the ninth pair of legs and the genitalia gives us no idea of the method of attachment of the former, and the length of the second joint does not correspond to that given in the description. A laciniate process is probably present as in Zygonopus and Trichopetalum. but in other respects there is a wide difference from those types, and a further study of the species will probably prove very interesting.

Reasoning from analogy and from the statements of the writers quoted, we suppose that this species has undergone the same deterioration of the exoskeleton as is described for *Zygonopus whitei.*

Regarding the distribution of this species, Dr. Packard adds:

"The specimens were most abundant in the Labyrinth in Mammoth Cave, but also occurred in other localities in the cave. It is also common in Diamond Cave, where I collected it, and was discovered by Mr. Sanborn in Poynter's Cave, 300 yards from daylight. In one of the specimens from the last-mentioned cave, the antennæ are rather more slender than usual.

"The genus Scoterpes, and its single species *copei*, appears to be limited to Mammoth Cave and the others near, in apparently the same system of caves. It was erroneously reported by me to occur in Weyer's and the Luray Caves, as the specimens collected belong to *Zygonopus whitei.* Without doubt the genus is a modified Trichopetalum, which has become longer and slenderer in body, with longer legs and antennæ as well as setæ; whether it is a descendant of *Trichopetalum lunatum* or not is uncertain; it may have descended from a different species; but there seems to be no reasonable doubt that it is a modified form of a small hairy lysiopetalid form, with antennæ exactly like those of Trichopetalum."

Dr. Packard's sections led him to the conclusion that the present species is as truly eyeless as a Polydesmus. All traces

of eyes, with their accompanying nerves and ganglia having disappeared. A compensating hypertrophy of the olfactory organs is noted.

ZYGONOPUS Ryder. 1881.

Proc. U. S. Nat. Museum, Vol. III, p. 524.

Zygonopus, Packard: Proc. Amer. Philos. Soc. XXI, p. 194 (1833).

Eyes wanting.

Antennæ rather stout, subclavate, fifth joint longest and thickest.

Mandibles with eight pectinate lamellæ.

Promentum not distinct.*

Segments with moderate, shoulder-like carinæ, the surface delicately areolate, appearing smooth ; setigerous tubercles prominent, setæ long.

Male legs with last joint not hispid.

Coxæ of second male legs with conic processes; legs without the cushion-like processes present in Conotyla.

Sixth legs of male much crassate, especially the fourth joint.

Male genitalia simple, consisting of a deeply bifid lamina and two laciniate processes.

Ninth legs of male two-jointed, the distal stout, obclavate, with a small chitinous knob on its outer face.

Segments of adult 30.

Distribution: Luray Cave, Virginia.

On account of the small size of the animal and special difficulty of manipulation, we were not able to satisfy ourselves whether the coxæ of the tenth and eleventh pairs of legs of the male are perforate.

In many of its characters this genus shows such evident and close relationship with Trichopetalum that we have sometimes doubted its validity. On the other hand the characters by which it is distinct from that genus (*e. g.*, want of eyes, swollen sixth legs of males, conic process of second legs, and 30 segments) are so numerous that there seems ample ground for retaining it.

The similarity to Scoterpes is probably even more striking, since both are cave animals, lack eyes, and are more or less soft-bodied. We have not had the opportunity of making a study of Scoterpes, but retain both genera, believing that the differences in the sixth and ninth male legs are sufficiently important to warrant such a course, and that these are indicative of the probable existence of still other differential characters.

* The microscopic preparation was not sufficiently successful to make this certain.

The importance of differences in the ninth male legs as diagnostic generic characters is evidenced by the fact that forms so different as Trichopetalum and Zygonopus have these legs almost undistinguishable (cf. figs. 21 and 43) even to the presence of the small, more or less chitinous bunch, possibly the rudiment of a claw on the lateral face, near the apex. Conotyla has a similar form of ninth leg, but does not have this bunch, and differs widely in other characters. These facts are suggestive of the probable importance of the large claw on the ninth legs of Scoterpes as described and figured by Dr. Packard (cf. our figure 13).

Zygonopus whitei Ryder.

Spirostrephon copei Packard *pro parte:* Am. Nat. XV, p. 231 (1881); Proc. Amer. Philos. Soc. XXI, p. 194 (1883).

Zygonopus whitei Ryder: Proc. U. S. Nat. Museum III, p. 527 (1881); McNeill, Bull. No. 3, Brookville Soc. p. 9 (1888).

Plates I–II, figures 14–21.

Body scarcely fusiform, slightly broadest toward the front, narrowed very abruptly on the last few posterior segments.

Vertex with a large, shallow, transversely oval depression between the antennæ.

Clypeus with a large transversely oval depression in the upper part.

Antennæ of moderate length, subclavate, moderately pilose.

Lingual lobes with three sense-cones.

Styliform process deeply quadridentate.

First segment longer than semi-circular, regularly rounded in front, nearly straight behind, lateral corners not produced. Outer bristle directed outwardly and upwardly, and located at the posterior corner. Second bristle mesad and cephalad from the outer, and about as far from the anterior margin of the segment as from the lateral bristle. Inside bristle mesad from the second, and about equally distant from it and from the median line.

Second segment shorter than the first, and with longer bristles.

Third and subsequent segments with rather small lateral carinæ, on which are located the two outer bristles, the inner one of which is somewhat anterior to, and but little above the outer. The inside bristle is rather close to the others, receding from the median line. All the bristles are slightly curved, and the length of the longer is about two-thirds the diameter of the body. Surface of the segments dorsally with irregular longtitudinal wrinkles. Below the carinæ the sides of the body are very delicately striate, after the manner of the Iulidæ, except that the striations are much finer and more curved, especially the upper ones. These striations are very much slighter than those of Pseudotremia and are much more numerous, numbering about twenty. On the anterior portion of the subsegment they are reticulately joined. All the segments, including the last, have a fine median sulcus. On

posterior segments the bristles tend to separate from each other and to arrange themselves in a transverse row; the inside pair approach on the posterior segments very close to the median line.

Anal segment short, posteriorly broadly truncate-emarginate, with eight bristles. The anterior two located near the median line and close to the anterior edge of the segment. Posterior six bristles much more slender than the others, located along the posterior margin at about equal distances from each other. The middle pair are not quite so close together as the others, and have papilliform enlarged bases about one-fifth as long as the exceedingly fine flexible hair that proceeds from them. This segment, as well as a few preceeding, and the anal valves, is supplied with a scanty, short pubescence.

Anal valves moderately convex, produced posteriorly into a rather sharp point, considerably exceeding the last segment. Surface finely vertically striate-wrinkled. Margins not raised, the three bristles very slender, about equally distant from each other and from the apex of the anal segment.

Pre-anal scale small, semi-circular, with two very fine long bristles.

Male genitalia (plate II, figs. 20, 21) simple, of a thin deeply bilobed lamina, the lobes apically decurved and bidentate, the teeth long and connivent. The anterior face is hispid at base with short hairs, which grade distad into papillæ; a few long variously curved hairs near the bottom of the fissure, and a few others near the margin distad. On the posterior side (fig. 21) springing from near the base of the lamina are two pairs of plumose-laciniate processes, the inner pair much shorter, and laciniate on both sides.

Ninth legs of male two-jointed, the basal joint perpendicular, clavate, with a few long bristles toward the apex, one of which is longer than the others and curved basally. This joint passes insensibly into a membranous lamina which connects the two joints and is not interrupted medianly. Second joint oblong-oval, with a few bristles near the upper and lower margins. On the lateral face near the apex is a rounded chitinous knob, which may be interpreted as the rudiment of a claw.

Color in alcohol, dull white.

Length 9 mm.; width .4 mm.

We have had for study one male specimen collected by Dr. L. M. Underwood at Luray Cave, Virginia, September, 1887.

The body of this species is nearly cylindrical, that is, less fusiform than any other known to us.

Owing probably to the cave life of this species, the exo-skeleton usually so hard and brittle, is soft and flexible. Pseudotremia has not suffered so much modification, as the presence of eyes also testifies. There appears to be very little carbonate of lime present, so that on drying the skin of an alcoholic specimen shrivels up like that of a spider. The legs and other parts wrinkle instead of breaking, and tend to become distorted in manipulation. Even the mouth-parts are evidently softer than in the open-air genera.

Another result of this condition of things is that the joints and sutures are not so evident, and the distinction between the mentum and promentum appears to be obliterated. The mentum, as well as the surrounding parts, is merely membranous, and no flexibility would be added if the usual joint were present.

TRICHOPETALUM Harger, 1872 (emended).

Am. Journ. Sci. and Arts IV, 117.

Craspedosoma, Latzel and Bollman; *Scoterpes* Bollman.

Eyes moderately developed, of several (10–14) ocelli arranged lunately in two or three curved rows.

Antennæ rather short, clavate; third and fifth joints subequal in length.

Mandibles with nine pectinate lamellæ.

Promentum present, triangular.

Segments with moderately prominent, shoulder-like carinæ.

Male legs with first joint not hispid.

Third, fourth, fifth and sixth legs of males strongly crassate.

Ninth pair of legs of male two-jointed, the distal joint broadly clavate, unarmed except that on the outer face of the last joint, near the apex is a small, blunt, chitinized knob, possibly the rudiment of a claw.

Tenth and eleventh legs of male with the coxæ perforate.

Genitalia of male consisting of a single pair of decurved structures hirsute antero-basally and with plumose-laciniate processes posteriorly.

Segments of adult 28.

Distribution: Northeastern North America.

The original description of this genus reads as follows:

"Sterna not closely united with scuta; third and fifth joints of the antennæ elongated; scuta furnished with bristles; no lateral pores; eyes present."

It will be seen that these characters, with the exception of "eyes present," are applicable to all Craspedosomatidæ. Indeed, it is probable that the genus Trichopetalum would not have been erected had not its author been misled by Gervais' figure into the supposition that in Craspedosoma the pedigerous laminæ are coalesced. But notwithstanding that the generic characters originally alleged are entirely insufficient, there can be no doubt that in Harger's *Trichopetatum lunatum* was discovered a generic type, and we have preferred to retain the name, supplying other characters for the generic diagnosis.

In comparison with this genus the anterior legs of the males of Zygonopus are remarkable for their slenderness, only the sixth legs being comparable in size with the corresponding ones of Trichopetalum.

The species of Trichopetalum which we have studied have the ninth legs of the male (Fig. 43), apparently exactly alike. They differ from those of Zygonopus in being somewhat clavate, instead of obclavate.

The fifth joint of the antennæ is equal to or longer than the third in this genus, Zygonopus and Underwoodia, while in all other American species of the family the fifth is shorter than the third, never bearing a greater ratio to it than 8.5 : 10. In this species, too, the fourth joint is about half the length of the fifth, while in Conotyla the fourth and fifth are subequal.

We are acquainted with three species falling under this genus, as here characterized. The original description of *Trichopetalum lunatum* gives no characters not common to all three, but the figure of the genitalia, on the other hand, does not bear any close resemblance to those of either of the species known to us, although it is possible to imagine it as having been made from either of them. It is thus impossible, without a study of his type, to know which of our species, if any, was described by Harger. Under these circumstances it would seem that the course least likely to cause confusion is to describe our three species new, giving figures of the genitalia, so that when the type of *T. lunatum* is studied a definite conclusion may be facilitated and the specific name not misapplied.

Trichopetalum lunatum Harger.

Trichopetalum lunatum Harger: Am. Journ. Sci. and Arts, IV, p. 118 (1872); Ryder: Proc. U. S. Nat. Mus., V, 527 (1882); Packard, Proc. Am. Philos. Soc. XXI, 192 (1883); McNeill, Bull. No. 3, Brookville Soc. 8, (1888).

Scoterpes lunatus Bollman: Proc. U. S. Nat. Museum, XI, 405 (1888); Bulletin 46 U. S. Nat. Museum, pp. 106 and 121 (1893).

Plate III, figures 52–54.

"Dirty white, banded transversely and mottled with light brown anteriorly. Segments 28; males with 45, females with 46 pairs of legs. Head large, dilated laterally, covered with short, erect, bristly hairs. Eyes of 10 ocelli, in a lunate group, convex toward the bases of the antennæ. Antennæ pilose, seven-jointed; the joints measure, the first .07 mm., second. 10 mm., third .23 mm., fourth .11 mm., fifth .22 mm., sixth .09 mm., seventh .07 mm. First scutum nearly semicircular, with the posterior margin slightly concave. Near the outer angles of this scutum are two small tubercles on each side, each bearing a stout bristle, and higher up a third tubercle on each side also bears a bristle. The remaining scuta throughout are furnished with three bristles

on each side, springing from tubercles, the lower two being approximate and situated on the upper surface of the short lateral processes, and the third higher up on the scutum. On a few of the posterior segments these bristles are in a transverse row, and on the last scutum, which is broad and truncate, the two inner ones are thickened at their bases. There is an impressed dorsal line. Legs slender, white, hairy, with the penultimate joint lengthened. The under side of the seventh segment of the male is furnished anteriorly with a pair of appendages directed backward and curved upward, and posteriorly with a pair of cylindrical jointed organs, directed horizontally outward, tipped with a short bristle, and appearing like modified legs of the posterior subsegment. In crawling these organs have a motion similar to that of the basal joints of the adjacent legs. Length 6 mm.

"This species is not uncommon under or among decaying leaves in moist woods about New Haven."

We have copied above the original description of this species, although a large part of it consists in an enumeration of characters common to all Craspedosomatidæ, and nothing diagnostic of a species is mentioned, with the possible exception of the form of the ninth legs of the male. The accompanying diagram of the genitalia and ninth legs, we reproduce (plate III, fig. 54). If correctly drawn by Harger, it certainly represents a species not seen by us, as a comparison with our diagrams of corresponding parts will show.

Trichopetalum album sp. n.

Plates II-III, figs. 22-29, 36-45.

Eyes in a lunate patch; the ocelli counted from the exterior edge show the following arrangement: 4+2+2+1+1=10, or 4+2+2+2+1=11.

Antennæ somewhat clavate, .7–.8 mm. long, the fifth joint thickest, .12 mm. in diameter; approximate ratios of length of joints 3: 5: 10–11: 5.5: 10: 5: 3.

Lingual lobes with three sense-cones.

First segment broadly reniform, with rather pointed ends, not twice as broad as long (5:3), with three setigerous tubercles on each side, one near the posterior angle ; the second cephalad, and somewhat mesad of the first, near the anterior margin of the segment ; the third about midway between the first and the median line, and situated in a large shallow depression. A delicate raised anterior margin. Posteriorly the segment is broadly emarginate. A delicate median line begins in front of the middle and extends to the posterior margin. Surface smooth and shining, or faintly areolate.

Subsequent segments with the lateral carinæ gradually increasing in size to about the middle of the body, and then decreasing so that the posterior segments have no distinct carinæ. The second pair of bristles are gradually placed more directly mesad from the outer pair, and on the terminal segments the six bristles are arranged in a straight transverse line. The anterior seg-

ments are broadly emarginate posteriorly. Posterior dorsal part of segment smoother than the anterior, and divided from it by a more or less definite transverse gently curved line. In front of this line the surface is finely areolate, behind it smooth and shining, with a few faint, usually longitudinal lines dividing it into larger areolations. A very fine median ridge, located in a nearly obsolete furrow. Below the lateral carina the posterior subsegment is longitudianally striate.

Anal segment short, broadly truncate, laterally broadly sinuate; medianly the margin of the truncation is slightly produced, giving a convex edge between the thickened papilliform bases of two long, exceedingly fine hairs which are, bases included, three times as long as the exposed part of the anal segment. At the ends of the truncation are two slender bristles, and one farther down on the sinuation. Two small bristle-bearing tubercles on anterior part of the segment close to the median line.

Anal valves smooth, not strongly convex, more prominent above the middle, and with a rounded angle, faintly margined; near the margin on each side three slender bristles, one close to the superior edge of the valves, the second near the angle, the third about half-way from the angle to the edge of the preanal scale.

Preanal scale semi-elliptical, posteriorly truncate; two tubercles with long posteriorly directed setæ, near the posterior margin; surface smooth.

Male genitalia (figs. 36–43) simple, consisting of a pair of more or less arcuate, basally and laterally hirsute structures, behind which are two pairs of laciniate processes. The apices of the genitalia of different specimens appear to vary considerably, but in all cases the end is somewhat broadened and emarginate, so as to leave the corners more or less produced, as shown in figure 36. The apical portion is flattened and very thin and the different ways it may be bent and the different angles at which it is consequently viewed will largely explain the apparent variation. The form shown in figure 41 is nearly or quite the same as the others, the apparent difference being caused by the fact that one of the corners is invisible on account of perspective, while the other is recurved.

Ninth legs of male oblong-clavate, with a few scattered hairs.

Color white, sometimes reticulately mottled with light horn-brown. The exo-skeleton is so transparent that the contents of the alimentary canal, if dark-colored, show through as a dark median line.

Length 6 mm.; width .6 mm.

Habitat: Common in moist, wooded localities in central New York and western Ontario. We have examined about 200 individuals collected at Onativia, Marcellus, Syracuse, Pratt's Falls and Kirkville, New York; also at Orillia, Ontario, and Chief Island, Lake Couchiching.

On the anterior segments the setigerous tubercles are little

more than a circular ring-like base for the setæ, while toward the posterior end of the body they become distinct prominences.

We describe this species with the expectation that it will prove to be Harger's *lunatum*, and consequently the type of the genus Trichopetalum, if the original specimens can be re-examined. For the present, however, it does not appear warrantable to make a determination, for the reasons stated under *T. lunatum*.

Trichopetalum cornutum sp. n.

Plate III, figures 46–49.

Very similar to *T. album*, but somewhat larger, the lateral striations more regular and more pronounced, the elevations laterad from the median seta more prominent, the arrangement of the ocelli somewhat different, but differing more especially in the male genitalia. These differ from *album* in having the apex deeply bilobed, the lobes more or less connivent, figure 49 being a lateral view. Figures 46 and 48 we were able to understand as being the same in form as 49, the apparent differences being caused as in *album* by the fact that the apical portion is so thin as to be bent in different ways, and is viewed at different angles. Figure 47 did not so easily homologize, but it is not impossible that it may do so, and as we had but one specimen it seemed best to include it here for the present.

The specimens of this species are in rather poor condition, with the setæ nearly all rubbed off. The remaining setæ are considerably shorter than in *album*, but may not be entire. The color is uniform dirty yellowish, without a trace of the brownish mottlings of *T. album*. This may result from their being cave animals.

Habitat: Indiana, Bloomington and Coon's Cave (Bollman). U. S. National Museum. Numbers 24, 42 and 441.

The Bloomington specimens are mixed with those of the following species. Eight specimens referred to the present species have been examined, but in their present condition the determination cannot be made with confidence without dissection sufficient to show the male genitalia.

Trichopetalum uncum sp. n.

Plate III, figure 51.

Very similar externally to the two preceding species, but evidently distinct in that the male genitalia are bi-hamate with the

inner branch large and very deeply bifid, the divisions pointed and slender.

Habitat: Bloomington, Indiana, collected by Bollman. A single specimen was found in vial No. 42, of the National Museum collection, along with material of the preceding species. It should be noted that none of the Indiana material which we have examined is the same as that from the East, and that the two species here established are founded on material which Mr. Bollman determined as *T. lunatum*, so that it becomes improbable that the last species is found in Indiana. A comparison will show that if Harger's descriptions and figures cannot be reconciled with our eastern specimens, still less is this probable in the case of the Indiana material.

The genitalia of this species show an evident approximation to the Zygonopus type, for the lateral hooks may be looked upon as homologous with the outer tooth of *Z. whitei*, while the inner tooth of that species is replaced by the forcipate process. Our specimen did not show plumose processes, but was not in proper condition to warrant the supposition that they are absent.

Trichopetalum flavidum (Bollman).

Craspedosoma flavidum, Bollman: Entomologica Americana. Vol. iv, p. 2 (April 1888).

Plate III, figure 50.

"Yellowish brown, feet and antennæ lighter. Robust, segments not constricted, lateral carinæ small, and body strongly resembling that of Campodes. Antennæ longer than width of body. Ocelli 12–14, distinct, arranged in a triangular patch and in 5 or 6 series. Dorsal plates rather smooth, setigerous granules small, setæ rather large. Male feet crassate, those of female slender."

"Length of body 5.8 mm.; width .7 mm.

"Hab.—Okolona.

"This species strongly resembles a *Campodes*. In life the individuals are a dusky yellow. This description is based upon a male and female."

In the National Museum collection is a small yellow female specimen with 26 segments purporting to be the type of this species. Supposing that it is one of the specimens mentioned by Mr. Bollman it is difficult to understand his reiterated statement of its strong resemblance to Cleidogona (Campodes). The size and habit are certainly that of Trichopetalum, although the carinæ are somewhat less developed than in the other species known to us. The sides are striate and the dorsal surface areo-

late as in *T. album.* That this is really a Trichopetalum we are not confident, but judging from the exterior it is nearer to Trichopetalum than to the other genera. One of Mr. Bollman's specimens is mentioned as being a male, and it may be reasonably supposed that he would have recognized and mentioned the conspicuous and characteristic ninth pair of legs. The eyes depart somewhat though not seriously, from the Trichopetalum type, for they have a third row of ocelli in addition to the lunate arrangement in two rows (fig. 50).

A further difference consists in the fact that the setæ are smaller and arranged more nearly in a transverse line, even on the anterior segments.

Trichopetalum (?) ocellatum (Packard).

Polydesmus ocellatus Packard: Am. Nat. XVII, 428 (1883).
Craspedosoma packardii Stuxberg: Am. Nat. XIX, p. 400 (1885).
Craspedosoma ocellatum (Packard) Bollman: Bull. 46 U. S. Nat. Museum p. 120 (1893).

Plate III, figures 30–35.

"The body is small, rather short, somewhat spindle-shaped, and unusually cylindrical. There are twenty-nine segments behind the head; the scuta are provided with the usual prominent lateral ridges. There is a row of dorsal setæ on each side of the median line; the surface of the scutes is finely granulated. The sides (genæ) of the head are full and swollen, somewhat wider than the first scute but about as wide as the body behind. Ocelli 12–13 in number, conspicuous and black. Antennæ with joint 4 half as long as 3, joint 5 remarkably thick, increasing in thickness to the end, longer than joints 6 and 7 taken together. Joint 6 not quite as long as thick; joint 7 small, conical; broad at base where it is nearly as thick as the 6th; the joints rather setose; there are two terminal flattened sense-setæ on the tip of the seventh joint. The end of the body is moderately blunt, with four setæ on each side of the last segment (anal valves). It is of a pale horn color. Length 4 mm.

"This aberrant form would not at first be regarded as a Polydesmus, but would be easily mistaken for a Trichopetalus. The individuals were mature or nearly so, as they were horn-brown. In the cylindrical body and thick antennæ it approaches *Polydesmus cavicola* Pack., from a cave on the shores of the Great Salt Lake. It differs from that species, which is eyeless, in the fusiform body, much thicker antennæ, and the finer granulations as well as the larger number of segments."

The above is Dr. Packard's original description. The species seems to have been placed in Polydesmus because of carinæ larger than those of Trichopetalum, and the granulations of the dorsal surface. From the number of segments, shape of antennæ, size,

and other characters, it seems that the present species is more related to Trichopetalum than to any other genus described in this paper. It is possible that a closer study will show that it is the type of a new genus.

In using Dr. Packard's description, the fact that he was comparing with species of Polydesmus should not be forgotten, and the "usual prominent lateral ridges" appear to be much larger than those of any American craspedosomatid known to us. Dr. Packard also counted the anal valves as a segment, which is not customary.

That there is but one row of bristles on each side of the median line, that there are but two olfactory cones, and that these are *flattened*, are such anomalous characters that we hesitate to credit their actual existence.

Two years after the original description was published, Dr. Packard printed a note he had received from Dr. Anton Stuxberg, of Gothenburg, Sweden, relative to the "Generic position of *Polydesmus ocellatus*." The species is referred to the European genus Craspedosoma on account of the general fact that this genus has eyes and thirty segments, Dr. Stuxberg having had no opportunity of examining specimens.

A change in the specific name is also proposed, on the following ground:

"In consequence of the necessity of ranging your species in another genus, all the members of which are provided with eyes, the specific name *ocellatus* should be removed and another introduced instead of it. I propose the name *Craspedosoma packardii*."

Distinctive specific names are of course desirable, but a general application of Dr. Stuxberg's principle would necessitate too many changes to make possible its admission as a rule of nomenclature, hence the original name is here retained.

Dr. Stuxberg also implies his belief that Dr. Packard's specimens were immature, being credited with but 28 segments (29 if the anal valves are counted), but we are convinced that 28 is the normal number for Trichopetalum. Dr. Stuxberg's statement that immature specimens of Craspedosoma have 29 and 27 segments, does not agree with other European writers, according to whom the stages are 26, 28, 30.

CONOTYLA gen. nov.

Eyes of numerous (16–19)* prominent ocelli arranged in triangular patches.

Antennæ long or very long, slender or sub-clavate; third joint longest.

Mandibles with eleven pectinate lamellæ.

Prementum not distinct.*

Segments with moderately prominent, shoulder-like carinæ.

Anterior male legs with ventral face of the last joint hispid with fine bayonet-like spines.

First two pairs of legs much smaller than the others; legs 4, 5 and 6 of males somewhat crassate.

Second legs of males with a cushion-like, cone-bearing process on the third joint; legs 4 and 5 with a similar process on the fourth joint.

Male genitalia of two distinct pairs, the posterior larger, attached to the bases of the ninth legs.

Ninth legs of male two-jointed, the distal joint oval, unarmed, without a chitinous knob.

Tenth and eleventh legs of male with large coxal apertures directed meso-caudad.

Eleventh legs of male with a meso-proximally directed process arising from the base of the third joint.

Segments of adult 30.

Distribution—Northeastern North America.

In addition to the above, the following characters are common to all the species we have examined :—

Body fusiform, broadest at about the 9th segment, narrowed abruptly cephalad, and very gradually caudad; in cross-section nearly circular, with rather prominent lateral elevations.

Labrum with the lateral teeth exceeding the middle one, but not projecting as far as the sides of the labrum.

Antennæ with average ratio of length of joints 2.5: 4.5: 7–8.5: 7: 10: 5: 1.5.

Antepenultimate segment without carinæ, that is, the surface between the bristle-bearing tubercles is not elevated.

Penultimate with its ventral portion nearly covered by the preceding segment.

Anal segment with two long transparent papillæ on the posterior truncation; from each papilla springs a long slender bristle.

The genitalia of the species of this genus are, as far as known, double, that is consist of two entirely distinct pairs of structures (*e. g.*, plate IV, fig. 73), and in this respect offer a sharp distinction from those of Zygonopus and Trichopetalum, the nearest

* The ocelli number 24, and a prementum is present in *Conotyla leibergi* sp. n., which is provisionally placed in the present genus, with which it apparently has most affinity. Males are not known.

generic relatives. We have little faith in the homologies of these structures suggested by European writers, for though in some special cases they may sometimes appear reasonable, a general application is not evident. In dissecting *C. fischeri* we found that the posterior pair of genital processes always remained attached to the ninth pair of legs, while the anterior pair remained in the body, and on account of their small size were at first overlooked. An examination of other species showed in each the two pairs of structures, though the anterior is much reduced, and perhaps functionless. The posterior pair of genitalia may perhaps be homologous to the larger of the plumose processes of Trichopetalum.

This genus much resembles in characters of form, carinæ and spines the three genera Zygonopus, Scoterpes and Trichopetalum. From the first two of these it is distinct in the possession of well-developed eyes, and from the last in having 30 segments.

The spines of the pectinate lamellæ are sometimes bifid at the tip, especially in the middle rows.

In this genus the bayonet-like spines of the last joint are found on all or nearly all the male legs, becoming fewer and smaller on the posterior legs.

In describing the species of this genus we have made frequent comparisons with *Conotyla fischeri*, the type of the genus, a new species of which we have abundant material and are hence able to describe more thoroughly than the other species.

Conotyla fischeri sp. n.

Plates IV–V, figures 55–78.

Eyes prominent, broadly triangular, the ocelli arranged in four rows, 2+4+6+7=19, the short rows being towards the antennæ. The direction of the rows is oblique to the posterior margin of the vertex, and diverging mesad.

Antennæ filiform, 2.8 to 3.2 mm. long, .14 to .16 mm. thick; approximate ratio of lengths of joints beginning with the seventh, 2.5: 4: 8: 7:10: 5: 1.5.

First segment viewed from above semicircular-reniform; a fine ridge, or rather row of minute, bead-like protuberances; a small plane or slightly depressed area on each side of the median line near the centre of the surface of the segment; on each side the customary three bristles and accompanying prominences, the outer and larger bristle being usually directed horizontally outward and located on the small carina or lateral corner of the segment. Second bristle much smaller, located a little mesad and cephalad of the other, near the margin of the segment; third bristle about midway between the second and the median line, and directly mesad from the first bristle.

Mentum semi-elliptical, about twice as broad as long. It is difficult to determine the posterior edge, as the chitin is gradually thinner, passing into a transparent membrane. A cross-section, however, shows that the chitinized membrane extends back to a transverse ridge and furrow, giving the mentum the proportions assigned above.

Promentum obsolete, the pointed triangular space between the rounded anterior edge of the mentum and the lingual laminæ is covered by a transparent membrane, sometimes appearing chitinized, but not to the same extent as the surrounding parts.

Stipes of gnathochilarium with two cardos, an exterior, subtriangular, and a larger interior, sharply serrated along its anterior edge (see plate). Including the processes, the stipes are five times as long as their greatest width, which occurs anteriorly; sparsely hirsute posteriorly with short bristles; a row of longer bristles along the lateral margin anteriorly; one long bristle about the middle, considerably removed from the anterior margin. Exterior process with nine cones, 4 on the apex, the others on the exterior face. Interior process thicker than the exterior, with 12–10 cones, all on the apex.

Lingual laminæ about three times as long as broad, the anterior and posterior edges nearly straight, converging mesad; a few (7–8) scattered bristles, a very long one near the anterior-exterior corner. Lingual lobes semicircular, subequal to base of inner process; with 4–5 cones, the inner of which is larger, longer, sharp-pointed and curved mesad.

Middle lobe of tongue subequal to the lingual laminæ, equal in width to inner process; anterior edges straight, meeting at a right angle, or rounded.

Lingual process longer than broad; middle tooth large, one or both of the small lateral teeth frequently obsolete.

Second segment about half as long as the first, the two outer bristles located on the upper side of the carina, the second nearly directly cephalad from the first, the third about midway between the first and the median line.

Third and subsequent segments gradually longer, and with larger, somewhat oblique, carinæ, on which the two outer bristles are located. The third bristle is gradually farther away from the median line on the succeeding segments, and directed more obliquely backward. The anterior subsegments have about five transverse parallel lines connected by fine longitudinal lines. Beginning at the middle of the first segment, and extending caudad over all the segments except the anal, is a fine median ridge, with a fine furrow on each side. Near the ventral edge of each segment, beginning with the second, is a thin oblique carina, nearly parallel to the thickened ventral margin, so that its posterior end is higher; this carina has a downward curve or angle on the anterior segments, and is straighter on the posterior.

Posterior segments have the carinæ gradually smaller, and the middle pair of bristles come closer to the median line. The surface of all the segments is finely areolate; on the lateral and ventral surfaces are fine parallel furrows suggesting the striated condition in Iulidæ. Posterior middle portion of the segment frequently with a few oblique wrinkles or depressions.

Antepenultimate segment shortest, without keel, that is the surface be-

tween the bristle-bearing protuberances is scarcely elevated, and the bristles are nearly in a traverse line.

Penultimate segment almost covered by the preceding; bristles in a straight row; posterior margin very finely serrate, as is also that of the preceding segments, but to a less degree.

Anal segment truncate posteriorly, slightly emarginate in the middle, laterally broadly sinuate. There are eight bristles, two close to the median line, near the middle of the segment, the others close to the posterior margin; at the emargination, one on each side of the median line, a pair of very slender bristles with large conic bases as long as the anterior pair of bristles; one bristle at each angle of the truncation; below these a third pair in the upper part of the sinuation. All the bristles of this segment are more slender than those of the preceding segments.

Anal valves subequal to the anal segment, above with a blunt angle, convex; a slight ridge near the somewhat faintly raised margins bears three slender bristles at equal distances from each other; the superior bristle is much closer to the anal segment than the inferior one is to the preanal scale.

Preanal scale semicircular, faintly truncate or medianly emarginate, bearing on each side, not far from the median line a setigerous tubercle; the bristles very slender, nearly twice as long as those of the anal valves, directed posteriorly and upward, lying close to the anal valves.

First pair of legs of male small, six-jointed, the joints beyond the coxæ measuring respectively .08, .34, .18, .12, and .42 mm., third and fourth joints widest, .12 mm.; no roughenings or protuberances; claw large, with two large secondary claws on the superior edge.

Second pair of legs of male also six-jointed, larger than first pair, measurements of corresponding joints, .10, .40, .18, .12 and .44 mm.; second joint thickest, .14 mm., not including a large rounded protuberance near the middle of the inferior surface of the joint. The diameter of this protuberance is about half that of the joint, and its surface is covered with transparent chitinous cones of various sizes. Claw as for the first legs.

Third pair of legs of male seven-jointed, lengths of joints, from coxa, .20, .04, .34, .46, .16, .12, .48 mm.; width of third joint .22 mm. The inferior surface of the distal half of the seventh joint is covered with hook-like, transparent processes arranged in longitudinal rows. Claw without evident secondary claws.

Fourth pair of legs of male with joints measuring .20, .04, .34, .54, .20, .14 and .46 mm., width of third and fourth joints .24 mm. About one-third of the distance from the distal end of the fourth joint a large subclavate protuberance about as broad as long, the surface covered with cones like the protuberance of the second leg. The seventh joint is roughened like that of the third leg. No secondary claws.

Fifth legs of male; joints .14, .04, .40, .52, .18, .14 and .54 mm., third joint .24 mm. wide. A large protuberance similar to that of the fourth legs. No secondary claws.

Sixth legs same as fifth in proportion of joints, etc. Third joint similar to second joint of second leg.

Seventh legs of male with joints of similar proportions; on the side of the proximal end of the fourth joint a long, nearly cylindrical process, at the end with four large teeth, between which its surface is beset with small cones. The distal end of the coxa has a rounded protuberance covered with small knobs. This protuberance is on the inferior-posterior surface of the coxa, and it appears to fit against the anterior of the two pairs of genitalia.

Tenth legs of male with nearly the same proportions as the seventh, slightly more slender, coxæ closely approximate, each produced into a protuberance next to the median line; the protuberance is distally of soft tissue, and very irregular in shape and size. Seventh joint roughened below with hooks. Claw with two small secondary claws on superior edge.

Eleventh legs of male with similar proportions; third joint inferiorly and proximally with a cylindrical process directed mesad. Seventh joint with hook-like roughenings more confined to distal portion; two secondary claws.

Twelfth legs of male slightly longer and more slender than the others. Seventh joint as for eleventh legs. Two secondary claws; inferior surface of coxæ with small knobs.

The legs of females are in a general way similar in size and shape to those of males, but the anterior are more slender, aud all are destitute of the peculiar knobs, processes, and protuberances.

The normal legs of the body are more slender than the anterior pairs. The bayonet-like structures of the seventh joint gradually decrease in number, and disappear at the forty-fifth pair. The surface of the coxæ of all the legs is roughened with small conical knobs, as is also the surface of the pediferous laminæ.

In the inferior groove of the claw of all the legs of this species is a very delicate hair extending considerably beyond the claw, to which it lies closely appressed. We have not been able to find any similar structure in other species.

Color obscure horn-brown, with dark brown points, especially on the exposed posterior portions of the segments; ventral portions mottled. Proximal joints of legs paler, the distal dark brown; antennæ fuscous. Penultimate segment pale, the last segment dark.

Length of large specimen 18 mm.; width 1.6 mm.

Habitat—Central New York. We have collected about 100 specimens from the following localities:—Syracuse, Jamesville, Onativia and Marcellus, Onondaga county; Wolcott, Wayne county; Farmington, Ontario county. At Marcellus several individuals were found under the loose bark of a fallen butternut tree (*Juglans cinerea*). All the other specimens were found among leaves and rotting vegetable matter in moist woods.

It gives us great pleasure to name this species for our friend, Prof. J. T. Fischer, of Syracuse University, whose keen powers of vision and lively company contributed greatly to the success and pleasure of many collecting expeditions in central New York.

Conotyla atrolineata (Bollm.).

Craspedosoma atrolineatum Bollman: Proc. U. S. Nat. Mus. X, p. 618 (1887); Bulletin 46 U. S. Nat. Museum, pp. 35 and 183 (1893).

Plate VI, figures 95–100.

Eyes rounded triangular in shape, the ocelli in diagonal rows beginning posteriorly 7+6+4+3=20, or 7+6+4+2=19.

Antennæ filiform, 2.5 mm. long, .14 thick, ratio of lengths of joints beginning with the seventh, 3: 4.5: 8: 7.5: 10: 5.5: 1.5, the seventh being proportionally longer than in other species of the genus. The antennæ are somewhat stouter than in *fischeri* and *bollmani*, cf. figs. 64, 83 and 95.

Gnathochilarium apparently not different from *C. fischeri*, except that the lingual processes are strongly tridentate.

First segment reniform; anterior margin and setigerous tubercles as in *C. fischeri*.

Subsequent segments with carinæ rather large, swollen, surface finely reticulated, anterior subsegment with about three transverse parallel ridges, sometimes concealed by the preceding segment. Between the anterior and posterior subsegments there sometimes appears a row of small, bead-like ridges.

Anal segment smooth, the posterior scarcely or not at all depressed. The two anterior setæ very close together, the others as in *C. fischeri*.

Anal valves slightly convex, the posterior margins nearly straight up to the angulation which is quite sharp and equal to the anal segment.

Preanal scale as in *C. fischeri*.

Male genitalia of the anterior pair with (fig. 97) a large bulbous base, bifid distally, the larger division laciniate-dentate at apex. The posterior pair of genitalia (fig. 96) are much more complex than in *bollmani* or *fischeri*.

Color light horn-brown, the carinæ and a rather broad dorsal line darker, sometimes very dark.

Length 14 mm.; width 1.3 mm.

We have examined nine specimens referred to this species. One mature male and two females. U. S. N. M. No. 439, from Glacier, B. C.; five immature specimens U. S. N. M. 332, from the same place, and one female from Winona, Minnesota (No. 331).

The type of this species was from Glacier, B. C., and we have examined specimens from that locality. Mr. Bollman also reported this species from Winona, Minn. (Coll. Holzinger). The single female specimen is now in the National Museum. It has three dark longitudinal lines, but the color is lighter than the typical specimen, the animal considerably more robust, less attenuate posteriorly. The arrangement of the ocelli is also different in specimens from the two localities, cf. figs. 99 and 100.

We would not be surprised if when the males are collected the species will prove to be distinct. The great difference in habitat

also indicates probable distinctness, for with the possible exception of *Underwoodia iuloides* (Harger) there is no chordeumid species known from localities so widely separated.

Conotyla bollmani (McNeill).

Trichopetalum bollmani McNeill: Proc. U. S. Nat. Museum X, 330 (1887); Bull. Brookville Soc. III, 8 (1888).

Craspedosoma bollmani (McNeill) Bollman: Proc. U. S. Nat. Mus. X, p. 619; Bull. 46 U. S. Nat. Mus., p. 36.

Scoterpes bollmani (McNeill) Bollman: Proc. U. S. Nat. Mus. XI, 405, 1888; Bull. 46 U. S. Nat. Mus., 106.

Plate V, figures 79-94.

Eyes triangular of about 19 ocelli, arranged in four rows, as in *C. fischeri*, 2+4+6+7, though this formula is varied by the interposition of small ocelli, and the curving of the rows.

Antennæ filiform, 3.5 mm. long, .16 mm. thick; ratio of lengths of joints beginning with the seventh, 2.5: 4.5: 8: 7.5: 10: 4.5: 1.

Gnathochilarium as in *C. fischeri.*

First segment semicircular or subreniform; about half way from the median line to the lateral angle is a well-pronounced depression about the size of the base of an antenna; the middle tubercle is also situated in a smaller, more shallow depression. Tubercles arranged as in *C. fischeri.* Surface nearly smooth, a very fine median furrow beginning about the middle of the segment, and extending to the posterior margin. Anterior margin raised.

Subsequent segments nearly the same as in *C. fischeri.* The ridge of the dorsal furrow is somewhat fainter, and the oblique wrinkles of the posterior portion of the segment do not appear. Moreover the whole dorsal surface of the segments is very minutely hispid with microscopic point-like bristles, either not present or scarce in *C. fischeri.* Posterior setæ as long as the segments.

Anal segment without median furrow or ridge, truncate behind for a distance of about half the breadth of the segment, the eight setæ arranged as in *C. fischeri*, except that the outside pair are farther away from those above them than in that species. Surface more finely areolate punctate than the other segments and with the microscopic point-like hairs.

Anal valves not strongly convex, more prominent above the middle, and almost angulate, with three setigerous tubercles along the margin somewhat more prominent than in *C fischeri.* The surface of the valves is like that of he anal segment.

Preanal scale as in *C. fischeri.*

Color uniform light horn-brown.

Length 17 mm.; width 1.7 mm.

Habitat: Caves near Bloomington, Indiana. We have examined about 40 specimens, as follows: Bloomington U. S.

N. M. No. 3; Truitt's Cave, No. 234; Neal's Cave, No. 235; Coon's Cave, Nos. 236 and 443; also Nos. 419 and 447, with no locality given. McNeill's types were from Mayfield's Cave, five miles northwest of Bloomington. The species is reported by Bollman from all the above localities and from Phitt's and Donehue's Caves, Bedford, Indiana, and said to be abundant.

Conotyla leibergi sp. n.

Plate VI, figures 102–104.

Eyes subtriangular, the posterior dorsal side straight, other sides curved, beginning at posterior dorsal side arranged 9+6+5+3+1=24, the first row with two small ocelli.

Antennæ subclavate, length 1.7 mm., 6th joint thickest, .16 mm. in diameter; ratio of lengths of joints, beginning with the seventh, 2: 4: 7: 6.5: 10: 5:5.

Gnathochilarium differing from that of the three preceding species in the possession of a small, broadly triangular promentum.

First segment anteriorly nearly semicircular, posteriorly slightly emarginate, margined anteriorly to the lateral angles; a fine dorsal line posteriorly; the three tubercles located as in *C. fischeri.*

Subsequent segments with gradually swollen carinæ of moderate size, proportionally not so large and abruptly elevated as in *C. fischeri.* The lines and reticulations as in that species, but more pronounced.

Anal segment broadly truncate, more so than in *C. fischeri.* Bristles arranged as in that species.

Anal valves subequal to anal segment, the angle more pronounced than in *C. fischeri;* moderately convex, margined, with three bristles, arranged as in *C. fischeri.*

Anal scale small, nearly semicircular; two tubercles, with long setæ appressed to the anal valves.

Color: Dorsum dark fuscous-brown, nearly black, a fine median line, a line along the tubercles, the ventral portions, feet and extremities of the body paler, horn-brown or sordid. Antennæ dark brown. On some paler specimens the darker color of the posterior subsegments gives the appearance of a series of transverse dark bands and a row of dark spots along the sides.

The carinæ of this species are proportionally not so large and abruptly elevated as in *C. fischeri.*

Length 14 mm.; width 1.4 mm.

Habitat: Lake Pend d'Oreille, Idaho.

We have examined three female specimens collected on "dry granite ledges, in tufts of moss." The material was sent us by Mr. J. B. Leiberg, for whom we take pleasure in naming this species.

We attempted to identify this species with *Trichopetalum glomeratum* Harger, but the differences in color, size and number of ocelli are too great to permit this.

The characters of the antennæ, gnathochilarium and ocelli render this species quite distinct from *atrolineata.* Indeed, it is probable that when the males are found this species will prove generically distinct from Conotyla.

Conotyla glomerata (Harger).

Trichopetalum glomeratum Harger: Am. Journ. Sci. and Arts, IV, pp. 118 (1872).

Craspedosoma glomeratum (Harger) Bollman: Proc. U. S. Nat. Museum X, 619 (1887); Bull. 46 U. S. Nat. Mus. pp. 36 and 120.

Plate VI, figure 104a.

"This species is somewhat larger than the preceding (*lunatum*), but closely resembles it, except in the following points: The general color is somewhat darker. The eyes of 19 ocelli in a subtriangular patch. There are 31 segments, and the fifth joint of the antennæ is much shorter than the third. These joints, except the first, measure: second .20 mm.; third .40 mm.; fourth .24 mm.; fifth .33 mm.; sixth .18 mm.; seventh .12 mm. Length of animal 10 mm.

"A single specimen of this species was collected by the writer in the valley of the John Day River, Oregon, in October, 1871."

The original description of this species is so brief that the generic position must remain in doubt. A general resemblance to *Trichopetalum lunatum* is alleged, but the thirty(-one) segments, the shorter fifth joint of the antennæ and the triangular eyes show a close approximation with Conotyla.

Conotyla wyandotte (Bollman).

Scotherpes wyandotte Bollman: Proc. U. S. Nat. Museum XI, p. 405 (1888). Bull. 46 U. S. Nat. Museum p. 106 (1893).

Plate VI, figure 101.

"*Diagnosis:* Related to *Cr. lunatum* (Harger), but the color dark, ocelli arranged in a triangular patch, and the body larger and more robust.

Habitat: Wyandotte, Indiana.

Type: U. S. National Museum.

Description: Body stout, short, scarcely depressed. Dorsal plates reticulated; lateral carinæ as in *lunatum.* Ocelli 16–4, in a triangular patch. Yellowish-brown; legs pale. Length .10 mm.; width, 1.5 mm.

This new species is described from a female which was found a few miles north of Wyandotte Cave, Crawford County [Indiana]."

The triangular eyes, dark color and larger size indicate that this species has more characters in common with Conotyla than with Trichopetalam, though when males are found it is likely to prove distinct from both genera.

We examined the type specimen, U. S. Nat. Museum No. 440, and made the following notes:—

Eyes (fig. 101) triangular, the ocelli in diagonal rows beginning posteriorly 1+6+5+3+1=16. Three ocelli border on the lateral margin of the head.

First segment with posterior margin convex, otherwise as in *C. fischeri.*

Subsequent segments with the median bristles longer than the exterior ones, at least on posterior segments. The tubercle on which the interior bristle is located is just mesad of the much swollen carina. An elevated ridge runs above both the exterior tubercles. Segments of the middle of the body short, bristles rather close together, the median pair located well ahead. Anterior subsegments with four or five rows of small, oblong elevations set close together. The usual median furrows and ridge present, but faint. On the posterior segments the carinæ gradually disappear, and the protuberances tend to become arranged in a straight line.

Penultimate segment equal in length to the antepenultimate.

Anal segment contracted posteriorly, viewed from above it appears squarely truncate. The usual eight bristles present.

Anal valves not prominent, margins scarcely raised; above slightly exceeding last segment, and faintly angled; each with three bristles, the superior one close to the apex of the anal segment.

In September 1893 two female specimens of a species bearing a general resemblance to *wyandotte* were collected in a swampy pasture at Grass Lake, near Jackson, Michigan.

Habitat: Known only from the vicinity of Bloomington, Indiana.

UNDERWOODIA gen. nov.

Eyes moderately developed, of numerous (13) ocelli arranged in triangular patches.

Antennæ moderately robust, subclavate, third joint longest, or the fifth subequal.

Mandibles with eight pectinate lamellæ.

Promentum present, triangular.

Segments with lateral carinæ striæform, appearing only on the anterior segments; setigerous tubercles minute.

Legs rather robust; terminal joints of male legs not hispid.

First pair of legs of male robust.

Second legs of male strongly crassate, the coxæ produced, hamate; claw very small.

Third legs of male moderately crassate; coxæ produced, third joint much swollen.

Legs 4–7 not specially modified.

Genitalia of male of two pairs of laminæ, the anterior broad, the posterior slender.

Ninth legs of male two-jointed; basal joint bulbous, attenuate above; second joint broadly oval.

Tenth legs with coxa much enlarged, the other joints reduced.

Segments of adult 30.

Distribution: Northeastern North America.

This genus is named for Dr. L. M. Underwood, to whose kindness we are indebted for the opportunity of studying Myriapoda.

The following new species is made the type of the genus because the male is known, and the generic secondary sexual characters are drawn from this species. In the other characters the two species agree, except in the proportions of the antennal joints.

A noteworthy fact regarding this genus is the enormous preponderance of females. We have collected nearly 300 specimens, of which but two are males. In most Diplopoda the females are more numerous than the males, but such a proportion as this is not reached elsewhere, as far as we are aware. The other genera of Craspedosomatidæ do not seem to have the sexes especially unequal in number.

Underwoodia polygama sp. n.

Plate X, figures 180–190.

Body fusiform, broadest about the middle, narrowed gradually to both ends.

Vertex prominent, smooth and shining, without evident sulcus.

Clypeus sparsely hirsute below; evenly convex.

Eyes broadly triangular, of 13 ocelli arranged in three rows 6+5+2. The external ocellus of the upper rows is somewhat above the line of those with which it is counted.

Antennæ moderately robust, slightly clavate; the approximate ratios of lengths of joints, beginning with the seventh: 3:4.5:9:5:10:5:3. Joints all hirsute, the distal more than the proximal.

Mentum rounded in front and behind.

Promentum triangular, the posterior side concave.

Stipes and lingual laminæ with a few long hairs.

Lingual lobes with three sense-cones.

Styliform processes deeply trifid, the middle tooth smallest.

First segment broadly reniform, the posterior corners rather square; not medianly emarginate behind. Outer setigerous tubercles somewhat mesad

from the posterior corner; second tubercle about midway between the first and third; the third rather close to the median line. Tubercles very small, located in very slight depressions; the setæ slender and if horizontal would nearly reach the posterior margin of the segment.

Surface of all the segments apparently smooth and shining, but if sufficiently magnified it appears finely reticulate-areolate, the areas being irregularly hexagonal or quadrate. On the anterior subsegments the areolation is somewhat coarser and more regular, consisting of rectangles in transverse rows. On the sides of the segments and below the longitudinal lines of the reticulations become more distinct giving the appearance of longitudinal striations. The usual fine median line distinct.

Carinæ very fine, linear, striæform, oblique, the anterior end being higher; the carinæ gradually decrease in size from the first segment and disappear about the tenth. Below, near to and parallel with the ventral edge of the segments is a fine furrow, more evident on posterior segments.

Setigerous tubercles and setæ also decreasing in size from the first segment, almost disappearing on the middle segments. On posterior segments the tubercles and setæ increase in size, extending beyond the posterior margins of their segments.

Posterior segments not much shorter than the anterior.

Anal segment without median line; broadly truncate; the dorsal pair of tubercles very small and close together, located in a very slight transverse furrow, the seta not reaching the posterior margin of the segment. The conic processes of the posterior margin as long as the distance from their bases to the anterior pair of tubercles; from their apices extend very slender hairs (frequently broken off) equalling in length the conic bases. The next pair of marginal setæ located near the corners of the truncation, and as long as the conic processes.

Anal valves smooth or with faint vertical wrinkles; three setigerous tubercles somewhat removed from the slightly compressed margin.

Preanal scale semicircular, broadly emarginate; two tubercles and slender setæ.

Pedigerous laminæ plain in front, reticulate-areolate, mucronate between the bases of the legs.

Legs of both sexes rather robust.

First legs of male (fig. 180) six-jointed, rather robust; basal joint with apex hirsute with fine hairs; second joint broader than long; last joint with a comb of coarser hairs along the ventral side; claw large; two supplementary claws.

Second legs of male (fig. 181) six-jointed, strongly crassate; basal joint produced into a long chitinous hook; second joint very small; joints 3–6 very stout and hirsute with fine flexuous hairs; last joint densely clothed with long flexuous hairs, especially long at apex, and far exceeding the very small claw.

Third legs of male (fig. 182) seven-jointed; basal joint produced into rounded processes with a tuft of flexuous hairs at apex; second joint very small, concealed (in the drawing) behind the first and third joints; third joint

strongly crassate; fourth joint less crassate, the others nearly normal, except that all are hirsute; claw very small, but larger than on the second legs.

Legs 4–7 not specially modified.

Male genitalia (figs. 186–187) consisting of an anterior lamina deeply bifid at apex, the divisions subequal, curved backward; anterior lamina simple, narrow, subequal in length to the other; a median subclavate process arising from the pedigerous lamina.

Ninth legs of male (figs. 186–187) two jointed, the basal joint large and bulbous at base, gradually attenuate distad into a point, subequal to the genitalia in length; second joint broadly oval, attached by a narrow base to the outer side of the first joint; outer face of second joint somewhat flattened, hirsute externally (anterior face) and distally, also with a few papillæ.

Tenth legs of male with the coxæ (fig. 185) greatly enlarged and with an irregular mass of membrane or hardened secretion attached to the ventral side; other joints normal but reduced in size.

Color dark horn-brown, lighter below. The shade varies, some specimens being much lighter than others. The darkest color is upon the head and the exposed portion of the anterior subsegments, giving the animal alternate bands of darker and lighter brown, if examined more closely. Last segment and anal valves dark. Excepting the dark band the segments are spotted and mottled with light brown or whitish. A fine median line pale or whitish. Feet pale, the distal joints darker than the proximal. Antennæ dark, each joint finely ringed with white at base.

Length about 8 mm.; width .65 mm.

Habitat: We have collected about 80 specimens on the north shore of Long Island, New York, May, 1893, at two stations about seven miles apart, Centreport and Cold Spring.

The habitat was in both cases quite the same, among rotting leaves on a heavily wooded hillside where the ground was springy and moist all the year. The Cold Spring station is near the building of the New York State Fish Commission. Of the nearly 80 specimens but two were males, hence the specific name. Specimens were not abundant and several hours were spent collecting them, in the hope of finding more males, so that the material for study might be more abundant, the animal being so small that nothing can be made out with accuracy without dissection.

The species differs from *U. iuloides* in being slightly larger, of dark color, in the better development of the eyes, and in having the third joint of the antennæ longer than the fifth.

Underwoodia iuloides (Harger).

Trichopetalum iuloides Harger: Am. Journ. Sci. and Arts, IV, 118 (1872); Ryder: Proc. U. S. Nat. Mus. III, 527 1881; Packard: Proc. Am. Philos. Soc. XXI, 192 (1883).

Chordeuma iuloides (Harger) Bollman: Bull. 46 U. S. Nat. Mus. 121 (1893).

Plate X, figures 177–179.

Eyes more or less triangular, of about 13 ocelli, without evident arrangement into rows.

Antennæ moderately clavate .75 to .85 mm. long, fifth joint thickest, .10 to .12 mm. in diameter; ratio of lengths of joints, beginning with the seventh, 3: 4.5: 8–10: 5.5: 10: 5: 3. Olfactory cones very slender and sharp-pointed.

First segment smooth, nearly semi-circular in front, straight behind, except a slight emargination in the middle; with a very fine raised margin anteriorly to the lateral angles. Median furrow indistinct. Three fine, hair-like setæ on each side, one close to the lateral angle, one a short distance from the median line and one midway between.

Subsequent segments nearly smooth, a very fine dorsal line, the first five or six segments with a slight trace of lateral carinæ, the others smooth, as in Iulidæ. Each segment has three small bristles on each side, situated as on the first segment. On posterior segments the bristles become larger, have a prominent base, and are closer to the posterior margin of the segment. The ventral edges of anterior segments, at least, are sharply and finely serrate.

Anal segment smooth, as viewed from above having a semi-circular outline, posteriorly truncate. From the posterior margin of the truncation, near the middle, come two long conic papillæ, each tipped with a very slender flexuous hair. At each corner of the truncation, a little removed from the margin is a slender bristle directed backward; another posteriorly-directed slender bristle some distance below, near the sinuation. The other two dorsal bristles are near the median line, some distance behind the middle of the segment, and each located in a depression.

Color light horn-brown, mottled with white, many specimens show very little brown and are dirty white in color, especially in alcohol. The body is so transparent that the contents of the alimentary canal frequently give the appearance of a dark dorsal stripe.

Length 6.5–8 mm.; width .6 mm.

Habitat: North Eastern North America. Harger's type was from Simmons' Harbor, north shore of Lake Superior. We have collected specimens at Orillia, Ontario; abundant on Chief Island, Lake Couchiching; Grass Lake, near Jackson, Michigan; and at several localities in central New York; Syracuse, Kirkville, Marcellus. A careful search is likely to be successful in any wooded locality which is so situated as to soil and drainage as to be always moist, without being submerged. Individuals are

however, seldom abundant, and we have spent considerable time in collecting about 200. None of these are males, so that the generic position of the species must remain somewhat in doubt. We were very unwilling to believe that so large a number of specimens were all females, and re-examined them several times; finally, in order to make sure that the internal structure corresponded with the external appearance, longitudinal sections of about 30 were cut, all of which showed more or less developed eggs. We had begun to suspect parthenogenesis or some other reproductive arrangement novel in Diplopoda when the specimens of *U. polygama* were collected. Males were in that case found, but with a disproportion of sexes so great as to encourage the hope that the males of *iuloides* will be discovered by persistent collecting.

Some specimens of this species have the fifth joint of the antennæ equal to the third, a character otherwise found only in Trichopetalum. The length, however, is not entirely the same in specimens from the different localities.

CASEYA gen. nov.

Eyes well developed, of numerous (23) ocelli, arranged in subtriangular patches.

Antennæ moderately robust, clavate, third joing longest.

Mandibles with eleven pectinate lamellæ.

Promentum present, triangular.

Segments cylindrical, without lateral carinæ, longitudinally striate; setigerous tubercles minute.

Legs slender; terminal joint of male legs not hispid.

First legs of male small and slender.

Second legs of male very slender, the coxæ produced into a curved process; third joint tuberculate on the ventral face; claw normal.

Third legs of male not crassate; coxæ produced, third joint not swollen.

Legs 4 and 5 not specially modified.

Sixth legs with coxa somewhat enlarged, and with a tuft of hairs.

Seventh legs of male with the coxa much enlarged, the other joints reduced.

Genitalia of male of two pairs of laminæ, the anterior large, the posterior smaller, both pairs complex.

Ninth legs of male two-jointed, the basal joint broad at base, produced distad, second joint broadly oval.

Tenth legs of male with coxæ much enlarged, the other joints reduced.

Segments of adult 30.

Distribution: California.

This genus is named for Captain Thomas L. Casey, to whom our thanks are due for a collection of Californian Myriapoda including this and other interesting forms.

Caseya differs from Underwoodia in the more numerous ocelli and pectinate lamellæ, the entire absence of carinæ, the pronounced lateral striæ, the slender anterior male legs, and the greatly enlarged coxæ of the seventh legs of the male. Many other differences of the same or less importance might be enumerated, such as the shape of the modified coxæ of the second and third pairs of male legs, the slight modification of the coxæ of the sixth male legs, the process of the coxæ of the tenth legs, and the oblique carinæ of the coxæ of the tenth and following legs; also the form of the male genitalia and ninth male legs, for these differences are not paralleled among the species of the other genera.

On the other hand there can be no doubt that these two genera form a natural group and have more affinity with the European genus Chordeuma than with the other American types.

The mandibulary cardo is apparently smaller and more coalesced than in Cleidogona; no sulcus is evident, but a suture becomes apparent as the alcohol dries out.

The body is somewhat more gradually tapering caudad, and slightly less so cephalad than Cleidogona, which this form much resembles in external appearance. The head is, however, not wider than the first segment, and the whole appearance of the animal is the most iuliform of any of our Craspedosomatidæ. The entire absence of carinæ, the rudimentary character of the setigerous tubercles, which are sunk in depressions, as though to more thoroughly dispose of them, and the presence of longitudinal striations, also give force to the fact that in the iuliform Craspedosomatidæ we have another of the strange approximations of external form between animals widely separated by the more important structural characters.

Caseya heteropus sp. n.

Body fusiform, broadest about the middle, narrowed gradually to both ends.

Vertex prominent, smooth and shining; a few scattered punctations (perhaps the bases of hairs); posteriorly emarginate-excavate, with a short median suture extending from the posterior margin and not reaching an imaginary line connecting the eyes.

Clypeus sparsely hirsute below, rather plane, a transverse depression above the labrum.

Eyes broadly subtriangular, the ocelli not arranged with much regularity, the vertical rows being usually more evident than the horizontal. Ocelli counted horizontally from above: 7+6+5+4+2=24, or 6+5+4+3+3=21, 1+6+5+4+3+2+1=22.

Antennæ moderately robust, somewhat clavate, ratio of lengths of joints, beginning with the seventh: 2:4:8:6:10:6:2.

Proximal joints sparsely, the distal more densely hirsute. Below and laterad from the antennal socket the margin of the head has a deep rounded notch.

Mentum broadly quadrangular-arcuate, all the sides curved, convex in front, concave behind.

Promentum triangular, subequilateral, posteriorly broadly emarginate; sparsely hirsute.

Stipes and lingual laminæ sparsely hirsute.

Lingual lobes with five sense cones.

Styliform processes quadridentate.

First segment broadly reniform, slightly emarginate in the middle posteriorly. A fine raised anterior margin; dorsal median line beginning just back of the middle of segment; outer setigerous tubercles somewhat mesad from the outer corners of the segment; second tubercle about midway between the first and third. Tubercles minute, rather closer to the posterior margin than in Underwoodia.

Surface of segments appearing smooth, but reticulate-areolate as described for *Underwoodia polygama*. On the sides and below the posterior subsegments are longitudinally striate as in Iulidæ. On the first segment are no striations; the second with but one above the lower tubercle; the third with two; the succeeding segments with three or four; below the lower tubercle about ten striations, very distinct, at equal distances, somewhat oblique, the posterior end lower. The suture between the subsegments is sinuate medianly, the anterior subsegment extending somewhat into the posterior. Tubercles minute, located in depressions, on all segments except the first and last arranged in a transverse line. No trace of lateral carinæ, the striations of the side not larger than those below. On posterior segments the striæ below the tubercles are somewhat more numerous. Corners of the segments below evenly rounded, the margin somewhat thickened; the lower side of the submarginal furrow is extended into a minute sharp tooth.

Last segment truncate, tubercles located as usual; conic processes and setæ not seen.

Anal valves with the usual tubercles and long setæ.

Preanal scale semicircular, subtruncate posteriorly; two long bristles somewhat remote from the posterior margin and located upon a transverse thickening of the scale.

Pedigerous laminæ very small, coarsely areolate, subcarinate in front, acuminate distad.

Legs rather slender, moderately hirsute, the coxæ approximate, reticulate-areolate, especially on posterior legs.

First legs of male (fig. 198) slender, apparently of the usual form, our specimen somewhat broken and distal joint lost.

Second legs of male (figs. 199–200) more slender than the first; coxa produced from the anterior face into a blunt process curved backward; the process is partly concealed by a tuft of long hairs which arise from the coxa behind the process, extend distad and mesad and are curved around the process; third joint very long, thickly tuberculate on the middle of the ventral face.

Third legs of male (figs. 201–203) with coxa much enlarged and produced into conic processes, clothed at apex with a tuft of long hairs; both surfaces of the joint are sparsely hirsute with shorter hairs; other joints not specially modified, except that the distal joints are more hirsute; claw normal, equal to that of the second legs.

Sixth male legs (fig. 206) with coxa slightly enlarged, the meso-distal corner prominent, clothed with long hairs.

Seventh male legs (figs. 207–209) with coxa greatly enlarged; on the middle of the distal side a conic process truncate at apex and surmounted with a tuft of long hairs; in front of the process are other long hairs, and another tuft at the inner distal corner of this joint. The second joint inserted at the outer corner of the coxa. Other joints somewhat reduced in size, so that the length of the seventh legs does not exceed that of the sixth. The third joint is shortened more than the others.

Male genitalia complex, (figs. 216–217) and as we had but one male, dissection was not carried far enough to make plain the relations of the parts. The posterior arm seems to be perforate, the anterior part of it extending up into the complicate anterior arm as two slender columns (fig. 216).

Ninth legs of male (fig. 218) with basal joint produced above and angled near the apex with a deep, rounded notch subtended by a sharp tooth; second joint narrower than in Uuderwoodia, hirsute distally and on the lateral face. The pedigerous lamina has long curved ends and is medianly prominent. It may be that this medial prominence is homologous with the long median process of Underwoodia.

Tenth legs of male (figs. 210–211) with coxæ much enlarged, similar to those of Underwoodia; on the posterior side near the aperture a large rounded prominence; also an oblique carina; other joints evidently reduced.

Eleventh and twelfth legs of male (figs. 212–213) slightly thicker than the normal (fig. 214). Third joint with a few small tubercles on the ventral face; coxæ obliquely carinate on the posterior face.

Color in alcohol, dark brown with a bluish tinge. This may be due to the fact that the specimens are old. Iulidæ sometimes turn blue in alcohol. The segments have light spots and are coarsely marbled. Legs and antennæ dark brown, especially the distal joints.

Length 15 mm.; width 1.7 mm.

Exact locality not known, but the specimens, a mature male and female, are evidently from California. In the same bottle was a

specimen of Pæromopus which is known with certainty to have been taken on the hills back of Saucelito, across the Golden Gate from San Francisco.

Notes on Exotic Craspedosomatidæ.

As likely to be of interest in connection with a study of the American forms, we add brief notes on the other genera and species, as far as they have been described sufficiently to state the more important characters.

RHISCOSOMA Latzel. 1884.

Myr. Œst. Ung. Mon. Zweite Hälfte, p. 173.

Eyes distinct, ocelli numerous (11).

Antennæ moderately long, rather slender, slightly clavate, fifth joint longest.

Segments above strongly arched, with large, continuous carinæ which are decurved in the direction of the dorsal arch; setigerous tubercles very small.

Distribution: Austro-Hungary.

This very curious genus was described from individuals supposed to be immature, with 23 segments, and measuring 3.5 mm. by .6 mm. The carinæ are so large as to reach down to the ground when the animal is crawling, so that the animal is hollowed out below. The resemblance to a Polyzonium is very great.

ATRACTOSOMA Fanzago, 1876.

Annuario d. Soc. d. Naturaliste in Modena X, p. 70.

Eyes distinct, of numerous ocelli (25–29) arranged in triangular or semicircular patches.

Antennæ very long and slender, third joint longest.

Segments with lateral carinæ large, horizontal, rounded in front, hooked behind; setæ rather long.

Seventh segment nearly normal.

First two pairs of legs small and slender, the next five pairs strongly crassate in the male.

Legs 3–7 of male with a very short claw, the ventral face of the last joint hispid. Coxa of seventh leg with a conic process. Genitalia of male complex, of three pairs of lamellæ.

Ninth legs of male simple, oblong (cf. Verhœff).

Tenth and eleventh legs of male with a wart-like process on the coxa, the terminal joint somewhat hispid.

The above characters are drawn from Latzel's description of *A. meridionale* Fanzago, the type species.

Atractosoma carpathicum Latzel.

Seventh segment of male with the ventral margin produced into two long slender teeth.

Genitalia totally different from those of *A. meridionale*, of two pairs of lamellæ.

Ninth legs of male very simple, reduced to a somewhat conic process with an apical bristle.

Atractosoma bohemicum Rosicky.

Anterior male legs with the terminal joint not cushioned or hispid.

Ninth male legs simple, without processes or teeth, their sternum also simple.

The North American Craspedosomatidæ, as far as known, show no close resemblances with the species of Atractosoma, either in form of body or structure of genitalia and ninth male legs.

CRASPEDOSOMA Leach and Rawlins, 1814.

Trans. Linn. Soc. XI. 2, p. 380.

Eyes well developed, of numerous (25–28) ocelli arranged in triangular patches.

Antennæ very long, slender, third joint longest.

Segments rather depressed, with traces of obtuse carinæ, especially in front; tubercles and setæ very small.

Seventh segment ventrally inflated.

First and second male legs small, the last joint fringed on the inner edge.

Legs 3–7 of male scarcely thicker than the normal, the last joint pulvinate.*

Male genitalia of two pairs of processes, the larger simple, broad, the others approximate, very slender.

Ninth legs of male replaced by a pelviform structure with median processes.

Tenth and eleventh male legs with a verruciform process.

Distribution: Many species, reported from nearly all parts of Europe.

The above characters are drawn from Latzel's description and plates of *Cr. rawlinsii*, the type of the genus. Numerous species have been referred to Craspedosoma, many of them without proper study of the secondary sexual characters, and without giving them such systematic weight as they seem to us to be entitled.

Among characters of this kind some of the more noteworthy are as follows :—

*Whether these legs differ from those we have called hispid is not clear.

Craspedosoma oribates Latzel.

Genitalia apparently similar in plan to those of *C. rawlinsii*,, but the ninth pair of legs consisting of two clavate structures united at base, diverging at apex and beset with bristles. Seventh pair of legs decidedly smaller than the sixth.

Craspedosoma stygium Latzel.

Genitalia, according to Latzel, of four pairs of structures, one clavate (probably ninth legs) and three pairs of smaller structures between.

Seventh pair of male legs wanting, that is, there are but six pairs in front of the genitalia.

Legs 4–6 stump-like, though the author of the species doubts whether this character may not be accidental.

Craspedosoma moniliforme Latzel.

Legs 3–7 not noticeably crassate, the terminal joint rather thick, pulvinate.

Seventh legs reduced, their coxæ enlarged, posteriorly with a hirsute process, the pedigerous laminæ posteriorly with a sharp cuneiform process.

Ninth legs clavate, more or less evidently jointed, with bristles at the end. Pedigerous lamina medianly produced between the clavate structures and hollowed out in front.

Craspedosoma mutabile Latzel.

Legs 3–7 strongly crassate, more sparsely hairy, shining, the terminal joint compressed, scarcely pulvinate.

Ninth legs in the young five-jointed, attenuate, falcate; in adult modified into a complex structure apically with long compound bristles; basally giving rise to a long flagellum, suggestive as the author says of the flagellum of Iulidæ, and apparently indicating a functional difference from other Chordeumidæ.

Tenth and eleventh legs with an inwardly projecting hamate process from the distal end of the coxæ, also a pear-shaped wart on the base of the coxæ.

It is also stated that the females do not have the legs of the second segment developed, a character apparently of great importance. The species has, however, according to Latzel, several varieties and in one of these a female had the usual number of legs. Judging from the American forms it is very remarkable that such a character should not be constant. The difficulty of correctly determining females is very great, especially when the species are incompletely known.

Craspedosoma flavescens Latzel.

Legs 3–7 strongly crassate, distal half of the last joint cushioned.

Ninth legs clavate, hirsute, separated by a pair of small structures basally

broad, apically clavate, with a pointed triangular transparent lamina rising from the base of each.

Tenth legs much reduced; coxæ swollen, on the inner side with a clavate process bearing a bristle, also a small wart below the process.

Eleventh legs normal excepting a small wart on the coxa.

It is to the present genus that the European writers have referred a considerable number of American species. To us it appears that the genus as treated in European works is not a natural one, and that the American species are all generically distinct from any of the European, as far as the sexual characters of either are sufficiently known to give basis for an opinion. To judge by the characters of the ninth male legs the European forms are all more diverged from the primitive than any of the American, and the greater complexity of the genitalia in most of them is in accordance with such an idea.

HAASIA. Bollman, 1893 (as subgenus).

Bulletin No. 46, U. S. N. Museum, p. 158.

Eyes entirely absent.

Antennæ slightly clavate, slender, much longer than the width of the body, the seventh joint longer than the sixth.

Segments with exterior two pairs of setæ approximate, rather large.

Legs very slender and densely hirsute.

The establishment of the subgenus appears somewhat premature; as both species placed under it are incompletely described. *Craspedosoma troglodytes* Latzel, is known only from a female specimen, and no characters of generic value are stated except the above. *Craspedosoma mamillatum* was described from a male specimen but only a rough sketch of the genitalia is given. From this it would appear that like the open air species of Craspedosoma the ninth male legs are reduced to a single joint, without a claw. If this is the case, and if *troglodytes* and *mamillatum* are congeneric, Haasia will prove valid.

CHORDEUMA C. L. Koch, 1847.

System der Myriap., p. 51, also p. 124.

Eyes well developed, of numerous ocelli (27–28) arranged in triangular patches.

Antennæ very long, twice the diameter of the body, slender, third joint longest.

Segments without carinæ; setæ and tubercles nearly obsolete, somewhat more evident on the posterior end of the body.

Males with 6 ambulatory legs in front of the genitalia and 39 behind.

First two pairs of male legs with the last joint pectinately spined.

Legs 3–6 of male distinctly crassate, the inner side of the last joint tomentose pulvillate.

Seventh legs of males three-jointed, the basal joint large, produced, the others small clavate; an indistinct very small fourth joint (rudimentary claw?).

Genitalia very complex, the anterior large, somewhat hood-like, with an included lamella; the posterior pair slender, apically bifid. There is present a clavate, distally hirsute structure much resembling the ninth legs of some of the species of Craspedosoma, but Dr. Latzel does not so interpret it.

The tenth male legs have also been completely modified for copulatory purposes, consisting of slender processes.

In females are but 49 ambulatory legs, and the sternum of the third segment projects cephalad covering the genitalia.

The above characters are from Latzel's description of *Chordeuma sylvestre*, the type of the genus. The description and figures of Verhoeff* differ considerably from those of Latzel, in the shape of the genitalia as well as in that of the seventh and ninth legs.

Chordeuma rhenanum Verhoeff.

Seventh legs reduced to a single squamiform joint.

Tenth legs also of one joint, irregular in shape, with rounded prominences.

Chordeuma germanicum Verhoeff.

Differs greatly in the genitalia, but has the table-like ninth legs of the other species as figured by Verhoeff.

Chordeuma has, perhaps, nearer relatives in America than the other European genera, as already noted under the genus Caseya. The rudimentary seventh and tenth legs of the males of Chordeuma, as well as other secondary sexual characters, give distinct lines of generic separation.

In addition to the European genera of Craspedosomatidæ already noted there have been described three others, Hyphanturgus of Waga, Megalosoma of Fedrizzi, and Prinosoma of Berlese, but these have not been recognized by Latzel and Haase, and stand as synonyms of Atractosoma and Craspedosoma.

HETEROCHORDEUMA Pocock, 1893.

Ann. Mus. Storia Nat. d. Genova XIII, p. 387.

Eyes of numerous ocelli (11) arranged in four transverse rows.

Antennæ moderately long, third and fifth segments longest.

*Berliner Eutom Zeitschr, xxxvi, p. 132 (1891).

Segments with broad horizontal carinæ, like those of Polydesmidæ; setigerous tubercles very small, only two pairs observed; surface covered with short hairs.

Genitalia composed of the two pairs of legs of the seventh segment, completely external.

Segments of adult 32.

Habitat: Karen Hills, Burmah, at 1200–1500 m. altitude.

This anomalous genus presents several unique features, and its family disposition must remain a matter of some doubt until the characters of the legs and mouth-parts are known. No other Craspedosomatidæ are known from southern Asia, but the discovery of this form suggests the probable existence of others in the neighboring regions.

INDEX OF GENERA, SPECIES AND SYNONYMS.

EXPLANATION OF THE PLATES.

PLATE I.

Branneria carinata.

Fig. 1.—Antenna, three distal joints, × 56.

Pseudotremia cavernarum.

Fig. 2.—Genitalia of male, anterior view.

Fig. 3.—Same, lateral view.

Fig. 4.—Gnathochilarium. U. S. N. M. No. 420.

Fig. 5.—Antenna, × 24.

Fig. 6.—Ninth legs of male with lamella, × 24. U. S. N. M. No. 420.

Fig. 7.—Eleventh legs of male, ×24. U. S. N. M. No. 436.

Pseudotremia carterensis.

Fig. 8.—Ninth legs of male, posterior view.

Fig. 9.—Lamella embraced between the ninth legs of male, ×35.

Fig. 10.—Genitalia of male, ×50.

Pseudotremia cavernarum.

Fig. 11.—Body, dorsal view.

Scoterpes copei.

Fig. 12.—Genitalia of male, after Packard.
Fig. 13.—Same, less magnified; also ninth legs, after Packard.

Zygonopus whitei.

Fig. 14.—Antenna, × 27.
Fig. 15.—First leg of male, × 50.
Fig. 16.—Second leg of male, × 50.

PLATE II.

Zygonopus whitei.

Fig. 17.—Fourth legs of male, × 50.
Fig. 18.—Sixth legs of male, × 50.
Fig. 19.—Twelfth leg of male, × 50.
Fig. 20.—Genitalia of male, anterior face.
Fig. 21.—Same, posterior face, also ninth legs.

Trichopetalum album.

Fig. 22.—Antennæ of male, × 105.
Fig. 23.—First leg of male, × 105.
Fig. 23*a*.—Second leg of male, × 105.
Fig. 24.—Third leg of male, × 105.
Fig. 25.—Fourth leg of male, × 105.
Fig. 26.—Fifth leg of male, × 105.
Fig. 27.—Seventh leg of male, × 105.
Fig. 28.—Tenth leg of male, × 105.
Fig. 29.—Normal leg of male, × 105.

PLATE III.

Trichopetalum ocellatum.

Fig. 30.—Head and three segments, after Packard.
Fig. 31.—Antenna, after Packard.
Fig. 32.—Eye, after Packard.
Fig. 33.—Segments, lateral view, after Packard.
Fig. 34.—Segments, dorsal view, after Packard.
Fig. 35.—Last six segments, lateral view, after Packard.

Trichopetalum album.

Figs. 36 (× 312), 37 (× 250), 38, 39, 40 (× 312), 41.—Apices of male genitalia, different views, from different specimens.
Fig. 42.—Male genitalia, anterior face, × 187.
Fig. 43.—Same, posterior view, also ninth legs.
Fig. 44.—Distal portion of gnathochilarium × 160.
Fig. 45.—Eye.

Trichopetalum cornutum.

Figs. 46, 47 (× 294), 48 (× 333).—Apices of male genitalia, different specimens and views.
Fig. 49.—Male genitalium, lateral view.

Trichopetalum flavidum.

Fig. 50.—Eye.

Trichopetalum uncum.

Fig. 51.—Genitalia of male, anterior face, × 169.

Trichopetalum lunatum.

Fig. 52.—Antenna, after Harger.
Fig. 53.—Eye, after Harger.
Fig. 54.—Male genitalia, after Harger.

PLATE IV.

Conotyla fischeri.

Fig. 55.—Head and first three segments, dorsal aspect.
Fig. 56.—Same, lateral aspect.
Fig. 57.—Last four segments, lateral aspect.
Fig. 58.—Labrum.
Fig. 59.—Distal portion of half of gnathochilarium.
Fig. 60.—Last four segments, ventral view.
Fig. 61.—Two distal joints of antenna, × 50.
Fig. 62.—Distal portion of half of gnathochilarium, dorsal face.
Fig. 63.—Gnathochilarium.
Fig. 64.—Antenna, × 25.
Fig. 65.—First leg of male, × 25.
Fig. 66.—Second leg of male, × 25.
Fig. 67.—Third leg of male, × 25.
Fig. 68.—Fourth leg of male, posterior view, × 25.
Fig. 69.—Fifth leg of male, posterior view, × 25.
Fig. 70.—Seventh leg of male, anterior view, × 25.
Fig. 71.—Process of the fourth joint of the seventh leg, more magnified.
Fig. 72.—Male genitalia, anterior view.
Fig. 73.—Ventral portion of segments 5–8, male genitalia, and basal joints of legs, lateral view.
Fig. 74.—Male genitalia, lateral view.
Fig. 75.—Anterior pair of male genitalia, anterior view.

PLATE V.

Conotyla fischeri.

Fig. 76.—Tenth pair of legs of male, × 25.
Fig. 77.—Eleventh pair of legs of male, × 25.
Fig. 78.—Twelfth pair of legs of male, × 37.

Conotyla bollmani.

Fig. 79.—Male gentalia, anterior view, U. S. N. M. No. 419.
Fig. 80.—Same, lateral view.
Fig. 81.—Right eye.
Fig. 82.—Left eye.
Fig. 83.—Antenna, × 25.

Fig. 84.—Head and first eight segments.
Fig. 85.—Last six segments.
Fig. 86.—First leg of male, × 45. U. S. N. M. No. 443.
Fig. 87.—Second leg of male, × 28.
Fig. 88.—Third leg of male, posterior view.
Fig. 89.—Fourth leg of male, posterior view, × 25.
Fig. 90.—Seventh leg of male, anterior view.
Fig. 91.—Tenth leg of male, posterior view, × 25.
Fig. 92.—Eleventh leg of male, posterior view, × 25.
Fig. 93.—Normal leg of male, anterior view.
Fig. 94.—Longitudinal section of spine, drawn from *C. fischeri*.

PLATE VI.

Conotyla atrolineata.

Fig. 95.—Antenna, × 57.
Fig. 96.—Male genitalium of posterior pair, × 127.
Fig. 97.—Male genitalium of anterior pair, × 127.
Fig. 98.—Ninth leg of male, × 16.
Fig. 99.—Eye, drawn from Winona specimen.
Fig. 100.—Eye, drawn from Glacier, B. C., specimen.

Conotyla wyandotte.

Fig. 101.—Eye. The photo-engravers omitted the number on the plate. The figure is above 100, at the right-hand margin of the plate.

Conotyla leibergi.

Fig. 102.—Antenna.
Fig. 103.—Gnathochilarium.
Fig. 104.—Eye.

Conotyla glomerata.

Fig. 104a.—Antenna and eye, after Harger.

Cleidogona mexicana.

Figures copied from Saussure and Humbert.

Fig. 105.—Gnathochilarium.
Fig 106.—Segment, ventral view.
Fig. 107.—Antenna.
Fig. 108.—Posterior part of body, lateral view.
Fig. 109.—Same, dorsal view.

Cleidogona major.

Fig. 110.—First pair of legs of male, × 16.
Fig. 111.—Second pair of legs of male, × 16.
Fig 112.—Third pair of legs of male, × 16.
Fig. 113.—Fourth pair of legs of male, × 16.
Fig. 114.—Fifth pair of legs of male, × 16.
Fig. 115.—Sixth pair of legs of male, × 16.

Fig. 116.—Seventh pair of legs of male, × 16.
Fig. 117.—Ninth pair of legs of male, × 16.
Fig. 118.—Tenth pair of legs of male, × 16.

PLATE VII.

Cleidogona major concluded.

Fig. 119.—Eleventh pair of legs of male, × 16.
Fig. 120.—Twelfth pair of legs of male, × 16.
Fig. 121.—Thirteenth pair of legs of male, × 16.
Fig. 122.—Twentieth pair of legs of male, × 16.
Fig. 123.—Fiftieth (last) pair of legs of male, × 16.
Fig. 124.—Apical joints of second leg, × 143.
Fig. 125.—Antenna, × 31.
Fig. 126.—Apex of sixth joint of second leg, × 160.
Fig. 127.—Ninth leg of male.
Fig. 128.—Male genitalia lateral view, × 46.
Fig. 129.—Apices of same, apical view, × 46.
Fig. 130.—Male genitalia, posterior view × 46.
Fig. 131.—Legs 7–12, drawn *in situ*.
Fig. 132.—Gnathochilarium.
Fig. 133.—Head, lateral view.
Fig. 134.—Head and six segments, dorsal view.
Fig. 135.—Last five segments, lateral view.
Fig. 136.—Same, dorsal view.
Fig. 137.—Pre-anal scale.

PLATE VIII.

Cleidogona cæsioannulata.

Fig. 138.—Genitalia of male, lateral view.
Fig. 139.—Same, dorsal (anterior view).
Fig. 140.—Ninth leg of male.
Fig. 141.—Eleventh leg of male.
Fig. 142.—Twelfth leg of male.
Fig. 143.—Antenna.

The above six figures were drawn from specimens collected near the Catholic University, Washington, D. C.

Fig. 144.—Last joint of ninth male leg.
Fig. 145.—Ninth legs, × 25.
Fig. 146.—Anterior aspect of genitalia.
Fig. 147.—Lateral view of genitalia.
Fig. 148.—Posterior view of genitalia.

Figures 144–148 were drawn from National Museum material, with no record of locality.

Fig. 149.—Ninth leg.
Fig. 150.—Genitalia; this and the preceding figure after McNeill. His material was collected in Monroe County, Indiana.

Cleidogona fustis.

Fig. 151.—Male genitalia, anterior view.
Fig. 152.—Same, lateral view.
Fig. 153.—Same, drawn from another specimen and at a different angle.
Fig. 154.—First leg of male.
Fig. 155.—Second leg of male.
Fig. 156.—Seventh leg of male.
Fig. 157.—Tenth leg of male.
Fig. 158.—Eleventh leg of male.

PLATE IX.

Cleidogona forceps.

Fig. 159.—Male genitalia, lateral view.
Fig. 160.—Same, anterior view.
Fig. 161.—Same, posterior view.
Fig. 162.—Ninth leg of male, × 30.
Fig. 163.—Apical portion of same, × 105.

Cleidogona laminata.

Fig. 164.—Genitalia and legs 9–12, drawn *in situ*.
Fig. 165.—Male genitalia, anterior view.
Fig. 166.—Same, posterior view.
Fig. 167.—Ninth leg of male, posterior view.
Fig. 168.—Same, anterior view.
Fig. 169.—Antenna, × 31.
Fig. 170.—Tenth legs of male.
Fig. 171.—Eleventh legs of male.

Bactropus conifer.

Fig. 172.—Antenna.
Fig. 173.—Gnathochilarium, × 105.
Fig. 174.—Genitalia of male, anterior view, with ninth legs.
Fig. 175.—Apical joints of ninth leg of male.
Fig. 176.—Last two segments, lateral view.

PLATE X.

Underwoodia iuloides.

Fig. 177.—Eye and part of antennal socket.
Fig. 178.—Antenna, × 80.
Fig. 179.—Second pair of legs of female.

Underwoodia polygama.

Fig. 180.—First legs of male, × 50.
Fig. 181.—Second legs of male, posterior view, × 50.
Fig. 182.—Third legs of male, posterior view, × 50.
Fig. 183.—Fourth legs of male, × 50.
Fig. 184.—Fifth legs of male, × 50.

Fig. 185.—Eleventh legs of male, × 45.
Fig. 186.—Male genitalia and ninth leg, posterior view.
Fig. 187.—Same, anterior view.
Fig. 188.—Gnathochilarium.
Fig. 189.—Antenna, × 57.
Fig. 190.—Distal joints of antenna.

PLATE XI.

Caseya heteropus.

Fig. 191.—Head and first six segments, lateral view, × 10.
Fig. 192.—Head, anterior view, × 25.
Fig. 193.—Eye, antennal socket, margin of cephalic plate and post-antennal organ, the last indicated by the small ring immediately below the ocelli.
Fig. 194.—Labrum.
Fig. 195.—Gnathochilarium.
Fig. 196.—Lingual lobe, lingual lamina with conic sense organs, and tridentate styliform process, × 105.
Fig. 197.—Antenna, × 25.
Fig. 198.—First leg of male; the specimen was injured, × 25.
Fig. 199.—Second legs of male, posterior view, × 25.
Fig. 200.—Proximal portion of same, anterior view, × 105.
Fig. 201.—Third legs of male, posterior view, × 25.
Fig. 202.—Proximal portions of same, anterior view, × 25.
Fig. 203.—Same, × 105.
Fig. 204.—Fourth legs of male, posterior view, × 25.
Fig. 205.—Fifth legs of male, anterior view, × 25.
Fig. 206.—Sixth legs of male, anterior view, × 25.
Fig. 207.—Seventh legs of male, anterior view, × 25.
Fig. 208.—Proximal joints of same, posterior view, × 25.

PLATE XII.

Caseya heteropus.

Fig. 209.—Portion of basal joint of seventh leg of male, anterior view, × 105.
Fig. 210.—Basal joints of tenth leg of male, anterior view.
Fig. 211.—Same legs, posterior view, × 25.
Fig. 212.—Eleventh leg of male, anterior view.
Fig. 213.—Twelfth leg of male, posterior view.
Fig. 214.—Normal leg of male, anterior, × 31.
Fig. 215.—Male genitalia and ninth legs, ventral (anterior) view, drawn *in situ*.
Fig. 216.—Ventral portion of segments 5–8, legs 7–10, and male genitalia, lateral view, drawn *in situ*, × 25.
Fig. 217.—Male genitalium, median view. The small unshaded part near the middle is open to the other side.
Fig. 218.—Ninth legs of male, anterior view, × 40.
Fig. 219.—Ninth legs of male, posterior view, × 40.

II.—*On the Reduction of Stellar Photographs, with Special Reference to the Astro-Photographic Catalogue Plates.*

BY HAROLD JACOBY.

Read October 14, 1895.

The following paper has been prepared at the request of Dr. Gill, who asked me to put together the formulæ which seemed to me best for the reduction of the Astrophotographic catalogue plates. In so doing I have drawn freely upon the work of others, particularly that of Rambaut, Turner and Henry. I have also had very valuable help from Mr. Finlay, Chief Assistant at the Cape Observatory, especially in the preparation of the tables. The methods here given are suitable for the reduction of any photographic plates, whether taken under the programme of the Permanent Committee or not. The only limitations are that the centre of the plate shall be more than 15° from the pole, and the extent of the plate not more than 2° square.

The fundamental problem with which we have to deal is the transformation of rectangular co-ordinates measured on the plate into the corresponding differences of right ascension and declination upon the sky. For the present I shall assume that the plate is correctly oriented, and that the scale-value is known. We shall then find the problem under consideration involves only five quantities. If we let:

α, δ, be the right ascension and declination of the center of the plate,

α', δ', be the right ascension and declination of a star,

x, y, be the rectangular co-ordinates of the star's image on the plate, x being positive both in the Northern and Southern hemispheres when the star's right ascension is greater than that of the centre of the plate, and y being positive when the star is nearer than the centre of the plate to the North Pole.

Now put:

$$\Delta\alpha = \alpha' - \alpha, \quad \Delta\delta = \delta' - \delta,$$

then the five quantities involved are:

$$x,\ y,\ \Delta\alpha,\ \Delta\delta,\ \delta.$$

Some of the writers on this problem have allowed the quantity δ' to appear in their formulæ: this may be necessary for plates taken very near the pole, but for all other plates it is not necessary.

To secure the maximum of facility in computation, we require the expansion of $\Delta\alpha$ and $\Delta\delta$ in ascending powers of x and y, in a series whose coefficients involve δ only. We also require x and y expanded in ascending powers of $\Delta\alpha$ and $\Delta\delta$, with the same condition as to the coefficients. These considerations lead to the following expansions, in which the unit for x* and $\Delta\alpha$ is the second of time, and for y and $\Delta\delta$ the second of arc. The same rule with regard to units applies to all the other formulæ in the present paper; so that wherever x or $\Delta\alpha$ appear, they are supposed to be expressed in seconds of time, and wherever y or $\Delta\delta$ appear, they are in seconds of arc. Similar expansions carried as far as terms of the third order have been given by Ball and Rambaut (Trans. Roy. Irish Acad., Vol. XXX., part IV.) Those given in the present paper were deduced by me from Turner's rigorous formulæ (Observatory, XVI., p. 374) and afterwards carefully checked by Mr. Finlay, who very kindly extended Ball and Rambaut's work as far as terms of the fifth order for that purpose. They hold good up to within 15° of the pole.

$$\begin{aligned}
\Delta\alpha = {} & x\sec\delta + A_1(x\sec\delta)y \\
& + A_2(x\sec\delta)y^2 \\
& + A_3(x\sec\delta)^3 \\
& + A_4(x\sec\delta)^3 y \\
& + A_5(x\sec\delta)y^3 \\
& + A_6(x\sec\delta)^3 y^2 \\
& + A_7(x\sec\delta)^5 \\
& + A_8(x\sec\delta)y^4
\end{aligned}
\qquad
\begin{aligned}
A_1 &= \tan\delta\sin 1'' \\
A_2 &= \tan\delta\sin^2 1'' \\
A_3 &= -\tfrac{1}{3}(15)^2\sin^2 1'' \\
A_4 &= -\tan\delta(15)^2\sin^3 1'' \\
A_5 &= \tan^3\delta\sin^3 1'' \\
A_6 &= -2\tan^2\delta(15)^2\sin^4 1'' \\
A_7 &= \tfrac{1}{5}(15)^4\sin^4 1'' \\
A_8 &= \tan^4\delta\sin^4 1''
\end{aligned}$$

$$\begin{aligned}
\Delta\delta = {} & y + D_1(x\sec\delta)^2 \\
& + D_2(x\sec\delta)^2 y \\
& + D_3 y^3 \\
& + D_4(x\sec\delta)^2 y^2 \\
& + D_5(x\sec\delta)^4 \\
& + D_6(x\sec\delta)^4 y \\
& + D_7(x\sec\delta)^2 y^3 \\
& + D_8 y^5
\end{aligned}
\qquad
\begin{aligned}
D_1 &= -\tfrac{1}{4}\sin 2\delta(15)^2\sin 1'' \\
D_2 &= -\tfrac{1}{2}(15)^2\sin^2 1'' \\
D_3 &= -\tfrac{1}{3}\sin^2 1'' \\
D_4 &= -\tfrac{1}{2}\sin^2\delta\tan\delta(15)^2\sin^3 1'' \\
D_5 &= \tfrac{1}{8}(3\sin\delta\cos^3\delta + \sin^3\delta\cos\delta)(15)^4\sin^3 1'' \\
D_6 &= \tfrac{3}{8}(15)^4\sin^4 1'' \\
D_7 &= \tfrac{1}{2}(1-\tan^2\delta)(15)^2\sin^4 1'' \\
D_8 &= \tfrac{1}{5}\sin^4 1''
\end{aligned}$$

* The use of the time-unit for the linear quantity x is to be understood as meaning that the unit for x is the distance corresponding to a second of time at the centre of the plate. This applies also to the unit for y, *mutatis mutandis.*

$$x\sec\delta = \Delta\alpha + A_1'\Delta\alpha\Delta\delta + A_2'\Delta\alpha^3 + A_3'\Delta\alpha^3\Delta\delta + A_4'\Delta\alpha\Delta\delta^3 + A_5'\Delta\alpha^3\Delta\delta^2 + A_6'\Delta\alpha^5$$

$$A_1' = -\tan\delta\sin 1''$$
$$A_2' = \tfrac{1}{3}(1-\tfrac{3}{2}\sin^2\delta)(15)^2\sin^2 1''$$
$$A_3' = \tfrac{1}{6}(-5\sin\delta\cos\delta+\tan\delta\sin^2\delta)(15)^2\sin^3 1''$$
$$A_4' = -\tfrac{1}{3}\tan\delta\sin^3 1''$$
$$A_5' = \tfrac{1}{2}\sin^2\delta(15)^2\sin^4 1''$$
$$A_6' = \tfrac{1}{120}(16\cos^4\delta-13\sin^2\delta\cos^2\delta+\sin^4\delta)(15)^4\sin^4 1''$$

$$y = \Delta\delta + D_1'\Delta\alpha^2 + D_2'\Delta\alpha^2\Delta\delta + D_3'\Delta\delta^3 + D_4'\Delta\alpha^2\Delta\delta^2 + D_5'\Delta\alpha^4 + D_6'\Delta\alpha^2\Delta\delta^3 + D_7'\Delta\alpha^4\Delta\delta + D_8'\Delta\delta^5$$

$$D_1' = \tfrac{1}{4}\sin 2\delta(15)^2\sin 1''$$
$$D_2' = \tfrac{1}{2}\cos 2\delta(15)^2\sin^2 1''$$
$$D_3' = \tfrac{1}{3}\sin^2 1''$$
$$D_4' = -\tfrac{1}{4}\sin 2\delta(15)^2\sin^3 1''$$
$$D_5' = \tfrac{1}{24}(5\sin\delta\cos^3\delta-\sin^3\delta\cos\delta)(15)^4\sin^3 1''$$
$$D_6' = \tfrac{1}{6}\cos 2\delta(15)^2\sin^4 1''$$
$$D_7' = \tfrac{1}{24}(5\cos^4\delta-12\sin^2\delta\cos^2\delta+\sin^4\delta)(15)^4\sin^4 1''$$
$$D_8' = \tfrac{2}{15}\sin^4 1''$$

Many of the terms in these expansions are generally inappreciable, but it is not necessary to enter into this point here, as it is better to consider it when constructing tables for the separate degrees of δ. It will be noticed that x only appears multiplied by $\sec\delta$. This is a great advantage, for we can avoid the use of x altogether, and turn our measured co-ordinates at once into $x\sec\delta$, by means of a separate scale-value table constructed for each degree of δ.

It remains to show how to correct the observations for refraction, and to determine the scale-value and orientation from the known stars on the plate. The aberration need not necessarily be considered when the scale-value is thus determined from known stars.

Let us now indicate by X_{obs} and Y_{obs} the actual co-ordinates measured on the plate. They will be expressed partly in divisions of the *réseau*, and partly in revolutions of the micrometer screw. We shall assume that the scale-value is known very nearly, both for the *réseau* and screw. We can then prepare separate scale-value tables for the *réseau* and screw, by means of which we can at once turn X_{obs} and Y_{obs} into $X\sec\delta$ and Y, expressed respectively in seconds of time and arc; and these tables can be made to include the effects of errors of the *réseau* and screw. These values of $X\sec\delta$ and Y will then be very near their true values, which we have called $x\sec\delta$ and y. The corrections which must be added to them are:

I. Correction for refraction:

$$M_x \; X \sec\delta + N_x \; Y, \qquad \text{for } X\sec\delta,$$
$$M_y \; X \sec\delta + N_y \; Y, \qquad \text{for } Y,$$

where M_x, M_y, N_x, N_y, are computed by the following formulæ:

$$\sin n \sin N = \cos\phi \cos(\theta - \alpha)$$
$$\sin n \cos N = \sin\phi$$
$$G = \cot(\delta + N)$$
$$H = \tan(\theta - \alpha) \sin N \operatorname{cosec}(\delta + N)$$
$$M_x = \beta\,(1 + H^2 - G\tan\delta)\sin 1''$$
$$N_x = \tfrac{1}{15}\,\beta\,(G H \sec\delta - H\tan\delta\sec\delta)\sin 1''$$
$$M_y = 15\,\beta\,(G H\cos\delta + H\sin\delta)\sin 1''$$
$$N_y = \beta\,(1 + G^2)\sin 1''$$

In these formulæ $(\theta - \alpha)$ is the hour-angle, and β the constant of refraction. The coefficients are so arranged that the correction for $x\sec\delta$ will come out in seconds of time, and that for Y in seconds of arc, if $X\sec\delta$ and Y are themselves expressed in seconds of time and arc respectively.

When the hour-angle does not exceed about one hour, the above formulæ may advantageously be replaced by the following, especially if it is intended to tabulate the coefficients M_x, etc., for a given declination, with the hour-angle as argument. If we put:

$$t = \theta - \alpha$$

and suppose t to be expressed in minutes of time, and compute:

$$\tan l = \tfrac{1}{2}\tan\phi$$
[6.4531—10] $w_1 = \beta\cos\phi\sec(\phi - \delta)\sec\delta\sin 1''$
[1.1308—10] $w_2 = \tfrac{1}{4}\,\beta\sin 2\phi\sec^2(\phi - \delta)\sec\delta\cos(l + \delta)\operatorname{cosec} l\sin^2 1^m\sin 1''$
[2.9169—10] $w_3 = \tfrac{1}{15}\,\beta\sin(\phi - 2\delta)\cos\phi\sec^2\delta\sec^2(\phi - \delta)\sin 1^m\sin 1''$
[4.9681—10] $w_4 = \tfrac{15}{2}\,\beta\sin 2\phi\sec^2(\phi - \delta)\sin 1^m\sin 1''$
[6.4532—10] $w_5 = \beta\sec^2(\phi - \delta)\sin 1''$
[6.4637—10] $w_6 = \tfrac{1}{15}\,w_4\tan(\phi - \delta)\sin 1^m$

where the constant logarithmic coefficients at the left-hand side are computed from the Besselian refraction table, using a constant value of $\log\beta$; which may be done safely, when the zenith distance does not exceed 45°. They include the effect of the difference between the photographic and visual refraction constants, and will therefore only need to be increased by the usual logarithm depending on the meteorological instruments. We then have:

$$M_x = w_1 + w_2 t^2$$
$$N_x = w_3 t$$
$$M_y = w_4 t$$
$$N_y = w_5 + w_6 t^2$$

from which a table of M_x, etc., may readily be written down with the help of Crelle's tables. The details of the demonstration of these refraction formulæ will be found in the *Astronomical Journal* (Vol. XV., No. 14).

II. *Correction for scale-value, orientation, and error of centre of the plate.*

$$\begin{aligned} &pX \sec\delta + \tfrac{1}{15} r \sec\delta\, Y + \tfrac{1}{15} k \sec\delta, && \text{for } X \sec\delta \\ &-15\, r \cos\delta\, X \sec\delta + pY + c, && \text{“ } Y \end{aligned}$$

The values of r, p, k and c are found from the known stars on the plate. We compute from the known right ascensions and declinations by means of tables formed from the expansions given above, the values of $x \sec\delta$ and y; we then have from every known star a pair of equations of the form

$$\left.\begin{aligned} 15\, n_x \cos\delta + 15\, pX + rY + k &= 0 \\ n_y + pY - 15\, rX + c &= 0 \end{aligned}\right\} \qquad (1)$$

in which n_x and n_y are computed by the following formulæ:

$$\left.\begin{aligned} n_x &= (X - x) \sec\delta + M_x\, X \sec\delta + N_x\, Y \\ n_y &= Y - y + M_y\, X \sec\delta + N_y\, Y \end{aligned}\right\} \qquad (2)$$

M_x, etc., being as before the refraction coefficients.

These equations can be solved by least squares or otherwise, and make known the values of p, r, etc.

If the solution be carried out by least squares, it is by no means necessary to form and solve the normal equations in the usual way. For the equations possess the following peculiarity: Each coefficient of r in the equations derived from the right ascensions appears as the coefficient of p in the corresponding equation derived from the declination. And each coefficient of p in the right ascension equations appears in the corresponding declination equation, with its sign changed, as the coefficient of r. On account of this peculiarity the rigorous least square solution can be effected in the following very simple way:

Let us, for brevity, indicate the coefficients of p and r in the right ascension equations by π and ρ. Let us also represent by ν the number of stars, so that there will be ν right ascension equations, and as many declination equations. The general form of the equations will then be:

From the right ascensions:

$$\pi p + \rho r + k + n'_x = 0$$

where, for brevity, we have written n_x' for $15 n_x \cos \delta$.

From the declinations:

$$\rho p - \pi r + c + n_y = 0$$

If we now indicate by square brackets the summation of ν quantities, the rigorous least square solution of the above 2ν equations is given by the following simple system of formulæ:

$$A = [\pi\pi] - \frac{[\pi]^2}{\nu}$$

$$C = [\pi n'_x] - \frac{[\pi]\,[n'x]}{\nu}$$

$$D = [\rho\rho] - \frac{[\rho]^2}{\nu}$$

$$E = [\rho n'_x] - \frac{[\rho]\,[n'x]}{\nu}$$

$$C' = [\rho n_y] - \frac{[\rho]\,[n_y]}{\nu}$$

$$E' = -[\pi n_y] + \frac{[\pi]\,[n_y]}{\nu}$$

$$p = -\frac{C + C'}{A + D}, \qquad \text{weight of } p = A + D$$

$$r = -\frac{E + E'}{A + D}, \qquad \text{weight of } r = A + D$$

$$k = -\frac{1}{\nu}\left\{ [\pi]\, p + [\rho]\, r + [n'_x] \right\}, \quad \text{weight of } k = \nu - \frac{[\pi]^2 + [\rho]^2}{[\pi\pi] + [\rho\rho]}$$

$$c = -\frac{1}{\nu}\left\{ [\rho]\, p - [\pi]\, r + [n_y] \right\}, \quad \text{weight of } c = \nu - \frac{[\pi]^2 + [\rho]^2}{[\pi\pi] + [\rho\rho]}$$

By the aid of these formulæ, the rigorous least square solution can be made in about half an hour, including the determination of the weights.

The total corrections to be added to the co-ordinates of the unknown stars will then be:

$$\left.\begin{array}{ll} (p + M_x)\, X \sec\delta + (\frac{1}{15}\, r \sec\delta + N_x)\, Y + \frac{1}{15}\, k \sec\delta, & \text{for } X \sec\delta \\ (-15\, r \cos\delta + M_y) X \sec\delta + (p + N_y)\, Y + c, & \text{“ } Y \end{array}\right\} \qquad (3)$$

which are very readily computed with Crelle's tables. After this to-

tal correction has been applied, we have only to turn the resulting $x \sec \delta$ into $\Delta\alpha$, and y into $\Delta\delta$, by means of the tables constructed with the expansions given above.

When it is desired to base the determination of the orientation constant r on measures of "trails," we can proceed as follows: We can regard the end of the trail simply as the image of a second star, having the same declination as the first impression of that star. If we calculate n_y for each impression of the star, using an approximate value of δ', or the declination of the star, the values of n_y will differ from the truth by a constant only. This constant will of course be the error of the approximate declination we have used for the star, and will be the same for both n_y's. With the two n_y's we get two equations like the second of equations (1). By subtraction of these equations, the above constant will disappear, and we shall have an equation involving r as the only unknown quantity.

As an example of the above methods of reduction, I shall take the plate discussed by M. Prosper Henry (Bull. Com. Perm. Tome II., deux^{me} fasc.) This plate was taken at Paris (latitude 48° 50′) 1891, December 2, at an hour-angle of $-0^h\ 9^m$, the declination of the centre being 24°, and the right ascension $1^h\ 4^m$. The first step is the preparation of the tables for the reduction of the 24° belt of the astrophotographic catalogue. These tables are appended to the present paper. Table I gives the refraction coefficients M_x, etc., the numbers obtained for the auxiliaries being

$w_1 = .000225$ $\quad w_2 = .00000000212$ $\quad w_3 = .00000000115$

$w_4 = .0000112$ $\quad w_5 = .000345$ $\quad w_6 = .00000000151$

Table II gives the quantities necessary for transforming $\Delta\alpha$ into $x \sec \delta$, and $x \sec \delta$ into $\Delta\alpha$, by the aid of the expansions already given. Finally, Table III gives the corresponding quantities for $\Delta\delta$ and y. In both tables it was found sufficient at declination 24° to include terms of the third order. The actual numbers tabulated are as follows:

Table II *A* gives value of $A_1\ (x \sec \delta) \times 10^3$, with argument $x \sec \delta$

	or	"	"	$-A_1' \Delta\alpha \times 10^3$,	"	"	$\Delta\alpha$
"	II *B*	"	"	$A_2' \Delta\alpha^3$	"	"	$\Delta\alpha$
"	II *C*	"	"	$A_2' y^2 \times 10^2$	"	"	y
"	II *D*	"	"	$-A_3\ (x \sec \delta)^3$	"	"	$x \sec \delta$

where it will be noticed that Table II *A* gives the values of either of two quantities, because A_1 and A_1' differ only in sign.

Similarly for Table III we have:

Table III *A*	gives	value of—	$D_1\ (x \sec\delta)^2$	with	argument	$x \sec\delta$
or	"	"	$D_1'\ \Delta a^2$	"	"	Δa
" III *B*	"	"	$D_2'\ \Delta a^2 \times 10^3$	"	"	Δa
" III *C*	"	"	$-D_2\ (x \sec\delta)^2 \times 10^3$	with	"	$x \sec\delta$
" III *D*	"	"	$D_3'\ \Delta\delta^3$	with	"	$\Delta\delta$
or	"	"	$-D_3\ y^3$	"	"	y

The transformation formulæ then become

$$\Delta a = x \sec\delta \pm (\text{Tab. II } A)\frac{y}{1000} + (\text{Tab. II } C)\frac{x \sec\delta}{100} \mp (\text{Tab. II } D) \begin{cases} x \sec\delta \text{ positive} \\ x \sec\delta \text{ negative} \end{cases}$$

$$\Delta\delta = y - (\text{Table III } A) - (\text{Table III } C)\frac{y}{1000} \mp (\text{Table III } D) \begin{cases} y \text{ positive} \\ y \text{ negative} \end{cases}$$

$$x \sec\delta = \Delta a \mp (\text{Table II } A)\frac{\Delta\delta}{1000} \pm (\text{Table II } B) \begin{cases} \Delta a \text{ positive} \\ \Delta a \text{ negative} \end{cases}$$

$$y = \Delta\delta + (\text{Table III } A) + (\text{Table III } B)\frac{\Delta\delta}{1000} \pm (\text{Table III } D) \begin{cases} \Delta\delta \text{ positive} \\ \Delta\delta \text{ negative} \end{cases}$$

In the above formulæ the upper signs belong to positive values of the arguments and the lower to negative values, as indicated at the end of each formula. The numbers given in the tables are invariably positive. All the multiplications can be effected with Crelle's tables.

I have not thought it worth while to prepare special scale-value tables for the 24° belt, because it would not be possible to make them definitive, in the absence of any data with regard to the errors of the Paris *réseau* and screw. These errors have been neglected in the present example. The preparation of such tables would, of course, be extremely simple, as they are little more than mere multiplication tables. I have accordingly altered the units in which M. Henry gives his measured co-ordinates; and at the same time applied the factor 0.995, which is the approximate ratio of the millimetre to the minute of arc for the Paris instrument. All of this would be done with the special scale-value tables in actual reductions. I thus get for the data of the problem:

Star	From Meridian observations. Right Ascension (1900.0)			Declination			From the Plate. $X \sec \delta$	Y
	h	m	s	°	′	″	s	″
1	0	59	31.38	24	25	18.2	—267.483	+1517.35
2	0	59	59.37	23	56	51.1	—240.496	— 191.70
3	1	1	1.05	24	22	9.7	—178.289	+1320.37
4	1	1	41.71	24	18	22.6	—137.815	+1093.05
5	1	2	4.61	24	26	21.5	—114.790	+1569.09
6	1	3	52.92	23	55	30.1	— 6.941	— 283.20
7	1	4	14.86	23	15	42.1	+ 15.246	—2671.86
8	1	4	16.12	23	59	5.7	+ 16.262	— 68.32
9	1	6	57.04	24	0	2.9	+177.143	— 5.19
10	1	7	55.00	24	55	49.6	+233.493	+3347.08
11	1	8	7.14	24	28	32.3	+246.422	+1710.60

From Table I, we find the following values of the refraction coefficients:

$$M_x = +.000226 \qquad N_x = \ .0000000$$
$$M_y = -.00010 \qquad N_y = +.000345$$

The next step towards the determination of p, r, k and c is the computation of $x \sec \delta$ and y from the above values of the stars' right ascensions and declinations. This is done by the aid of Tables II and III, and the computation is here given *in extenso* for the first and last stars:

Star.	I.			II.		
	h	m	s	h	m	s
a'	0	59	31.38	1	8	7.14
a	1	4	0.00	1	4	0.00
Δa	—		268.62	+		247.14
$\mp$ (Tab. II A) $\frac{\Delta\delta}{1000}$	+		.882	—		.913
$\pm$ (Tab. II B)	—		.026	+		.020
$x \sec \delta$	—		267.764	+		246.247
	°	′	″	°	′	″
δ'	24	25	18.2	24	28	32.3
$\Delta\delta$	+		1518.2	+		1712.37
+ (Tab. III A)	+		14.62	+		12.3
+ (Tab. III B) $\frac{\Delta\delta}{1000}$	+		.20	+		.19
$\pm$ (Tab. III D)	+		.03	+		.04
y	+		1533.05	+		1724.90

We now proceed to the computation of n_x and n by means of equations (2). We have:

Star.	I	II
$X \sec \delta$	$-$ 267.483	$+$ 246.422
$x \sec \delta$	$-$ 267.764	$+$ 246.247
$(X-x) \sec \delta$	$+$ .281	$+$ .175
$M_x\ X \sec \delta$	$-$ .060	$+$ .056
$N_x\ Y$	.000	.000
n_x	$+$ .221	$+$ .231
$15\ n_x \cos \delta$	$+$ 3.03	$+$ 3.16
Y	$+$1517.35	$+$1710.60
y	$+$1533.05	$+$1724.90
$Y-y$	$-$ 15.70	$-$ 14.30
$M_y\ X \sec \delta$	$+$ .03	$-$ .02
$N_y\ Y$	$+$ .52	$+$ .59
n_y	$-$ 15.15	$-$ 13.73

We now form equations (1), the coefficient $15\ X$ being roughly computed by multiplying $X \sec \delta$ by $15 \cos \delta$ with Crelle's tables. We thus get from our two stars the equations:

$$\left.\begin{array}{l} +\ 3.03 - 3665\ p + 1517\ r + k = 0 \\ -\ 15.15 + 1517\ p + 3665\ r + c = 0 \end{array}\right\} \text{Star I.}$$

$$\left.\begin{array}{l} +\ 3.16 + 3375\ p + 1711\ r + k = 0 \\ -\ 13.73 + 1711\ p - 3375\ r + c = 0 \end{array}\right\} \text{Star II.}$$

The quantities p and r are so small that we may neglect $\frac{1}{200}$ part of them; so that it will be quite sufficient to retain the first two figures of their coefficients. In this way we obtain the following series of equations, from whose solution p and r will, of course, come out multiplied by 100, because we have dropped two figures from their coefficients:

From the Right Ascensions.

1	$-$	37	p	$+$	15	r	$+$	k	$+$ 3.03	$=$	0
2	$-$	33	p	$-$	2	r	$+$	k	$+$ 2.69	$=$	0
3	$-$	24	p	$+$	13	r	$+$	k	$+$ 1.56	$=$	0
4	$-$	19	p	$+$	11	r	$+$	k	$+$ 1.63	$=$	0
5	$-$	16	p	$+$	16	r	$+$	k	$+$ 2.51	$=$	0
6	$-$	1	p	$-$	3	r	$+$	k	$+$ 1.93	$=$	0
7	$+$	2	p	$-$	27	r	$+$	k	$+$ 4.16	$=$	0
8	$+$	2	p	$-$	1	r	$+$	k	$+$ 1.97	$=$	0
9	$+$	24	p		0	r	$+$	k	$+$ 1.88	$=$	0
10	$+$	32	p	$+$	33	r	$+$	k	$+$ 3.16	$=$	0
11	$+$	34	p	$+$	17	r	$+$	k	$+$ 3.16	$=$	0

FROM THE DECLINATIONS.

1	+	15	p	+	37	r	+	c	—	15.″15	=	0
2	—	2	p	+	33	r	+	c	—	14.46	=	0
3	+	13	p	+	24	r	+	c	—	15.44	=	0
4	+	11	p	+	19	r	+	c	—	13.08	=	0
5	+	16	p	+	16	r	+	c	—	14.62	=	0
6	—	3	p	+	1	r	+	c	—	13.41	=	0
7	—	27	p	—	2	r	+	c	—	14.77	=	0
8	—	1	p	—	2	r	+	c	—	14.09	=	0
9		0	p	—	24	r	+	c	—	14.46	=	0
10	+	33	p	—	32	r	+	c	—	13.19	=	0
11	+	17	p	—	34	r	+	c	—	13.73	=	0

The combined solution of all these equations by least squares gives the following values of the unknowns, in which p and r have been multiplied by .01 to restore their original units. The sum of the squares of the 22 residuals is 10.3179, so that the mean error of one equation is $\pm 0.''76$.

$p = -.000089,$	mean error $\pm .000081$
$r = +.000145,$	" " $\pm .000081$
$k = -2.''64,$	" " $\pm 0.''24$
$c = +14.''24,$	" " $\pm 0.''24$

The total corrections required by the measured co-ordinates of the unknown stars are now found by means of the expressions (3) to be:

$$+.000137\,X\sec\delta + .000011\,Y - {}^{s}0.193, \quad \text{for } X\sec\delta$$
$$-.00209\,X\sec\delta + .000256\,Y + 14.''24, \quad \text{" } Y$$

Having thus arrived at the constants required for the reduction of the plate, we now come to the computation of the places of the unknown stars from their measured co-ordinates. This is of course the most important part of the subject, since the process must be applied a very large number of times for each plate; while the foregoing computations need only be made for the comparatively small number of known stars.

As an example of this part of the work I take the first star of the above series, treating it now as an unknown star. We have:

Right Ascension.				Declination.			
$X \sec \delta$			—267.483	Y			+ 1517.35
+.000137 $X \sec \delta$			— .037	—.00209 $X \sec \delta$			+ .56
+.000011 Y			+ .017	+.000256 Y			+ .39
Constant			— .193	Constant			+ 14.24
$x \sec \delta$			—267.696	y			+ 1532.54
$\pm$ (Tab. II A) $\frac{y}{1000}$			— .886	—(Tab. III A)			— 14.52
+ (Tab. II C) $\frac{x \sec \delta}{100}$			— .003	— (Tab. III C) $\frac{y}{1000}$			— .29
$\mp$ (Tab. II D)			+ .034	$\mp$ (Tab. III D)			— .03
Δa			—268.551	$\Delta \delta$			+ 1517.70
Δa		—4	28.551	$\Delta \delta$			+ 25′ 17.70
a (Centre)	1	4	0.000	δ (Centre)	24	0′	0.00
a' (Star)	0	59	31.449	δ' (Star)	24	25′	17.70

In the above example considerably more figures have been written down than are really necessary, and all the multiplications have been done with Crelle's tables. The final place of the star is of course very much more accurate than the place originally obtained from the meridian observations.

I now give for comparison the places derived as above for all the stars, together with the discordances from the meridian places taken in the sense "meridian *minus* photographic." The column headed "H" contains the corresponding residual as obtained by M. Henry.

	Right Ascension.	Merid—Photo.			Declination.	Merid—Photo.		
		Jac.	H.	J—H.		Jac.	H.	J—H.
	h m s	s	s	s	° ′ ″	″	″	″
1	0 59 31.449	—.069	—.064	—.005	+24 25 17.70	+0.50	+0.54	—0.04
2	0 59 59.393	—.023	—.019	—.004	23 56 51.28	—0.18	—0.20	+0.02
3	1 1 1.002	+.048	+.052	—.004	24 22 8.73	+0.97	+1.02	—0.05
4	1 1 41.659	+.051	+.054	—.003	24 18 23.93	—1.33	—1.31	—0.02
5	1 2 4.627	—.017	—.014	—.003	24 26 21.20	+0.30	+0.33	—0.03
6	1 3 52.866	+.054	+.053	+.001	23 55 30.97	—0.87	—0.91	+0.04
7	1 4 14.941	—.081	—.084	+.003	23 15 41.78	+0.22	+0.20	+0.02
8	1 4 16.068	+.052	+.050	+.002	23 59 5.82	—0.12	—0.16	+0.04
9	1 6 56.967	+.073	+.067	+.006	24 0 2.34	+0.56	+0.52	+0.04
10	1 7 55.052	—.052	—.054	+.002	24 55 49.88	—0.22	—0.19	—0.03
11	1 8 7.176	—.036	—.040	+.004	24 28 32.16	+0.14	+0.16	—0.02

The differences in the column J—H, though small, are of a systematic character. They are doubtless due in part to a difference between the constants of reduction employed by M. Henry and those which I have used, M. Henry having employed a predetermined scale-value whilst I have deduced the correction of the scale-value and orientation from the known stars. But in order to account completely for the discordances, it would be necessary to investigate the differences between M. Henry's formulæ and those given in the present paper. Such differences exist, especially in the refraction formulæ, where M. Henry computes merely the change in the magnitude of the co-ordinates x and y caused by refraction. But refraction not only changes the magnitude of x, but it also removes the x as a whole to a different position on the plate. And the $\Delta\alpha$ corresponding to x depends not only on the magnitude of x, but also on its position with respect to the centre of the plate.

It may be of interest to consider the effect of errors in the assumed right ascension and declination corresponding to the centre of the plate. For this purpose I take up again the expansions given in the beginning of this paper, writing them now in a somewhat different form, and introducing the auxiliaries x' and y' for brevity. It is sufficient for the present purpose to include terms of the third order. We have, putting

$$x' = (a' - a)\cos\delta, \qquad y' = \delta' - \delta \tag{a}$$

the following:

$$\left.\begin{aligned} x &= x' - \tan\delta\, x'\, y' + \tfrac{1}{3}\,(1 - \tfrac{1}{2}\tan^2\delta)\, x'^3 \\ y &= y' + \tfrac{1}{2}\tan\delta\, x'^2 + \tfrac{1}{2}\,(1 - \tan^2\delta)\, x'^2\, y' + \tfrac{1}{3}\, y'^3 \end{aligned}\right\} \tag{b}$$

$$\left.\begin{aligned} x' &= x + \tan\delta\, xy - \tfrac{1}{3}\,(1 + \tan^2\delta)\, x^3 + \tan^2\delta\, xy^2 \\ y' &= y - \tfrac{1}{2}\tan\delta\, x^2 - \tfrac{1}{3}\, y^3 - \tfrac{1}{2}\,(1 + \tan^2\delta)\, x^2\, y \end{aligned}\right\} \tag{c}$$

From equations (a) we have, by differentiation with respect to α and δ:

$$dx' = -\cos\delta\, d\alpha - \tan\delta\, x'\, d\delta, \qquad dy' = -d\delta \tag{d}$$

Now differentiating equations (b), and substituting from equations (c) and (d), we get, after slight reductions:

$$\left.\begin{aligned} dx &= -\cos\delta\, d\alpha + \tan\delta\, y\,.\,\cos\delta\, d\alpha - x^2\,.\,\cos\delta\, d\alpha - xy\,.\,d\delta \\ dy &= -d\delta - \tan\delta\, x\,.\,\cos\delta\, d\alpha - xy\,.\,\cos\delta\, d\alpha - y^2\,.\,d\delta \end{aligned}\right\} \tag{e}$$

These results signify that if we have computed x and y from the known right ascension and declination of the star, using α and δ as the right ascension and declination of the centre of the plate, and if the true right ascension and declination of the centre of the plate are:

$$\alpha + d\alpha \qquad\qquad \delta + d\delta,$$

then the true values of x and y will be:

$$x + dx \qquad\qquad y + dy.$$

We shall therefore have the following equations, in which p and r indicate the scale value and orientation constants, as before, and X and Y are the observed co-ordinates:

$$\left.\begin{aligned} x + dx &= X + p\,X + r\,Y \\ y + dy &= Y + p\,Y - r\,X \end{aligned}\right\} \qquad (f)$$

The constants k and c do not appear in these equations, because up to the present I have assumed that an imaginary line passing through the optical centre of the object-glass, and cutting the sky at a point whose right ascension and declination are

$$\alpha + d\alpha, \qquad\qquad \delta + d\delta$$

will cut the plate at a point whose co-ordinates x and y are both o. If such a line cuts the plate at a point whose co-ordinates are

$$-\chi, \qquad\qquad -\psi$$

equations (f) become:

$$\left.\begin{aligned} x + dx &= X + p\,X + r\,Y + \chi \\ y + dy &= Y + p\,Y - r\,X + \psi \end{aligned}\right\} \qquad (g)$$

I shall now impose upon the above imaginary line the further condition that it be perpendicular to the plate, which condition at once assigns definitive values to χ and ψ, and for a given position of the telescope, to dx and dy. This is equivalent to defining the sight line of the telescope as a line drawn through the optical centre of the object-glass, and perpendicular to the plate. In this way we avoid the question of a possible inclination of the plate to the sight line of the telescope.

We now substitute in equation (g) the values of dx and dy

from equations (*e*), replacing x and y by X and Y, which does not cause an appreciable loss of accuracy in these small terms. This gives:

$$\left.\begin{array}{l}(X-x)+p\,X+(r-\tan\delta\,.\,\cos\delta\,d\alpha)\,Y+(\chi+\cos\delta\,d\alpha)+X^2\,.\,\cos\delta\,d\alpha+XY\,d\delta=0\\(Y-y)+p\,Y-(r-\tan\delta\,.\,\cos\delta\,d\alpha)\,X+(\psi+d\delta)+XY\,.\,\cos\delta\,d\alpha+Y^2 d\delta=0\end{array}\right\}(h)$$

Equations (*h*) are complete equations for determining the constants of reduction of a plate.

These constants are:

p,	r,	the constants of scale value and orientation,
χ,	ψ,	the errors of centreing the plate,
$\cos\delta\,d\alpha$,	$d\delta$,	the errors of pointing the telescope.

The corrections required by the observed co-ordinates of a star, beyond those already given in my reduction of M. Henry's plate, are evidently

$$\begin{array}{ll}X^2\,.\,\cos\delta\,d\alpha+XY\,d\delta & \text{for } X\\ XY\,.\,\cos\delta\,d\alpha+Y^2\,d\delta & \text{“ } Y\end{array}$$

When X and Y are each equal to 1°, none of these terms could amount to $0.''01$ until $\cos\delta\,d\alpha$ or $d\delta$ become as large as $33''$.

Equations (*h*) bring out several very interesting points. If we neglect the very small terms in X^2, XY and Y^2, we see that the equations are of the same form as those used in the reduction of M. Henry's plate. But in that case it is evident that we did not obtain the true orientation constant r, but the quantity

$$r-\tan\delta\,.\,\cos\delta\,d\alpha$$

It follows that for plates taken at considerable declinations we must not expect the orientation constant to come out the same for each plate, as in each individual case the value obtained will depend on the accidental error of pointing the telescope. Equations (*h*), moreover, show that it is impossible to determine this accidental error without retaining the terms in X^2, etc., which are so small that they would not determine $\cos\delta\,d\alpha$ and $d\delta$ with accuracy. Similarly it is impossible to separate $\cos\delta\,d\alpha$ and $d\delta$, which depend on the pointing of the telescope, from χ and ψ, which depend on the adjustment of the plate.

But if we assume that the adjustment of the plate is perfect, or in other words, that a perpendicular let fall upon the plate from the optical centre of the object glass cuts the plate at the intersection of the co-ordinate axes used in its measurement, then χ and ψ are 0, and we have for our former constants k and c:

$$k = \cos\delta \, d\alpha, \qquad c = d\delta$$

Upon this assumption, the corrections which have to be added to the measured X and Y on the plate are:

$$\begin{aligned} &p\,X + (r - k\tan\delta)\,Y + k + k\,X^2 + c\,XY && \text{for } X \\ &p\,Y - (r - k\tan\delta)\,X + c + k\,XY + c\,Y^2 && \text{“ } Y \end{aligned}$$

which are of exactly the same form as the expressions (3) except for the negligible terms in X^2, XY, and Y^2.

One other matter deserves brief notice in the present paper. It will sometimes happen that certain plates do not contain enough well-determined stars to furnish satisfactory values of p and r. In that case we can use the known stars upon the neighboring overlapping plates, as was first suggested by M. Loewy. We may suppose that the values of p, r, k and c are very small; or, if not, that their values are very approximately known. Using these approximate values we now determine for all the known stars, and for a number of unknown stars well distributed in the overlapping portion of the two plates, the values of $\Delta\delta$ and $\Delta\alpha$. This is done exactly in the manner already described; or, in other words, we reduce some of the stars preliminarily without the help of the overlapping plate.

Now let us indicate by p', r', k' and c', the corrections required by the assumed approximate values of p, r, k and c; and by the subscripts 1 and 2, any corresponding quantities belonging to the two plates. We shall then have from each known and unknown star the following four equations:

$$(a)\quad \begin{cases} \delta' - \delta_1 = \Delta_1\delta - r_1' \cdot 15\,X_1 + p_1'\,Y_1 + c_1' \\ \delta' - \delta_2 = \Delta_2\delta - r_2' \cdot 15\,X_2 + p_2'\,Y_2 + c_2' \\ a' - a_1 = \Delta_1 a + r_1' \cdot X_1 \sec\delta_1 + p_1' \cdot \tfrac{1}{15}\,Y_1 \sec\delta_1 + \tfrac{1}{15}\,k_1' \sec\delta_1 \\ a' - a_2 = \Delta_2 a + r_2' \cdot X_2 \sec\delta_2 + p_2' \cdot \tfrac{1}{15}\,Y_2 \sec\delta_2 + \tfrac{1}{15}\,k_2' \sec\delta_2 \end{cases}$$

From these equations we obtain by subtraction

$$(b)\quad \begin{cases} \delta_2 - \delta_1 = \Delta_1\delta - \Delta_2\delta - r_1' \cdot 15\, X_1 + r_2' \cdot 15\, X_2 + p_1'\, Y_1 - p_2'\, Y_2 + c_1' - c_2' \\ a_2 - a_1 = \Delta_1 a - \Delta_2 a + r_1'\, X_1 \sec\delta_1 - r_2' \cdot X_2 \sec\delta_2 + p_1' \cdot \tfrac{1}{15}\, Y_1 \sec\delta_1 \\ \qquad\qquad - p_2 \cdot \tfrac{1}{15}\, Y_2 \sec\delta_2 + \tfrac{1}{15}\, k_1' \sec\delta_1 - \tfrac{1}{15}\, k_2' \sec\delta_2 \end{cases}$$

If we now write

$$\begin{aligned} \mu_1 &= \Delta_1\delta - (\delta' - \delta_1) & \nu_1 &= \Delta_1 a - (a' - a_1) \\ \mu_2 &= \Delta_2\delta - (\delta' - \delta_2) & \nu_2 &= \Delta_2 a - (a' - a_2) \\ \mu_0 &= (\Delta_1\delta - \Delta_2\delta) - (\delta_2 - \delta_1) & \nu_0 &= (\Delta_1 a - \Delta_2 a) - (a_2 - a_1) \end{aligned}$$

the above equations take the form:

$$(I)\quad \begin{cases} -r_1' \cdot 15\, X_1 + p_1'\, Y_1 + c_1' + \mu_1 = 0 \\ -r_2' \cdot 15\, X_2 + p_2'\, Y_2 + c_2' + \mu_2 = 0 \\ r_1' \cdot X_1 \sec\delta_1 + p_1' \cdot \tfrac{1}{15}\, Y_1 \sec\delta_1 + \tfrac{1}{15}\, k_1' \sec\delta_1 + \nu_1 = 0 \\ r_2' \cdot X_2 \sec\delta_2 + p_2' \cdot \tfrac{1}{15}\, Y_2 \sec\delta_2 + \tfrac{1}{15}\, k_2' \sec\delta_2 + \nu_2 = 0 \end{cases}$$

$$(II)\quad \begin{cases} -r_1' \cdot 15\, X_1 + r_2' \cdot 15\, X_2 + p_1'\, Y_1 - p_2'\, Y_2 + c_1' - c_2' + \mu_0 = 0 \\ +r_1' \cdot X_1 \sec\delta_1 - r_2' \cdot X_2 \sec\delta_2 + p_1' \cdot \tfrac{1}{15}\, Y_1 \sec\delta_1 - p_2' \cdot \tfrac{1}{15}\, Y_2 \sec\delta_2 \\ \qquad + \tfrac{1}{15}\, k_1' \sec\delta_1 - \tfrac{1}{15}\, k_2' \sec\delta_2 + \nu_0 = 0 \end{cases}$$

In these equations μ_1, μ_2, ν_1, ν_2 can be computed for the known stars, and μ_0, ν_0 for the unknown stars. It is therefore clear that every known star on each plate will give us a pair of equations of the form (I); and every unknown star on the overlapping portion of the two plates will give a pair of equations of the form (II). By combining all these equations by least squares, or otherwise, we can arrive at values of p_1', r_1', etc., which, being added to the former provisional values, p, r, etc., give us the definitive constants of reduction.

In the above operation we should of course use *all* the equations of the form (I) that can be obtained from the known stars. The number of equations of the form (II) which must be included will depend on the precision of the photographic measures, relative to the precision of the places of the known stars. If the photographic measures are very much more accurate than the places of the known stars derived from meridian observations, then a very small number of equations of the form (II) will suffice. It should also be noticed that experience will perhaps show that p_1' and p_2' are either equal, or connected by a very simple law depending on the temperature of the telescope tube. If so, our equations will of course be much simplified. In order to settle this point practically, it will be necessary to compare the values of p derived from many different plates. In doing

this it is necessary to compute the effect of aberration upon the value of p derived from the known stars in the manner explained above. We find that the quantity which must be added to the value of p so derived, to reduce it to what it would have been if there were no aberration, is given by the following formulæ:

$$\gamma_1 = -(\tan \varepsilon \sin \delta + \sin \alpha \cos \delta) \sin 1''$$
$$\gamma_2 = \cos \alpha \cos \delta \sin 1''$$
$$\text{Corr}^n = C\gamma_1 + D\gamma_2$$

In these formulæ ε is the angle between the equator and ecliptic, and C, D, are the usual Besselian day numbers given in the Berlin Jahrbuch.

Since each plate has four overlapping plates, it is clear that a rigorous application of the above method of adjustment will give us a series of equations involving twenty unknowns, four for each of the plates under consideration. The solution of such a series of equations for each plate would offer insuperable difficulties, on account of the excessive labor involved. Even the application of the process to two overlapping plates with the necessary eight unknowns would be too much trouble. Except in very special cases, therefore, we shall have to substitute some approximate method of adjustment for the above rigorous one. Various approximate methods readily suggest themselves, but it will not be possible to decide on the best one until a considerable number of plates have been measured and preliminarily reduced. We shall then have material which will enable us to deal with the question practically.

TABLE I.

REFRACTION COEFFICIENTS.

t	M_x	N_x	M_y	N_y
m				
0	.000225	.0000000	.00000	.000345
10	.000226	.0000000	.00011	.000345
20	.000226	.0000000	.00022	.000346
30	.000227	.0000000	.00034	.000346
40	.000229	.0000000	.00045	.000347
50	.000231	.0000001	.00056	.000349
60	.000233	.0000001	.00067	.000350

M_x and N_y are always positive. N_x and M_y are negative for negative hour angles.

Right Ascension Tables.

Table II. A.

Arg. $x \sec \delta$ or Δa	0	1	2	3	4	5	6	7	8	9
s	s	s	s	s	s	s	s	s	s	s
0	0.000	0.002	0.004	0.006	0.009	0.011	0.013	0.015	0.017	0.019
10	.022	.024	.026	.028	.030	.032	.035	.037	.039	.041
20	.043	.045	.048	.050	.052	.054	.056	.058	.060	.063
30	.065	.067	.069	.071	.073	.076	.078	.080	.082	.084
40	.086	.089	.091	.093	.095	.097	.099	.102	.104	.106
50	0.108	0.110	0.112	0.114	0.117	0.119	0.121	0.123	0.125	0.127
60	.130	.132	.134	.136	.138	.140	.143	.145	.147	.149
70	.151	.153	.156	.158	.160	.162	.164	.166	.168	.171
80	.173	.175	.177	.179	.181	.184	.186	.188	.190	.192
90	.194	.197	.199	.201	.203	.205	.207	.210	.212	.214
100	0.216	0.218	0.220	0.222	0.225	0.227	0.229	0.231	0.233	0.235
110	.238	.240	.242	.244	.246	.248	.251	.253	.255	.257
120	.259	.261	.264	.256	.268	.270	.272	.274	.276	.279
130	.281	.283	.285	.287	.289	.292	.294	.296	.298	.300
140	.302	.305	.307	.309	.311	.313	.315	.318	.320	.322
150	0.324	0.326	0.328	0.330	0.333	0.335	0.337	0.339	0.341	0.343
160	.346	.348	.350	.352	.354	.356	.359	.361	.363	.365
170	.367	.369	.372	.374	.376	.378	.380	.382	.384	.387
180	.389	.391	.393	.395	.397	.400	.402	.404	.406	.408
190	.410	.413	.415	.417	.419	.421	.423	.426	.428	.430
200	0.432	0.434	0.436	0.438	0.441	0.443	0.445	0.447	0.449	0.451
210	.454	.456	.458	.460	.462	.464	.467	.469	.471	.473
220	.475	.477	.480	.482	.484	.486	.488	.490	.492	.494
230	.497	.499	.501	.503	.505	.508	.510	.512	.514	.516
240	.518	.521	.523	.525	.527	.529	.531	.534	.536	.538
250	0.540	0.542	0.544	0.546	0.549	0.551	0.553	0.555	0.557	0.559
260	.562	.564	.566	.568	.570	.572	.574	.577	.579	.581
270	.583	.585	.588	.590	.592	.594	.596	.598	.600	.603

$$\Delta a = x \sec \delta \pm (\text{Tab. II. A.}) \frac{y}{1000} + (\text{Tab. II. C.}) \frac{x \sec \delta}{100} \pm (\text{Tab. II. D.}) \begin{cases} x \sec \delta \text{ pos.} \\ x \sec \delta \text{ neg.} \end{cases}$$

$$x \sec \delta = \Delta a \mp (\text{Tab. II. A.}) \frac{\Delta \delta}{1000} \pm (\text{Tab. II. B.}) \begin{cases} \Delta a \text{ positive} \\ \Delta a \text{ negative} \end{cases}$$

The numbers given in the Tables are invariably positive.

Right Ascension Tables. (*Continued.*)

Table II. B.

Arg. Δa	
72.3	s .001
104.2	.002
123.6	.003
138.2	.004
150.3	.005
160.7	.006
169.9	.007
178.2	.008
185.8	.009
192.8	.010
199.4	.011
205.5	.012
211.3	.013
216.8	.014
222.0	.015
227.0	.016
231.8	.017
236.3	.018
240.7	.019
245.0	.020
249.2	.021
253.1	.022
257.0	.023
260.8	.024
264.4	.025
268.0	.026
271.4	.027
274.8	.028
278.1	.029
281.3	

Table II. C.

Arg. y	
1036	s .001
1795	.002
2316	.003
2741	.004
3109	.005
3436	.006
3736	

Table II. D.

Arg. $x \sec \delta$	
65.6	s .001
94.8	.002
112.4	.003
125.7	.004
136.7	.005
146.0	.006
154.5	.007
162.0	.008
169.0	.009
175.3	.010
181.2	.011
186.8	.012
192.2	.013
197.1	.014
201.8	.015
206.4	.016
210.8	.017
214.9	.018
219.0	.019
222.8	.010
226.6	.021
230.2	.022
233.7	.023
237.1	.024
240.5	.025
243.6	.026
246.8	.027
249.9	.028
252.8	.029
255.8	.020
258.6	.031
261.4	.032
264.2	.033
266.9	.034
269.5	.035
272.0	.036
274.6	.037
277.1	

DECLINATION TABLES.

TABLE III. A.

Arg. $x \sec \delta$ or $\Delta\alpha$	0	1	2	3	4	5	6	7	8	9	Diff.
s	″	″	″	″	″	″	″	″	″	″	″
0	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.02	.002
10	.02	.02	.03	.03	.04	.04	.05	.06	.07	.07	.006
20	.08	.09	.10	.11	.12	.13	.14	.15	.16	.17	.010
30	.18	.20	.21	.22	.23	.25	.26	.28	.29	.31	.014
40	.32	.34	.36	.37	.39	.41	.43	.45	.47	.49	.018
50	0.51	0.53	0.55	0.57	0.59	0.61	0.64	0.66	0.68	0.71	.022
60	0.73	0.76	0.78	0.81	0.83	0.86	0.88	0.91	0.94	0.97	.026
70	0.99	1.02	1.05	1.08	1.11	1.14	1.17	1.20	1.23	1.27	.030
80	1.30	1.33	1.36	1.40	1.43	1.47	1.50	1.54	1.57	1.61	.034
90	1.64	1.68	1.72	1.76	1.79	1.83	1.87	1.91	1.95	1.99	.038
100	2.03	2.07	2.11	2.15	2.19	2.23	2.28	2.32	2.36	2.41	.042
110	2.45	2.50	2.54	2.59	2.63	2.68	2.73	2.77	2.82	2.87	.046
120	2.92	2.97	3.02	3.07	3.12	3.17	3.22	3.27	3.32	3.37	.050
130	3.42	3.48	3.53	3.58	3.64	3.69	3.75	3.80	3.86	3.92	.054
140	3.97	4.03	4.09	4.14	4.20	4.26	4.32	4.38	4.44	4.50	.058
150	4.56	4.62	4.68	4.74	4.81	4.87	4.93	4.99	5.06	5.12	.062
160	5.19	5.25	5.32	5.38	5.45	5.52	5.58	5.65	5.72	5.79	.066
170	5.86	5.93	6.00	6.06	6.13	6.21	6.28	6.35	6.42	6.49	.070
180	6.56	6.64	6.71	6.79	6.86	6.94	7.01	7.09	7.16	7.24	.075
190	7.32	7.39	7.47	7.55	7.63	7.71	7.78	7.86	7.94	8.02	.079
200	8.11	8.19	8.27	8.35	8.43	8.52	8.60	8.68	8.77	8.85	.083
210	8.94	9.02	9.11	9.20	9.28	9 37	9.45	9.54	9.63	9.72	.087
220	9.81	9.90	9.99	10.08	10.17	10.26	10.35	10.44	10.53	10.63	.091
230	10.72	10.81	10.91	11.00	11.10	11.19	11.29	11.38	11.48	11.57	.095
240	11.67	11.77	11.87	11.97	12.07	12.16	12.26	12.36	12.46	12.56	.099
250	12.67	12.77	12.87	12.97	13.07	13.18	13.28	13.38	13.49	13.59	.103
260	13.70	13.80	13.91	14.02	14.12	14.23	14.34	14.45	14.55	14.66	.107
270	14.77	14.88	14.99	15.11	15.21	15.33	15.44	15.55	15.66	15.77	.111

$$\Delta\delta = y - (\text{Tab. III. A.}) - (\text{Tab. III. C.})\frac{y}{1000} \mp (\text{Tab. III. D.}) \begin{cases} y \text{ positive} \\ y \text{ negative} \end{cases}$$

$$y = \Delta\delta + (\text{Tab. III. A.}) + (\text{Tab. III. B.})\frac{\Delta\delta}{1000} \pm (\text{Tab. III. D.}) \begin{cases} \Delta\delta \text{ positive} \\ \Delta\delta \text{ negative} \end{cases}$$

The numbers given it the Tables are invariably positive.

Declination Tables. (*Continued.*)

Table III. B.

Arg. Δa	
s	
53.5	″.01
92.7	.02
119.7	.03
141.2	.04
160.3	.05
177.5	.06
193.0	.07
207.2	.08
220.7	.09
233.2	.10
245.5	.11
256.6	.12
267.5	.13
278.0	

Table III. C.

Arg. $x \sec \delta$	
s	
43.5	″.01
75.3	.02
97.2	.03
115.0	.04
130.5	.05
144.2	.06
156.8	.07
168.5	.08
179.3	.09
189.5	.10
199.3	.11
208.5	.12
217.4	.13
225.9	.14
234.2	.15
242.1	.16
249.8	.17
257.2	.18
264.5	.19
271.6	.20
278.5	.21
285.2	

Table III. D.

Arg. $\Delta \delta$ or y	
″	
861	″.01
1242	.02
1472	.03
1647	.04
1791	.05
1914	.06
2024	.07
2123	.08
2214	.09
2297	.10
2375	.11
2448	.12
2517	.13
2583	.14
2644	.15
2705	.16
2762	.17
2816	.18
2869	.19
2919	.20
2969	.21
3016	.22
3062	.23
3107	.24
3151	.25
3193	.26
3233	.27
3274	.28
3313	.29
3352	.30
3389	.31
3426	.32
3461	.33
3496	.34
3531	.35
3565	.36
3598	.37
3631	.38
3663	.39
3694	

III.—*The Monoclinic Pyroxenes of New York State.*

BY HEINRICH RIES.

Read March 17th, 1895.

CONTENTS.

INTRODUCTION.

The following paper is intended to give the results of a crystallographic, chemical and optical investigation of the monoclinic * pyroxenes occurring within New York State, and to this is added such information as has already been published by others.

In the course of this work the pyroxenes in the collections of the following institutions have been examined: School of Mines, Columbia University; American Museum of Natural History, New York City; The New York State Museum, Albany, N. Y.; Rutgers College, New Brunswick, N. J.; National Museum, Washington, D. C.; Hamilton College, Clinton, N. Y.; Cornell University, Ithaca, N. Y.; Williams College, Williamstown, Mass.; as well as the private collections of Prof. Thos. Egleston, Prof. A. H. Chester and Mr. F. L. Nason.

* This does not include wollastonite.

A constant difficulty all through the work has been the lack of fresh material for chemical and optical work, so that crystallographic portion of the paper predominates.

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Literature.

The following list includes all papers referring to the monoclinic pyroxenes of New York State, the more important mineralogical ones being marked with an asterisk.

1. Bailey, S. C. H.—On the Minerals of New York Island. Ann., N. Y. Lyceum Nat. Hist., vol. VIII, Nov. 1865.

2*. Beck, L. C.—Report on the Mineralogy of New York State, Albany, 1846.

3*. Blum.—The alternation of pyroxene to mica. Pseudomorphosen, 3d, nachtrag, p. 93, 1863, and p. 163, 1843.

4*. Brewer.—Analysis of Pyroxene from Edenville. Liebig's-Kopp's Jahresber, p. 712, 1850.

5. Bruce.—White Pyroxene from New York Island. Bruce's Min. Jour., p. 266, 1814.

6. Cleveland.—Mineralogy. Appendix.

7. Crawe, J. W. and A. Gray.—Mineralogy of Jefferson and St. Lawrence Co., New York. Amer. Jour. Sci., ii, vol. XXV, p. 346 and Neues Jahrb. fur Min., p. 83, 1835.

8*. Dana, E. S.—System of Mineralogy, 1893.

9. Dana, J. D.—Note on Hudsonite. Amer. Jour. Sci., ii, vol. XIX, p. 362.

10. Dana, J. D.—Leucaugite from Amity, N. Y. Amer. Jour. Sci., iii, vol. VI, p. 24.

11*. Des Cloiseaux.—Note on Hudsonite. Mineralogie, p. 62, 1863.

12*. Des Cloiseaux.—On Pyroxene from Orange Co., Manuel de Mineralogie, vol. I, p. 54, 1862. Atlas Fig. 57 and 58.

13*. Doelter, C.—Ueber Diopsid. Tscher. Min. Mitth., N. F., vol I, p. 55 and

14.* Doelter, C.—Diopside from Greenwood Furnace. Tscher Min. Mitth., 1887, p. 286.

15. Eakle, A. S.—On some dikes occurring near Lyon Mt., Clinton Co., N. Y. Amer. Geol., vol. VII, July, 1893.

16.—FINCH, J.—Essay on the Mineralogy and Geology of St. Lawrence Co., N. Y. Amer. Jour. Sci., i, vol. XIX, p. 220.

17. FRIEDERICH, J. J.—The Minerals of New York, N. Y. Trans. N. Y. Acad. Sci., vol. VI, p. 130.

18. GALE, L. D.—Geology of New York County. Geol. Rept. of New York, 1839, p. 177.

19.* HAWES, G. W.—Analysis of Pyroxene from Edenville, N. Y. Amer. Jour. Sci., iii, vol. XVI, p. 597.

20. HORTON, R.—List of Minerals found in Orange Co., N. Y. Geol. 1st Dist., N. Y., p. 577, 1843.

21.* KEATING.—Lamellar Pyroxene from West Point. Jour. Phila. Acad. Sci. vol. III, p. 68.

22. KEMP, J. F.—On the Rosetown extension of the Cortlandt Series. Amer. Jour. Sci. iii, vol. XXXVI, p. 247.

23.* KEMP, J. F. & HOLLICK, A.—The Granite at Mts. Adam and Eve and their contact phenomena. Ann. N. Y. Acad. Sci., vol. VIII, p. 638.

24. KEMP, J. F. & MARSTERS, V. F.—The Dikes of L. Champlain. Bull. U. S. G. S. No. 107.

25. KEMP, J. F.—Gabbros on the western shore of L. Champlain. Bull. Geol. Soc. Amer. vol. V, p. 213.

26. KEMP, J. F.—Crystalline Limestones, Calcites and associated Schists of the eastern Adirondacks. Bull. Geol. Soc. Amer. vol. VI, p. 241.

27.* KENGOTT.—Note on Hudsonite. Sitzber. Akad. Wien, vol. XII, p. 297, 1844, and Amer. Jour. Sci., ii, vol. XIX, p. 362.

28. *KRANTZ.—Note on Crystals of Pyroxene from Orange Co., N. Y. Pogg. Ann., Bd., CXI, p. 263, Taf. iii, Fig. 5 and 6.

29. LACROIX, A.—Theses presentés a la Faculté del Sciences de Paris, 1 re contribution a l'Etude des Gneiss a Pyroxene et des Roches a Wernerite. Bull. Fr. Min. Soc. 1889, p. 186.

30. LEEDS, A.—Notes on the Lithology of the Adirondacks. Amer. Chemist, Mar., 1877, and Zeitschr. fur Kryst u Min., Vol. II, p. 644.

31. *LEEDS, A.—Augite from Amity, N. Y. Amer. Jour. Sci., Vol. VI, p. 24, 1873.

32. *MATHER, W. W.—Geol. 1st Dist. N. Y., 1846. Various references to New York pyroxenes in the chapters on the crystalline rocks.

33. *MERRILL, G. P.—Notes on the serpentinous rocks of Essex Co., N. Y. Proc. U. S. Nat. Mus., Vol. XII, p. 595.

34. MERRILL, G. P.—On the occurrence of Ophiolites of Thurman, Warren Co., N. Y., with remarks on Eozoon Canadense. Amer. Jour. Sci., iii, Vol. XXXVII, p. 189.

35. *NASON, F. L.—Some New York minerals and their localities. Bull. N. Y. State Museum, Vol. I, No. 6.

36. PIERCE.—Minerals of Lake Champlain. Amer. Jour. Sci., i, Vol. IV, p. 113.

37. *RAMMELSBERG.—Analysis of Pyroxene from Edenville, N. Y. Mineralchemie, p. 386, 1875.

38. *v. RATH, G.—Diopside from Dekald, N. Y. Sitzber. Niederrh. Ges. fur Nat. u. Heilk., p. 224, 1886.

39. *v. RATH, G.—Pyroxene from Orange Co., N. Y. Zeitschr. fur Kryst. u Min., Vol. V, p. 495.

40. v. RATH, G.—Ueber Diopsid from Dekalb, N. Y. Ibid. vol. XIII, p. 598.

41.* v. RATH, G.—On Pyroxene from Diana, N. Y. Pogg. Ann., vol. CXLIV, p. 377, 1872.

42.* v. RATH, G.—Alteration products of Pyroxene from Orange Co., N. Y. Ibid. vol. CXI, p. 263, 1860.

43. RIES, H.—List and Bibliography of Minerals occurring in Warwick township, Orange Co., N. Y. Ann. N. Y. Acad. Sci., vol. VII.

44. ROBINSON, S.—List of American Mineral Localities. Boston, 1826.

45. SEYBERT.—Note on green Pyroxene from Willsboro on L. Champlain. Amer. Jour. Sci., vol. V, p. 116, 1822.

46. SHEPHERD, C. U.—Geology and Mineralogy of Orange Co., N. Y. Amer. Jour. Sci., i, vol. XXI, p. 321.

47.* SMITH and BRUSH.—Note on the composition of Hudsonite. Amer. Jour. Sci., vol. XVI, p. 369, and vol. XIX, p. 362, 1853.

48. SMYTH, JR., C. H.—Petrography of the Gneisses in the town of Gouverneur, N. Y. Trans. N. Y. Acad. Sci., vol. ——.

49. SMYTH, JR., C. H.—On the Gabbros and associated rocks in the southwestern Adirondack Region. Amer. Jour. Sci., iii, vol. XLVIII.

50. SMYTH, JR., C. H.—A group of Diabase Dikes among the Thousand Islands, St. Lawrence River. Trans. N. Y. Acad. Sci., vol. XIII, p. 209.

51. SMYTH, JR., C. H.—Crystalline Limestones and associated Rocks of the northwestern Adirondack Region. Bull. Geol. Soc. Amer., vol. VI, p. 263.

52.* TROOST, G.—The Pyroxenes of the United States. Phila. Acad. Sci., vol. III, p. 105, 1825.

53. VANUXEM, L.—Note on Hudsonite.
Jour. Phila. Acad. Sci., vol, III, p. 68.

54. WHITE, T. G.—The Geology of Essex and Willsboro townships on L. Champlain. Trans. N. Y. Acad. Sci., vol. XIII, p. 229.

55.* WILLIAMS, G. H.—On the paramorphosis of Pyroxene to Hornblende in rocks. Amer. Jour. Sci. iii, vol. XXXVIII, p. 259 1884.

56.* WILLIAMS, G. H.—Note on some remarkable crystals of Pyroxene from Orange Co., N. Y. Amer. Jour. Sci. iii, vol. XXXIV, 1887.

57.* WILLIAMS, G. H.—Contact Phenomena of the Cortlandt Series near Peekskill, N. Y. Amer. Jour. Sci. iii, vol. XXXVI, p. 254.

58.* WILLIAMS, G. H.—On the possibility of Hemihedrism in the Monoclinic System with especial reference to Pyroxene. Amer. Jour. Sci. iii, vol. XXXVIII, 1889.

59. WILLIAMS, G. H.—The Gabbros and Diorites of the Cortlandt Series near Peekskill, N. Y. Amer. Jour. Sci. iii, vol XXXI, p. 26, 1886.

60.* ZIMANYI, K. Die Hauptbrechungsexponenten der wichtig gesteinsbildenden Mineralien, bei Na-licht. Zeitschr. fur Kryst. u Min., vol. XXII, p. 343.

General Characters of Pyroxene.

The Pyroxene group includes minerals which are for the most part normal metasilicates of the general formula $RSiO_3$. They are simple silicates involving a single base (as Wollastonite) as well as isomorphous mixtures of several. They also sometimes depart from the normal metasilicate type in that they often contain an excess of iron oxide or alumina. All the monoclinic pyroxenes are isomorphous mixtures of more than one base. Hintze makes the following varieties :*

Diopside.	$MgCa\ Si_2O_6$
Sahlite.	$(MgFe)\ CaSi_2O_6$
Hedenbergite.	$CaFeSi_2O_6$
Schefferite.	$(MgFe)\ (CaMn)\ Si_2O_6$
Jeffersonite.	$(MgFeZn)\ (CaMn)\ Si_2O_6$
Augite.	$\left[\begin{matrix}(MgFe)\ CaSi_2O_6+ \\ (MgFe)\ (AlFe)_2\ Si\ O_6\end{matrix}\right]$

Pyroxene crystallizes in the monoclinic system, and the crystallographic relations of the different members vary but little. The members are theoretically of different composition, although they nevertheless grade into each other.

The axial ratios upon which measurements are usually reckoned are those calculated by G. V. Rath on augite from Vesuvius (Pogg. Ann. 1873, Erg. Bd. VI, p. 340.)

$$a : b : c = 1.09213 : 1. : 0.58931.$$
$$\beta = 74° 10' 9''$$

The habit of pyroxene crystals is usually columnar parallel to c (001), those of augite tending towards a short thick form, while those of diopside are often slender. In cross-section they are frequently rectangular or square from the great development of a (100) and b (010) but they are sometimes tabular, and if so the flattening is parallel to a (100).† (The New York pyroxenes are an exception to this rule). Hemihedrism is known to occur, but it is very rare. Twinning is commonest parallel to a (100) and sometimes parallel to c (100). Hintze also mentions twins paralel to y (101) and W ($\bar{1}22$). The twinning line often runs through the middle of the crystal and in this case gives no reen-

* Handbunch der Mineralogie, p. 1016.

† Hintze, Handbuch der Mineralogie, p. 1019.

trant angle. Lustre vitreous to dull. Crystals often transparent especially in the diopsides. Color mostly green, but varies from colorless through various shades of green to black, also brown and yellow. Streak white, green or gray. Fracture conchoidal.

Cleavage parallel to *m* (110). Parting parallel to *c* (001) and *a* (100). Hardness 5–6., Sp. Gr. 3.2–3.6.

Etch figures on diopside usually show triangles the acute angles of which point in the direction of the positive hemi-pyramid, or a deltoid with rounded sides, whose acute angle points towards the negative and obtuse angle toward the positive pyramid. A parallelogram is formed on the clino-pinacoid.

The plane of the optic axes coincides with the plane of symmetry, and the acute bisectrix lies in front of the vertical axis. Pyroxene is optically positive. c : ć varies from 36°–54°.

Tschermak* claimed that the variation of the extinction angle is due to the chemical composition and that it is especially influenced by the percentage of iron in the non aluminous ones. He noticed that a change of color was accompanied by a change in the angle which the optic axis made with the normal to *a*. F. J. Wiik† claimed that c : ć increased with the percentage of FeO in the Finnish pyroxenes. He, however, found that there were pyroxenes which would not fit this rule, and came to the conclusion that the pyroxenes of the younger volcanic rocks followed a different law.

Herwig‡ made a long series of similar determinations, but they showed no deducible law.

Doelter§ found in a series of augites that the FeO percentage (in those containing no Fe_2O_3) had an effect on the optical properties. No regular law could be formulated if Fe_2O_3 were present or if the sum of FeO and Fe_2O_3 were used. A better curve was obtained when the sum of FeO, Fe_2O_3 and Al_2O_3 was taken. A regular curve was only obtained when the sum of the amounts of the component silicates are taken.

Flink found that manganese had the same effect as iron on the extinction angle.

According to Des Cloiseaux‖ an increase of temperature pro-

* Min. Mitth., 1871, p. 21.

† Zeitschr. für Kryst. u. Min., VIII, p. 78 and 208.

‡ Ibid, XI, p. 67.

§ Neues Jahrb., 1885, I, p. 56.

‖ Nouv. rech., 1867, p. 649.

duces a change in position of the optic axes and bisectrices. In a section normal to the acute bisectrix an increase of temperature from 17° to 196° C caused the optic axes of light colored pyroxenes to wander 1° 34′ from their original position; with more intensely colored ones the change was 0° 36′.

Pleochroism is generally weak, and is found chiefly in the darker varieties, the light colored ones being non-pleochroic.

The specific heat of pyroxene has been determined on the black diopside from Nordmarken, Sweden, and found to be 0.1830.

The different varieties of pyroxene may be defined as follows:

DIOPSIDE. $CaMgSi_2O_6$ or SiO_2, 55.60%; CaO, 25.90; MgO, 18.5. Color white, yellowish, grayish white to pale green, or even black. Crystals often transparent and colorless. The crystals are usually slender and prismatic, and iron is frequently present in small amount.

Malacolite as originally used referred to a bluish-gray or grayish-green variety. Rosenbusch classes under this term those rock-making monoclinic pyroxenes poor in alumina or free from it, and not laminated parallel to the orthopinacoid. *Alalite*, *Traversselite* and *Canaanite* are merely locality names.

HEDENBERGITE. $CaFeSi_2O_6$, or SiO_2, 48.40; FeO, 29.40; CaO, 22.20. Occurs in crystals or in lamellar masses, of a black color.

SAHLITE. This is placed by Dana as a sub-variety, but Hintze makes it a full species, having the composition $(MgFe)CaSi_2O_6$. The color is usually grayish green, and the name is derived from the type occurrence at Sala, Sweden.

Diallage. According to Dana* the composition is near diopside, but it often contains a considerable percentage of alumina. Its chief characteristic is a lamellar structure due to a parting parallel to the orthopinacoid, sometimes another parallel to the clinopinacoid and less often one parallel to the base.

Coccolite was first applied to a dark green variety rich in iron from Arendal, but is now used to designate any granular variety of pyroxene.

AUGITE includes the aluminous monoclinic pyroxenes. It varies more in composition probably than any of the other varieties. Dana gives the composition as $CaMgSi_2O_6$ with $(MgFe)(AlFe)_2SiO_6$, and Hintze gives it as $(MgFe)CaSi_2O_6+(MgFe)$

*System of Mineralogy, 1893.

$(AlFe)_2SiO_6$. The color is usually green to black, and the habit of the crystals is short and stout.

Leucaugite is a name given to white or grayish varieties, with alumina, lime, magnesia and little or no iron.

The varieties described above are purely theoretical and no fixed line of division exists, for all stages of transition in composition between the different ones may occur.

In treating of the pyroxenes of New York State the writer has for convenience set an arbitrary line of division, classing as diopside those with less than 3% of alumina and as augite those containing more than that amount.

Distribution of the Pyroxenes in New York State.

There is in the eastern portion of New York State an extensive area of igneous and metamorphosed rocks which are bordered by the Cambrian and Silurian strata of sedimentary origin, and into which they have often penetrated. Where the limestone is in contact with the igneous rock it not only becomes more coarsely crystalline, but there are also developed in these contact zones a number of minerals chief among which are pyroxene, amphibole, wollastonite, scapolite, garnet, tourmaline, feldspar, titanite, zircon.

This large igneous area forms the Adirondack *massif* west of Lake Champlain, and which extending through Clinton, St. Lawrence, Essex and Jefferson Counties, includes a series of (Ref. 29 and 30) quartz-orthoclase gneisses with biotite or augite, crystalline limestones often shading to ophicalcites on the east and closely associated with black hornblendic and pyroxenic gneisses on the west, and thirdly a great series of intruded plutonic rocks on the Gabbro family.

In this region the pyroxene occurs in the form of small grains and crystals as a primary constituent of the gabbros and gneisses, as well as in the limestones and ophicalcites at or near their contact with the intrusive masses. In the limestone, the pyroxene begins to appear in scattered grains as the contact is approached, and these increase in number and degree of development until at the contact the limestone is often filled with an interlacing mass of crystals while between it and the intrusive there is often a space lined with well-formed and sometimes quite large pyroxene crystals. Other minerals may occur as well, and the space be-

tween is frequently filled with calcite. The igneous rock also becomes more pyroxenic as the zone of contact is approached. The most important of these contact localities are at Russell, East Russel, Gouverneur, Pierrepont, Diana, Natural Bridge, Rossie, Oxbow, Dekalb and Edwards.

The small beds of ophicalcite of the eastern Adirondack region contain an abundance of pyroxene in grains and crystals, which are either disseminated through the rock or else collected with other minerals in the form of large bunches of silicates in the limestone. An excellent illustration of these bunches of silicates appears in a recent paper by Prof. J. F. Kemp. (See Ref. 30.)

In this same region the pyroxene not unfrequently occurs in intimate association with the ore-bodies, either as well developed crystals, or forming granular streaks between the ore bed and the wall rock.

The pre-cambrian rocks of the Highland region in southeastern New York are composed of a series of gneissic and granitic rocks, interbedded limestones and beds of iron ore, the whole intersected by many dikes. The conditions of occurrence of pyroxene in this region are therefore somewhat similar to those found in the Adirondacks. While it occurs in grains and anhedra* in many of the gneissic rocks and dikes its best development is around the beds of magnetite. The most important localities are at the O'Neil Mine, the Bradley Mine and the Sterling Mines. Owing to the cessation of mining these localities are practically exhausted.

To the southwest of the Highland region the area around Mts. Adam and Eve is of great importance, for the intrusion of the granite into the limestone has given rise to a rich development of contact minerals, pyroxene being among the best developed. Most of the specimens have been found near Edenville.

The gabbros and diorites of the Cortlandt Series, near Peekskill, Westchester Co., contain an abundance of pyroxene, and the same mineral has been formed as a result of contact metamorphism in the surrounding limestones (Ref. 61 and 63). The same is true of the Rosetown extension of this area across the Hudson River (Ref. 22).

*L. V. Pirsson. Philadelphia Meeting Geol. Soc. Amer., Dec. 1895.

Other isolated pyroxene occurrences are at the Tilly Foster Mines, Putnam Co., and at New Rochelle, Westchester Co., the former associated with magnetite in gneiss and the latter with serpentine.

Pyroxene is very abundant at certain localities in the dolomitic limestones of Dutchess, Putnam, Westchester and New York Counties. The crystals all bear the closest resemblance to one another, and are found singly, in streaks, or in clusters lining cavities. A massive form of the same species occurs at times. The important localities are Kingsbridge, New York Co., Sing Sing, Westchester Co., Pawling and Paterson, Dutchess Co. The dolomites in which these pyroxenes occur have been highly metamorphosed by dynamic action.

It will be seen from the foregoing that the pyroxenes occur in New York State under the following conditions: 1. As primary constituents of igneous rocks. 2. In the contact zones between the limestones and intrusive rocks. 3. In crystalline limestones in areas of regional metamorphism. 4. Associated with the iron ore bodies.

In general, it may be said that the lighter colored varieties occur in the limestone, while the darker ones are found along the contact zones and in the igneous rocks. The minerals usually found associated with the pyroxene are scapolite, feldspar, wollastonite, amphibole, titanite, mica, tourmaline, garnet, chondrodite, zircon and quartz. The pyroxene occurs both massive or in crystals that are scattered through the rocks or that form clusters lining veins or cavities. These latter are generally filled in with calcite or quartz.

General Characters of the New York Pyroxenes.

Crystallography.

The forms occurring are comparatively few in number, but the combinations and their relative development of faces are, in most instances, quite characteristic of the locality. These peculiarities are mentioned under the detailed descriptions of the different localities. The great majority of the specimens found only show faces in the prismatic zone, owing to adverse conditions of growth. Doubly terminated individuals are not uncommon but they have not been observed from every locality.

The following faces have thus far been noted on the New York Pyroxenes:

m (110) ∞ P	u (111)—P
f (310) ∞ P $\bar{3}$	s ($\bar{1}11$) P
a (100) ∞ P $\bar{\infty}$	v (221)—2P
b (010) ∞ P $\breve{\infty}$	o ($\bar{2}21$) 2P
c (001) OP	λ ($\bar{3}31$) 3P
e (011) P $\breve{\infty}$	Δ ($\bar{3}11$) 3P $\bar{3}$
z (021) 2P $\breve{\infty}$	μ (121)—2P$\breve{2}$
p ($\bar{1}01$) P $\bar{\infty}$	a (312)—$\frac{3}{2}$P $\bar{3}$

Prisms. The unit prism m (110) is a very common face and is almost invariably present. It may or may not exceed the ortho and clino pinacoids in size. The ortho-prism f (310) has only been observed on one crystal from this state and that from the Tilly Foster Iron Mine in Putnam Co. It has not been previously recorded from New York State, but is common on many European pyroxenes.

Pinacoids. The ortho pinacoid a (100) and the clino pinacoid b (010) are as common as the unit prisms, but show great variation in their development. When of equal size and greater development than the prism the section of the crystal is square. A greater development of one of the pinacoids gives the crystal a tabular habit. Thus the white pyroxenes from Sing Sing, Westchester Co., are nearly always tabular parallel to a while those from St. Lawrence Co. are not uncommonly tabular parallel to b. The basal pinacoid c (001) is often seen on terminated crystals. A basal parting may give the same appearance to the crystal. The basal pinacoid face is generally rectangular in outline, but this varies somewhat depending on the number of faces which intersect it.

Domes. Two clinodomes and one orthodome occur. The latter is the commonest of the three. It is rarely present without the basal pinacoid and is generally smaller than it. A characteristic exception to this rule is found in the augites from Mt. Adam, Orange Co., and those from the Tilly Foster Iron Mine in Putnam Co. The two clinodomes e (011) and z (021) are generally represented by small triangular faces. The dome z is rare, but the dome e is quite a characteristic form on many augites from the Highland Region of Orange Co.

Pyramids. Terminated crystals as a rule show the positive and negative unit pyramids and the positive pyramid o ($\bar{2}21$). The latter is rarely present without the other two. The pyramid v (221) is rare and usually small when present. A notable exception to this is the white augite found in the dolomitic limestones of Dutchess, Westchester and New York Counties. The Δ (311) has only been observed on crystals from two localities, viz., Russell and De Kalb and the pyramid λ ($\bar{3}31$) is even rarer and found on crystals from Diana, Lewis Co., μ (121) and a (312) have only been noted on augite of Orange Co.

A curious inequality of development is shown by the diopsides of DeKalb, on which one face of u (111) is often large, while the other is so small as to appear absent.

The pyramid faces are often dull or even slightly rough, and seamed with a series of longitudinal pits.

The accompanying table gives the distribution of the different faces found on the New York pyroxenes.

TABLE GIVING OCCURRENCE OF CRYSTAL FORMS AT THE DIFFERENT LOCALITIES.

Locality.	*a*	*c*	*b*	*m*	*f*	*e*	*z*	*u*	*s*	*v*	*o*	λ	Δ	*p*	μ	*a*
Adams' Lake	*	*	*	*		*		*	*		*			*		
Cheever	*	*	*	*				*	*							
Chilson Hill	*	*	*	*				*	*		*					
DeKalb	*	*	*	*		*		*		*	*		*	*		
Diana	*	*	*	*			*	*	*		*	*				
Gouverneur	*	*	*					*	*	*						
Greenwood Lake	*	*	*	*												
Hammondville	*	*	*	*					*							
Highlands of Hudson	*	*	*	*		*										
Kingsbridge	*	*	*	*						*	*					
Macomb	*	*	*	*				*								
Monroe Township	*	*	*	*		*	*	*	*		*			*		
Natural Bridge	*	*	*	*			*	*	*		*					
Oxbow	*	*	*	*				*	*		*					
Pawling	*	*	*	*						*	*					
Pierpont	*	*	*	*												
Pitcairn	*	*	*	*				*	*		*			*		
Port Henry	*	*	*	*		*		*	*					*		
Rossie	*	*	*	*				*	*		*					
Russell	*	*	*	*				*								
Sing Sing	*	*	*	*						*	*			*		
Tilly Foster	*	*	*	*	*	*		*	*		*			*		
Warwick	*	*	*	*				*	*		*			*	*	*

Cleavage. A well-developed prismatic cleavage is often present. Sometimes it is only apparent in thin sections, but at others is so pronounced as to cause the crystals to cleave easily. An orthopinacoidal cleavage is said by A. R. Leeds to occur in the pyroxenes of the Adirondack region (Ref. 34), but it is probably a parting.

Parting. There exist two pronounced partings due to twinning, one parallel to the base, the other to the orthopinacoid. The former is the more abundant and is seen on specimens from nearly every locality.

Both show themselves on the surface by the existence of numerous striæ.

Twinning occurs after two laws, viz., parallel to the base and orthopinacoid, the former being the most common. Usually the only outward evidence of the fact is the striated surface referred to in the preceding paragraph.

The twinning may be repeated, the alternate twin lamellæ being generally extremely thin. At times there is only one twinning plane which passes through the centre of the crystal, parallel to the orthopinacoid, thus producing twice the number of faces of the same symbol at one end of the individual.

A curious case of twinning is noted by Prof. G. H. Williams on a crystal from Orange Co., in which the lower half of the crystal alone is twinned. (Ref. 60.)

Perfectly fresh crystals do not generally show twinning.

Hemihedrism.—According to Prof. G. H. Williams this has been shown to occur on crystals from two localities in New York State (Ref. 62). One example is a crystal from Orange Co., which shows planes of different forms grouped about opposite extremities of the vertical axis. From its occurrence on several crystals this inclined hemihedrism seems to be not altogether rare. The Orange Co. crystal shows c (001), s ($\bar{1}11$), o ($\bar{2}21$), e (011) and u (111) at the upper end and c (001) and u (111) at the lower. Another crystal from this same locality shows c (001), s ($\bar{1}11$,) o ($\bar{2}21$) and u (111) above, and below the two halves of the crystal in twinning position and with only o ($\bar{2}21$) and p ($\bar{1}01$.) The crystal was carefully tested by Prof. Williams but showed no pyro-electricity. A second instance of hemihedrism is noted in a crystal from Grassy Lake, St. Lawrence Co., with u (111,) s ($\bar{1}11$), o ($\bar{2}21$) at one end and p ($\bar{1}01$), c (001), u (111), s ($\bar{1}11$) and o ($\bar{2}21$) at the other.

These crystals were first called by Prof. Williams hemimorphic, but subsequently the term hemihedral was used by him.

Optical Properties.

With the exception of an approximate determination of the extinction angles of the pyroxenes occurring in the igneous and metamorphic rocks of New York State, the only optical determinations which have been made are those by K. Zimanyi on DeKalb diopside (Ref. 64), and by C. Doelter on augite from Greenwood Furnace. (Ref. 14.)

This may be due to the fact that New York does not abound in fresh glassy crystals whose condition would be such as to encourage optical investigation.

Relation between the optical and chemical properties.

The researches of Wiik, Doelter and Herwig have already been mentioned in the introductory portion of this paper, and in order to determine how far the writer's results agree with theirs the following table was made, giving the extinction angle, and the percentages of FeO, Fe_2O_3 and Al_2O_3.

Locality.	$c \wedge c$	FeO.	Fe_2O_3.	Al_2O_3.	Sum of Three.
Russel	37°	1.29		2.42	3.71
DeKalb	40°	1.12		.40	1.52
Sing Sing	40°	.80		4.11	4.91
Port Henry	41°	1.80		1.32	3.12
Pitcairn	41° 30′	1.301		3.09	4.391
Diana	41° 30′	8.63	.50	4.94	14.07
Greenw. Furn	42° 20′	2.55	5.05	5.09	12.64
Warwick	45° 15′	6.86	.57	5.82	13.25
Cheever	52°	15.98	3.53	7.49	27.00

An examination of the above table shows that the extinction angle does not increase with the percentage of FeO, thus showing a disagreement with Wiik's results, although it should be added that Wiik found several exceptions to his rule. Comparing the extinction angles with the corresponding sum of the ferrous and ferric iron gives no better results. If, however, the combined percentages of FeO, Fe_2O_3 and Al_2O_3 be taken, a more regular series is obtained, the greatest variation being the pyroxene from Russel. If, furthermore, those containing under 3% of Al_2O_3 be excluded from the list as belonging more properly to the diop-

sides a still better series is obtained, but not a perfectly regular one.

Indices of Refraction.

These were determined by the Kohlrausch method,* on specimens from all localities furnishing sufficiently fresh material. The measurements were made on polished surfaces, but the reflections afforded were often rather weak. For the sake of comparison the indices of refraction for yellow light are given below:

	α	β	γ
Russel	1.6626	1.6718	1.6940
Port Henry	1.6683	1.6730	1.6902
DeKalb †	1.6674	1.6745	1.6961
DeKalb	1.6749	1.6852	1.7013
Sing Sing	1.6778	1.6848	1.7025
Pitcairn	1.6806	1.6843	1.7036
Diana	1.6888	1.6932	1.7108

It will be seen that the index of the Russel diopside is the lowest of the series, and lower in fact than any recorded in Hintze's Handbuch der Mineralogie, where a number of determinations made on pyroxenes from various localities are given.

Axial Angles.—The axial angle is known to vary with the chemical composition in the same manner as the extinction angle, the increase of the angle with the corresponding increase of iron and alumina does not seem to be as regular, however, as the enlargement of the extinction angle, and also, the axial angle does not increase with the extinction angle.

The following table may serve to illustrate this fact:

	$c \wedge c$.	2 Vna.	Sum of FeO, Fe_2O_3, Al_2O_3.
Russel	37°	58° 56′	3.71%
DeKalb	40°	59° 30′	1.52%
Sing Sing	40° 10	59°	4.91%
Port Henry	41°	56° 30′	3.12%
Pitcairn	41° 30′	59° 40′	4.391%
Diana	41° 30′	60° 40′	14.07%

The same disagreement between the extinction angle and the axial angle, is shown by the following measurements ‡ of pyroxenes from other localities.

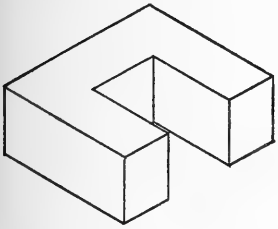
* Methylene iodide with index of 1.732 was used.

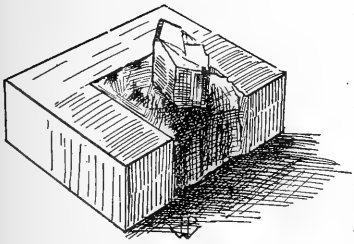
† Determined by K. Zimanyi, see Ref. 60.

‡ Hintze, Handbuch der Mineralogie, p. 1026–1029.

Locality	c∧t	2 Vna
Diopside, Nordmarken	38° 3½′	58° 52′
White pyroxene, Kussinsk, Ural	38° 34′	58° 45′
Diopside, Schwarzenstein, Tyrol	39° 4′	58° 56′
Green coccolite, Arendal	40° 22′	58° 38′
Schefferite, Langban.	44° 25½′	65° 3′
Diopside, Nordmarken	44° 42′	60° 28′
" "	45° 21′	66° 44′
Hedenbergite, Tunaberg	47° 10′	59° 52′
Augite, Frascati	54°	68°

Method of Cutting Sections at Right Angles to the Acute Bisectrix.





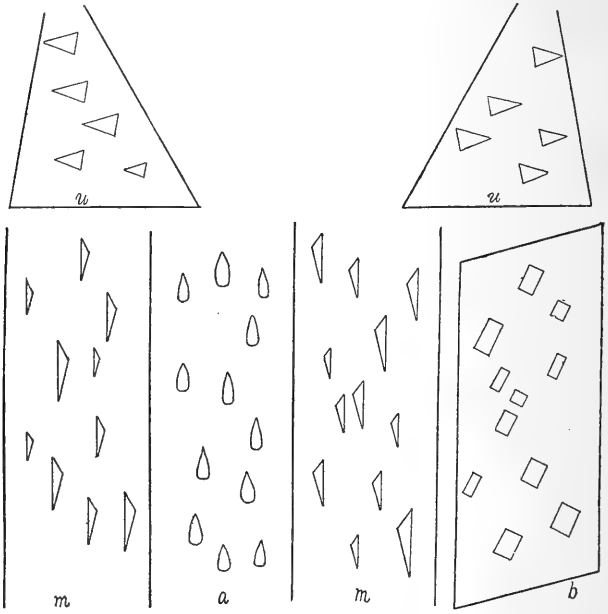
In cutting sections of the crystals for the purpose of measuring the axial angle some difficulty was at first experienced in getting the section cut at just the desired angle, as no saw for sectioning brittle minerals in any desired direction was at hand. The following method was devised and on account of its simplicity and the uniformly good results obtained seems worthy of mention.

A frame of hard polished steel was made of the shape, shown in the upper part of Fig 1. On the clinopinacoidal face, or a ground plane corresponding to it, there is scratched a line representing the trace of a plane normal to the acute bisectrix. The crystal is then fastened in the frame with a piece of wax so that the line coincides with the upper surface of the frame, and plaster of paris poured in around it and allowed to harden. The crystal is thus firmly embedded in the frame as shown in the lower cut of the figure, and is ground down until its surface is even with that of the steel frame. The crystal is then removed, the ground surface polished and cemented to a glass slip and the other end of the crystal ground down in the usual way.

The section giving a perfectly symmetrical and satisfactory interference figure was obtained at every trial. The smallest crystal sectioned was three-eighths of an inch long and the same in width.

Etchfigures.

Crystals of diopside from DeKalb and augite from Pitcairn, showing smooth and bright faces, were treated with warm hydrofluoric acid for several minutes, and in both cases with the following results:



On the prism face there was produced an acute angled triangle, whose longer side was parallel, or very nearly so, to the edge $110 \wedge 010$. The acute angle always pointed towards the positive hemipyramid, while the obtuse augle pointed towards the orthopinacoid.

On the orthopinacoid the etchfigures were irregularly deltoid in outline, with the lower end rounded, and the upper end always drawn out into a point which was towards the negative hemipyramid.

Somewhat irregular figures were produced on the clinopinacoid,

but those which far exceeded all the others in numbers were rectangles, whose longer side made an angle of 25°, with the edge 010 ∧ 110. The upper sides of these rectangles are parallel to the intersection of 010 and 011.

A triangular figure was produced on the negative unit pyramid face, whose acute angle pointed toward the edge 111 ∧ $\bar{1}$11. The base of the triangle made an angle of 15°, with the edge 111∧110.

Very unsatisfactory figures were obtained on the basal pinacoid. The majority were squares whose sides were respectively parallel and perpendicular to the plane of the orthopinacoid. There were also a few pits whose outline was closely that of an equilateral triangle.

The results noted above agree very closely with those obtained by Wulfing* on diopsides from Ala., and by Greim†. Greim states that the triangular pits were sometimes truncated by a fourth plane, but this was not noticed by the writer on any of the crystals etched by him.

Chemical Composition.

As previously stated pyroxene is divided into several varieties of definite theoretical composition. It rarely happens that the analysis when calculated out gives a formula which corresponds exactly to any of these, but instead, the pyroxene is found to consist approximately of an isomorphous mixture of several metasilicates.

Rammelsberg‡ put forth the theory that in aluminous pyroxenes, the ferric iron and alumina were present as sesquioxide and mixed with the normal metasilicates, thus giving the general formula n $\ddot{R}\,SiO_3+\ddot{R}_2O_3$, while the pyroxenes with no alumina were simple mixtures of isomorphous silicates.

Tschermak§ subsequently showed that in many cases in the alumina free augites Ca=Mg+Fe, while in the aluminous ones Ca<Mg+Fe.

The writer has attempted in each case to calculate the mixture of metasilicates present. (See detailed accounts of localities).

*Beiträge zur Kenntness der Pyroxenfamilie in Chemischer und Optischer Beziebung.--Heidelberg, 1891.

†Neues Jahrbuch für Mineralogie, 1889, p. 252.

‡ Zeitschr. d. d. geol. Ges., 1876, p. 496.

§ Min. Mittheil., 1871, p. 17-46.

This was sometimes possible, but at other times the result was not exact, due perhaps to impurities or a slight error in the analysis. In all the analyses made by the writer the material was finely powdered and then treated with a magnet and afterwards with a specific gravity solution.

An examination of the formulæ calculated shows the presence not uncommonly, of the wollastonite or orthorhombic pyroxene molecule. There also remains at times an amount of SiO_2.

The analyses further indicate that Tschermak's theory of the relation between Al_2O_3 and the oxides of Ca, Mg and Fe holds good in the case of only about one-half of the New York pyroxenes analyzed, as will be seen from the following table:

ALUMINOUS PYROXENES.

Ca.		Mg+Fe.	LOCALITY.
.4041	>	.3961	Cascadeville.
.4278	>	.3028	Diana.
.386	>	.1847	Keene.
.31	<	.379	"
.3353	<	.4282	Mt. Marcy.
.3825	<	.492	Pitcairn.
.309	<	.373	Pt. Henry.
.4166	>	.2640	Rogers Rock.
.4107	>	.3545	"
.368	<	.455	Greenwood Furnace.
.277	>	.189	Rosetown.
.480	>	.375	Warwick.
.458	>	.3655	Edenville.
.4432	>	.4156	Sing Sing.
.375	>	.359	West Point.
.345	<	.453	Willsborough.
.394	<	.419	Edenville.

ALTERATION PRODUCTS.

Uralitization is the almost universal method of alteration. It begins with the appearance of a fibrous structure on the surface of the crystal, especially the prism faces, and gradually extends through the entire individual. This change is well shown in the pyroxenes of Russel and Pierrepont. The white varieties alter to tremolite, as shown by the white pyroxenes of Kingsbridge and Sing Sing.

These paramorphs of hornblende after pyroxenes are well shown in the gabbros of the Cortlandt Series near Peekskill, where there

is a direct change to compact black hornblende. Prof. Williams has stated that the tendency of the pyroxene molecule to assume the form of hornblende is sufficient to affect a complete change in the crystalline structure, but if "some external agency could be introduced, which would render the molecules more or less mobile without increasing the temperature to a point where the augitic mode of arrangement is more stable than the hornblende, it will be readily seen that they must assume the form best in accordance with the lower temperature." He also thinks that just such an external agency as this would be furnished by the pressure to which the rocks are subjected in mountain making (Ref. 59).

A second and not uncommon alteration product is serpentine. This change is well shown in the ophicalcites of Warren and Essex Counties. The serpentine grains show a core of unaltered pyroxene, and all stages in the transition may be seen. The composition of the serpentine and pyroxene are given below (Ref. 38).

	Pyroxene.	Serpentine.
SiO_2	55.26	42.17
Al_2O_3	.22	.30
Fe_2O_3	.22	1.57
FeO	.57	.64
MgO	19.53	41.33
CaO	24.48	
MnO	tr	tr
H_2O		13.72
	100.28	99.73

As will be seen from the above analyses, the change consists in the assumption of water and the loss of lime, which crystallizes out as calcite.

Chlorite has been observed as a result of the alteration of augite in a few instances (Ref. 15, 48, 49).

Pink garnet frequently appears to result from the alteration of the augites in the Adirondack gabbros (Ref. 29). The two minerals occur in very close association, and the same cracks often traverse both. The following is an analysis of the pyroxene and the garnet:

	Pyroxene.	Garnet.
SiO_2	56.00	43.38
FeO	2.40	.....
CaO	21.63	22.61

	Pyroxene.	Garnet.
MgO	5.23	10.50
Fe_2O_3	4.70	17.08
Al_2O_3	8.44	5.05
MnO		.70
Alkalies	.50	
Loss on Ignition	.20	
		99.32

Blum (Ref. 3) has described the alteration of pyroxene to mica in the augites from Monroe Township, Orange county. The sides of the crystals are almost entirely covered with brown mica (clintonite), which is the same color as the augite. The mica plates have their cleavages in approximately parallel position. In one crystal only a core of the augite remained.

Detailed Account of Pyroxene Localities.

Augites.

For convenience the occurrences are divided into the Adirondack Area and the Highland Region, under each of which heads the localities are arranged alphabetically.

I. The Adirondack Area.

Adams Lake.—The writer feels some hesitation in describing this locality under the heading of New York State, for while there are a number of specimens in the Columbia University collection which are labeled "Adams Lake, N. Y.," there is also a crystal exactly like the others labeled "Adams Lake, Can.," and I am informed by Prof. F. D. Adams that there is a Canadian locality of this name, which is a bay of Lake Rideau, in lots 2, 3, 4 and 5, Ranges V and VI, N. Burgess township, Ontario.

The crystals are light green and $1\frac{1}{2}$ inches long, with smooth faces which are bright in places, but also show some uralite. They are all doubly terminated. The combination of forms present in all is a (100), b (010), m (110), u (111), s ($\bar{1}11$), o ($\bar{2}21$), c (001) and p ($\bar{1}01$). (Pl. XVI, Fig. 7.) The dome z (021) may occur. Both basal and orthopinacoidal partings are present.

Bonaparte Lake, Lewis Co.—There is one crystal in the collection of Columbia University which is said to come from this locality. It is exactly like those described from Adams Lake.

Cascadeville, Essex Co.—Granular pyroxene in a calcite vein is found on the mountain side above Long Pond, opposite the

hotel. The grains are rounded, transparent, of a light green color and many have a strong basal parting. No faces were found on them. An analysis of this material showed:

	Per cent.	Ratio.	Prop. parts.
SiO_2	54.63	.9105	22
Al_2O_3	5.26	.0513	1
FeO	3.00	.0416	1
CaO	22.63	.4041	10
MgO	14.18	.3545	9
	99.66		

The above analysis gives the formula $Mg_9Ca_{10}Fe_1Al_2Si_{22}O_{67}$, which may be considered as made up of $FeSi_2O_6$, $CaAl_2SiO_6$, $Mg_9Ca_9Si_{19}O_{55}$. The latter corresponds closely to the diopside molecule $MgCaSi_2O_6$.

According to Beck (Ref. 2, 289),* green pyroxene crystals occur at this locality which show the combination *a* (100), *b* (010), *m* (110), *c* (001), *p* ($\bar{1}01$), *o* ($\bar{2}21$), *s* ($\bar{1}11$), and *u* (111). At the same place there is found a yellowish green or emerald green coccolite, which is translucent to semi-transparent. It is associated with grains of jet black pyroxene. The former is probably similar to the greenish granular pyroxenes in calcite from this locality in the collection of the New York State Museum.

DeLong's Mill.—Pyroxene of a dark color occurs in Hammond Township near DeLong's Mill (Ref. 2, p. 295), together with zircon, feldspar and apatite. The forms noted on it are *a* (100), *b* (010), *m* (110), and *u* (111). A grayish white and green variety, with a strong prismatic cleavage and pronounced basal parting, also occurs. A very incomplete analysis of it is given by Beck.

Diana, Lewis County.—There is an excellent section of a contact zone exposed on Ashmore's farm, near Natural Bridge. It is along the contact of the anorthosite and limestone, and is about two feet wide. The mineralogical structure of it is as follows: There is next to the gabbro and shading into it a layer containing abundant wollastonite. Next to this and towards the limestone is a second, though not sharply defined layer, containing a mixture of feldspar, scapolite, sphene and zircon. There then follows calcite with much pyroxene, and then coarse granular calcite,

*The Long Pond mentioned by Emmons (Geol. N. Y., 1837, p. 31) is the same locality as Cascadeville.

which passes into the normal limestone. The pyroxene in the limestone at the contact often shows well developed crystals. Graphite is common in the limestone.

The augite crystals from Diana are generally black or greenish black, and in section green. They have smooth, but dull faces. Doubly terminated specimens are not rare, and a basal parting is nearly always present. The ordinary combination of forms is a (100), b (010), m (110), u (111), s ($\bar{1}11$), o ($\bar{2}21$) and z (021), (Pl. XVI., Fig. 6). Other combinations observed on crystals from this locality in the Columbia University, School of Mines collection are m (110), b (010), c (001), u (111), o ($\bar{2}21$) and s ($\bar{1}11$); a (100), and b (010) broad, m (110) narrow, c (001) broad, e (011) narrow, and u (111) small, (Pl. XVI., Fig. 1). The latter resembles the common Orange County form. A strong prismatic cleavage is sometimes present, and the crystals often reach a large size one in the School of Mines collection being five inches long, three inches thick, and with the forms a (100), b (010), m (110), c (001), and o ($\bar{2}21$). It closely resembles the dark green augite from Russel.

The following combinations of forms from Diana are noted by L. C. Beck (Ref. 2) m (110), o ($\bar{2}21$), v (221); a (100), m (110), o ($\bar{2}21$); a (100), b (010), m (110), o ($\bar{2}21$); a (100), b (010), m (110), e (001), u (111), s ($\bar{1}11$); and a (100), m (110), e (011), v (221).

There is in the Root collection at Hamilton College, a light green crystal from Diana which has the forms a (100), b (010), m (110), p ($\bar{1}01$), o ($\bar{2}21$), and λ ($\bar{3}31$). (Pl. XV., Fig. 8). The crystal is twinned many times parallel to c (011), and once parallel to a (100), the twinning plane dividing it symmetrically. The similarity of this twin to those of fassaite from Monzoni in the Tyrol has been pointed out by G. v. Rath, (Ref. 41).

An analysis of the common dark green pyroxene from Diana gave

	Per cent.	Ratio.	Prop. parts.
SiO_2	53.97	.8995	290
FeO	8.63	.1198	39
CaO	23.96	.4278	133
MgO	7.32	.1830	60
Al_2O_3	4.94	.0482	15
Fe_2O_3	0.50	.0031	1
	99.33		

Sp. Gr. 3.36

This gives $Ca_{133}Mg_{60}Fe_{39}\ddot{F}e_2Al_{30}Si_{290}O_{840}$

or $39\,(CaFeSi_2O_6)$
$15\,(Al_2Si_3O_9)$
$60\,(CaMgSi_2O_6)$
$CaFe_2SiO_6$
$33\,(CaSiO_3)$

leaving $Si_{12}O_{26}$, which is approximately SiO_2.

c : c	41° 30′
a	1.6888
β	1.6932
γ	1.7108
γ—a	.022
2W*	79° 27′
2V	60° 40′

Gouverneur, St. Lawrence Co.—Bright gray and dark green pyroxene occurs associated with hornblende in the limestone one mile southeast of Gouverneur (Ref. 2, p. 295). A flat crystal tabular parallel to $b\,(010)$ is figured by Prof. S. L. Penfield in Dana's System of Mineralogy, 1893. The forms on it are $a\,(100)$, $b\,(010)$, $m\,(110)$, $c\,(001)$, $u\,(111)$, $v\,(221)$ and $\triangle\,(\bar{3}11)$.

Augite in rounded masses and with an extinction angle of 40° occurs in the schist underlying the limestones at Gouverneur. In the gneisses the pyroxene in section is pale and colorless and has an extinction of 45°. It shows a certain amount of alteration to chlorite, but changes mostly to uralite. Pyroxenic phases of the limestone are not uncommon, the latter containing colorless grains of pyroxene with a high extinction angle (Ref. 48).

The dark green crystals which the writer has seen from this locality are usually of prismatic habit and without terminations. One form in the Collection of the School of Mines, Columbia University, shows $a\,(100)$, $b\,(010)$, $c\,(001)$, with $u\,(111)$, and $s\,(\bar{1}11)$, very small (Pl. XIV., Fig. 4). A white and much decomposed crystal in the same collection has the planes $a\,(100)$, $b\,(010)$, $m\,(110)$, $c\,(001)$, and $u\,(111)$. (Pl. XVI., Fig 4).

Hammondville, Essex Co.—There is a small black crystal with smooth dull faces from this locality in the collection of Cornell University. (Pl. XIV., Fig. 1). The planes noted on it are $m\,(110)$, and $b\,(010)$ broad, $a\,(100)$ narrow, and the terminal faces are $c\,(001)$, and $s\,(\bar{1}11)$. The crystal is a very well formed one considering its occurrence with magnetite. The sp. gr. is 3.5.

Black pyroxene associated with magnetite occurs on the shore

*2W = in H_2O.

of Crag Harbor near Port Henry, and is said to occur in regular grains and imperfect crystals, (Ref. 21).

Keene, Essex Co.—Black pyroxene in calcite is found at the Weston Mine two miles southwest of Keene. The mineral occurs intermixed with the ore, and also in streaks along the edges of the ore bed. When surrounded by calcite the pyroxene often develops well bounded crystals, the ordinary form being *a* (100), *b* (010), *m* (110), and *c* (001). One small crystal had the combination *a* (100), *b* (010), *m* (110), *s* ($\bar{1}10$), and *o* ($\bar{2}21$). (Pl. XVI., Fig 2). Most of the crystals are decomposed and in section sometimes show an abundant deposition of magnetite grains along the cleavage lines. In section the augite is slightly pleochroic, the colors being green to yellow. It also exhibits an intimate association with garnet, which may perhaps be an alternation product of it. (Ref. 26).

An analysis of the fresher portion of the material gave

	Percentage.	Ratio.	Prop. parts.
SiO_2	56.00	.933	32
FeO	2.40	.034	1
CaO	21.63	.386	13
MgO	5 23	.1307	5
Fe_2O_3	4.70	.029	1
Al_2O_3	8.44	.082	3
Alkalies	.50		
Ignition	.20		
	99.10		

Sp. Gr. 3.5

From the above we obtain the formula $Ca_{13}Mg_5Fe_1\ddot{F}e_2Al_6Si_{32}O_{95}$, which is resolvable into

$$5\,(CaMgSi_2O_6)$$
$$CaFeSi_2O_6$$
$$3\,(CaAl_2SiO_6)$$
$$CaFe_2SiO_6$$

leaving $Si_{12}O_{26}$, which is approximately SiO_2.

Keene, Essex Co.—Dark green prismatic grains of augite are abundant in the limestone near Keene. Their composition is

	Percentage.	Ratio.	Prop. Parts.
SiO_2	56.14	.935	467
FeO	2.85	.039	19
Fe_2O_3	.38	.002	1
Al_2O_3	8.19	.080	40
CaO	17.79	.31	150
MgO	13.67	.34	170
	99.02		

Lyon Mountain, Clinton Co.—The Bostonite dikes near Lyon Mountain contain augite associated with plagioclase and olivine. The augite occurs in irregular grains or idiomorphic crystals, showing *a* (100), *b* (010), and *m* (110). It is usually of a rose tint and shows slight pleochroism. The large, well-formed crystals show a decomposed granular core, and alteration to chlorite is not uncommon. The extinction is about 45° (Ref. 15).

Mt. Marcy, Essex Co.—Diallage is said to occur in broadly foliated dark green masses in the gabbros of Mt. Marcy (Ref. 30). The composition of it is

	Per cent.	Ratio.	Prop. parts.
SiO_2	46.28	.7811	56
TiO_2	.59		
FeO	14.80	.2055	15
CaO	18.78	.3353	24
MgO	8.91	.2227	16
Fe_2O_3	2.21	.0138	1
Al_2O_3	7.38	.0720	5
H_2O	1.115		
	100.065		

Sp. Gr. 3.386

This calculated, gives the formula.

$$Ca_{24}Mg_{16}Fe_{15}Fe_2Al_{10}Si_{56}O_{175}$$

This can not be resolved into a mixture of isomorphous silicates, and it seems therefore more reasonable to consider the ferric iron and alumina to be present as oxides, and we therefore get

$$Ca_{24}Mg_{16}Fe_{15}Si_{56}O_{167}+Fe_2O_3+5Al_2O_3.$$

The pyroxene formula can then be resolved into the following metasilicates:

15 ($CaFeSi_2O_6$)
9 ($CaMgSi_2O_6$)
7 ($MgSiO_3$)

Natural Bridge, Lewis County.—The pyroxenes from this locality are generally embedded in calcite. As Natural Bridge lies almost on the boundary line between Lewis and Diana Townships, it is probable that many of the crystals labeled "Diana" come from the former locality.

A number of augite crystals were collected by the writer at

Natural Bridge, but none of them showed any good terminal faces. The faces of the prismatic zone were usually easily recognizable and smooth. The crystals are dark green to black. Only three specimens have been found in the collections examined, which were labeled as having come from this locality. One is a group of grayish black crystals in the collection of Hamilton College, showing the forms *a* (100), *b* (010) narrow, *m* (110) large, *u* (111), *o* ($\bar{2}21$) and *s* ($\bar{1}11$) small. (Pl. XV, Fig. 9.) The pyramid faces are etched with longitudinal interrupted striations, those on *u* (111) being parallel to *a* (100), while those on *o* ($\bar{2}21$) are parallel to *b* (010). The other two specimens above mentioned are single crystals in the collection of Columbia University, School of Mines. They are black with a greenish coating, and doubly terminated. The combination of forms noted on both is *a* (100) and *b* (010) very narrow, *m* (110) large, *u* (111), *s* ($\bar{1}11$), *o* ($\bar{2}21$) and *z* (021) very small. These crystals are very like the form usually labeled as having come from Diana.

Oxbow, Jefferson Co.—Pyroxene occurs on the shore of Vrooman's Lake (Ref. 2, p. 290), near Oxbow. It is of a green color and associated with crystallized mica. The forms recorded are *a* (100), *b* (010) narrow, *m* (110) broad, *c* (001), and *s* ($\bar{1}11$). The only specimen which the writer has seen from this locality is in the Root Collection at Hamilton College. The crystals are similar to those described by Beck and show the planes *a* (100), *b* (010), *m* (110), *u* (111), *s* ($\bar{1}11$), and *o* ($\bar{2}21$).

Pitcairn, St. Lawrence Co.—The green augites from this locality have bright prismatic faces and striated terminal ones. The crystals occur singly or in clusters and are invariably intergrown with microcline and albite.* A prismatic cleavage and basal parting are generally present, though the former is only seen in thin sections. The crystals are mostly two to three inches long and about an inch thick. Doubly terminated individuals are not rare, and a common habit is a flattening parallel to *b* ($\bar{0}10$). The terminal faces are always covered with interrupied striæ. The most general combination of forms is *a* (100), *b*(010), *m* (110), *u* (111), *s*($\bar{1}11$), and *o* ($\bar{2}21$) (Pl. XIII, Fig. 7). The basal pinacoid *c* (001) is not uncommon, and *p* (101) was noticed on one specimen in the Columbia University collection. Another

*L. M. Luquer, School of Mines Quarterly, XIV, p. 328.

combination of forms is m (110), b (010), c (001), u ($\bar{1}11$), o (221), and s ($\bar{1}11$).

A second variety in the same collection is a cluster of very small glassy crystals of a grayish white color. They are $\frac{1}{3}$–$\frac{1}{2}$ in. long, with the ends rounded, but the faces in the prismatic zone are a (100), m (110), b (010). An analysis of the common green variety gave:

	Percentage.	Ratio.	Prop. parts.
SiO_2	54.57	.9061	50
FeO	1.301	.018	1
CaO	21.42	.3825	21
MgO	18.56	.464	26
Al_2O_3	3.09	.0302	2
Alkalies	.40		
Ignition	.15		
	99.39		

From the above we obtain the formula

$$Ca_{21}Mg_{26}Fe_1Al_4Si_{50}O_{154}, \text{ or } (Ca_{21}Fe_1Al_4)Mg_{26}Si_{50}O_{154}.$$

This is close to diopside in composition but, on account of the high percentage of alumina is placed under augite.

Sp. Gr. 3.20.

C: $\mathfrak{c}$	41° 30′
	Na.
a	1.6806
β	1.6843
γ	1.7036
$\gamma - a$	.0230
2H	78° 57′
2V	59° 40′

Port Henry, Essex County.—Pyroxene of a jet black color occurs in close association with the magnetite at this locality. Massive and granular specimens are not uncommon, but crystals are rare. There is a fine group of crystals in the collection of Prof. Kemp, which were found in the Cheever mine at Mineville, four miles northwest of Port Henry. The pyroxene is associated with granular magnetite and labradorite, and occurs on the edge of the orebody. When it is intergrown with the magnetite it shows no crystal faces, but when surrounded by the feldspar well developed ones occur. The crystals (Pl. XIV, Fig. 8) are about half an inch long and nearly the same thickness. In the pris-

matic zone are a (100), b (010) and m (110) equally developed, but the latter may become so narrow as to give the crystal a square appearance. The terminal faces are u (111) and s ($\bar{1}11$), the latter often so extended as intersect the front prism faces. A basal parting is sometimes present as well as a lamellar structure. The crystals have smooth but dull faces and are emerald green in the thinnest sections. They show a strong pleochroism. C:c is 52° and the specific gravity is 3.60.

A section thin enough to measure the angle of the optic axes could not be obtained, as the material is so opaque, nor could any determinations be made of the indices of refraction by the Kohlrausch method, even with using phenylsulphide.

The composition of this black augite is:

	Percentage.	Ratio.	Prop. parts.
SiO_2	49.12	.8186	37
FeO	15.98	.2220	10
CaO	17.30	.309	14
MgO	6.06	.151	7
Fe_2O_3	3.53	.0220	1
Al_2O_3	7.49	.0731	4
	99.48		

Sp. Gr. 3.60.

From this analysis we obtain the formula $Ca_{14}Mg_7\dddot{F}e_{10}Fe_2Al_4Si_{37}O_{117}$ or

$$4\,(CaMgSi_2O_6)$$
$$10\,(CaFeSi_2O_6)$$
$$2\,(MgAl_2SiO_6)$$
$$MgFe_2SiO_6$$

leaving Si_6O_{15}, which is approximately SiO_2

Rogers Rock, Essex Co.—A greenish gray variety of augite of slender prismatic form with the planes a, b and sometimes m is found at this locality (Ref. 2). One specimen was 7–8 inches long and of proportionate diameter. The crystals which are rarely well formed are associated with feldspar and titanite. They are sometimes intergrown with the latter.

An analysis of this augite by Seybert (Ref. 45) gave

	Percentage.	Ratio.	Prop. parts.
SiO_2	52.66	.8676	14
FeO	12.30	.1708	3
CaO	23.33	.4166	7

	Percentage.	Ratio.	Prop. parts.
MgO	5.73	.0932	2
Al_2O_3	6.66	.065	1
H_2O	.33		
MnO	tr		
	101.01		

This gives $Ca_7Mg_2Fe_3Al_2Si_{14}O_{43}$ or approimately

3 ($CaFeSi_2O_6$)
2 ($CaMgSi_2O_6$)
$CaAl_2SiO_6$
$CaSiO_3$

A brown and black granular pyroxene is associated with the crystallized material and the composition of this as analyzed by the same author was found to be

	Percentage.	Ratio.	Prop. parts.
SiO_2	51.00	.85	22
FeO	14.43	.20	7
CaO	23.00	.4107	10
MgO	6.26	.1545	5
Al_2O_3	3.00	.0293	1
H_2O	.66		
MnO	tr		
	98.35		

This gives $Ca_{10}Mg_5Fe_7Al_2Si_{22}O_{69}$ or approximately

7 ($CaFeSi_2O_6$)
3 ($MgCaSi_2O_6$)
$MgAl_2SiO_6$
$MgSiO_3$

Rossie, St. Lawrence Co.—Most of the individuals from this locality are large green crystals, with smooth dull faces and glassy interior. Those specimens in the collections of Columbia University have evidently come from a vein in the anorthosite at its contact with the limestone. Most of the crystals exhibit the common basal parting, and the combination of faces observed on all is *a* (100), *b*(010), *m* (110), *u* (111), *o* ($\bar{2}21$), and *s* ($\bar{1}11$); *c* (001), also occurs on some. One figured by Prof. Penfield in Dana's System of Mineralogy shows *a* (100), *b* (010), *m* (110), *u* (111) and *o* ($\bar{2}21$). (Pl. XVI., Fig. 5).

Prof. G. H. Williams has described a crystal of pyroxene collected at Grassy Lake near Rossie, (Ref. 58), and which is now

in the collection of the National Museum at Washington. It is $3\frac{1}{2}$ inches long, and perfectly formed. The interesting feature about it is the hemihedral distribution of the planes. At the upper end are the planes u (111) very large, s ($\bar{1}11$) and o ($\bar{2}21$), at the lower end p (101), c (001), u (111) small, s ($\bar{1}11$) and o ($\bar{2}21$). In the prismatic zone are a (100), b (010), m (110). On Pl. XIV., Fig. 2 there is given a drawing of this crystal copied from Prof. William's paper.

Russel, St. Lawrence Co.—Many of the forms from Russel are stout greenish black often doubly terminated individuals, of variable size. They have moderately smooth prismatic faces, but much pitted terminal ones. The ordinary combination of planes is a (100), b (010), m (110), p ($\bar{1}01$) and u (111) (Pl. XV., Fig. 7); o ($\bar{2}21$), was seen on one specimen. This same form of crystal is sometimes labeled Pierrepont. A parting parallel to a (100) and c (001) is present. One form in the Columbia University collection is very flat parallel to b (010) and shows only the planes b (010) and m (110). (Pl. XIII., Fig. 3). It is much decomposed.

Thousand Islands.—Many of the diabase dikes of these islands contain augite, which in section is of a brownish pink color, with faint pleochroism. The prismatic cleavage is pronounced and twinning abundant. The augite alters to pale green chlorite or to a yellowish brown aggregate resembling serpentine. (Ref. 50.)

Chilson Hill, Ticonderoga, Essex Co.—The rock at this locality is a gneiss containing much calcite. The minerals found in the former are scapolite, quartz, graphite, apatite, titanite and pyroxene. These latter which have been described by F. L. Nason (Ref. 39), are peculiar on account of the large size of the crystals, and the inclusions which they carry. Two specimens in the collection of the New York State Museum at Albany are said to be the largest ever found in the State and perhaps in the world. The larger of the two measures 36 inches in circumference and is 18 inches long, and weighs over 100 pounds, while the second is 18 inches in circumference and 12 inches long. The faces present are a (100), b (010) and m (110), all equally developed. There are no terminal faces, the flat ends of the crystals being due to parting planes. The crystals are commonly lamellar and badly decomposed, and the faces are roughened by numerous small interrupted striæ. Calcite often penetrates the crystals and together with quartz often forms rounded included masses. Graph-

ite is also a common associate and scales of it deeply penetrate the crystals.

The gabbros of the eastern Adirondacks contain a green augite in great abundance. Deep pink garnets occur in close association with it and the same cracks often traverse both minerals. As has been already mentioned the garnet is probably an alternation product. Reaction rims of hornblende around the augite often separate it from the feldspar. (Ref. 29). Interstitial allotriomorphic augite occurs in the diabase dikes, south of Port Kent, Essex Co., (Ref. 24), and also in the diabase, lamprophyre and camptonite dikes of Willsboro and Essex township of Essex Co., (Ref. 54).

2. The Highland Area.

Bradley Mines, Monroe Township, Orange Co.—These mines are about three miles northeast of Arden. The bed of magnetite is cut by a diorite and porphyry dike. Associated with the ore are large quantities of calcite enclosing crystals of magnetite, apatite, augite and titanite, as well as some pyrrhotite. The augite is in granular masses or in short, stout crystals of a dark green color. They all show the planes *a* (100), *b* (010), and *m* (110) in the prismatic zone, but the terminal faces are too rounded to admit of positive identification.

Coldspring, Putnam Co.—Beck (Ref. 2, p. 294) states the occurrence of pyroxene at this locality, but gives no further information about it.

Greenwood Furnace, Orange Co.—This is another indefinite locality. There are no mines or mineral localities at the former site of Greenwood Furnace, now called Arden, and most of the ore used was obtained from the Oneil Mine, which has furnished an abundance and variety of mineralogical specimens in past years, so that the crystals labeled Greenwood Furnace very probably came from there. There is also a possibility of their having come from the Bradley Mines, in Woodbury Township, about three miles northeast of the old Greenwood Furnace.

Beck (Ref. 2) states, however, that pyroxene associated with crystallized mica has been found one-half mile east of Greenwood Furnace. It is green, gray-green and ash-gray. The combination of forms are *a* (100), *m* (110), *e* (011); *a* (100), *m* (110), *e* (011), *c* (001); *a* (100), *b* (010), *m* (110), *c* (001); *a* (100), *b* (010),

$e(011)$, $a(001)$, $p(\bar{1}01)$. One crystal found was 6 in. long and 10 in. in circumference.

There are a number of specimens in the collection of the New York State Museum which have the usual habit of Orange County crystals, with the faces $a(100)$, $b(010)$, $m(110)$, $c(001)$, and $e(011)$.

The specimens in the Columbia University collection are short, stout greenish black crystals, of the combination $a(100)$, $b(010)$, $m(110)$, $c(001)$, and $s(\bar{1}11)$. One fresh piece was found which in section gave an extinction of 42° 40′. This is very close to that recorded by Doelter (Ref. 14). The color in section was light green.

Doelter has described some augites from Greenwood Furnace (Ref. 14), in which the extinction on $b(010)$ was 42° 20′ and on $m(110)$ 31° 50′. The crystals were prismatic individuals with their faces somewhat roughened by alteration, but the light green interior portion of them was perfectly fresh. The composition of this latter portion was:

SiO_2	49.18
FeO	2.55
CaO	20.62
MgO	16.83
Fe_2O_3	5.05
Al_2O_3	5.09
	99.52

Sp. Gr. 3.295.

The above calculated gives a formula $Si_{47}Ca_{21}Mg_{24}Al_3\dddot{F}e_2Fe_2O_{156}$, which Doelter considers as consisting of the following silicates:

19 (MgO, CaO, 2 SiO_2)
2 (CaO, FeO, 2 SiO_2)
2 (Fe_2O_3, MgO, SiO_2)
3 (Al_2O_3, MgO, SiO_2)

He then points out that Ca : Mg : Fe : : .368 : .420 : .035 or as 11.5 : 12 : 1, hence Ca<Mg+Fe, as he claims is the case with augites.

Highland Township, Orange Co.—Granular pyroxene is not uncommon around many of the small ore bodies found in the township.

There is one specimen of granular augite in the Columbia

University collection, from West Point. The exact location is unknown. It very closely resembles that found with the ore near the Weston mine in Essex County.

Highlands, Putnam Co.—Pyroxene occurs associated with amphibole and titanite at the pyrite mines on the east side of Anthony's nose. The writer found one large decomposed crystal, with prismatic faces and a lamellar structure caused by basal parting.

A large stout augite crystal, much decomposed and bearing the label "Highlands of the Hudson," is in the Cornell University collection. It has the common habit of Orange county crystals, with the combination of forms *a* (100), *b* (010), *m* (110), *c* (001) and *e* (011), (Pl. XIV, Fig. 5). Attached to it are several smaller ones with the planes *s* ($\bar{1}11$) and *u* (111).

A fine black doubly terminated crystal of the form shown in Pl. XV, Fig. 3, and labeled "Orange Co.," is in the Williams College collection.

Monroe Township, Orange Co.—It is unfortunate that the term Monroe on many pyroxene labels indicates nothing more definite than Monroe township, for there are several localities within the township where pyroxene occurs, and when the term is found on labels of specimens which were collected over five years ago, it may also refer to localities within the townships of Tuxedo and Woodbury, which were formerly included in Monroe township. In the present township the two localities which have furnished most of the pyroxene specimens are the Oneil and the Clove Iron mines, both southeast of Monroe village.

The majority of the pyroxene crystals which the writer has seen from this township are large black or greenish black individuals, with dull roughened faces and more or less decomposed. One of the best specimens is in the collection of Cornell University. It is a black doubly terminated crystal, about $1\frac{1}{4}$ in. long, and $\frac{3}{4}$ in. thick. The faces present are *a* (100), *b* (010), *m* (110), *u* (111), *s* ($\bar{1}11$), *o* ($\bar{2}21$) and *p* (101) (Pl. XIII, Fig. 2). The faces in the prism zone have an almost submetallic lustre and are striated with lines parallel to the base, which probably represent parting planes.

Another group of black crystals in the same collection shows the forms *a* (100), *b* (010), *m* (110), *c* (001) and *e* (011). (Pl. III, Fig. 3). This combination is a very common one in Orange

county. The crystals of this group vary in length from a fraction of an inch to several inches. The base is often very narrow. Still another specimen from Monroe township in the same collection shows the combination a (100), b (010), m (110), u (111). s ($\bar{1}11$), o ($\bar{2}21$) and z (021), the latter very small, (Pl. XIII., Fig. 5).

There is in the Columbia University collection a single crystal from Monroe township. It is black with rough faces and about an inch long. It is tabular parallel to a (100) and shows the forms a (100), b (010), m (110) and e (011), (Pl. XV, Fig. 1). Growing out of one end is a smaller crystal of the same form and habit, the axes of the two being parallel. The larger individual is twinned parallel to a (100), but the smaller one is not.

Montrose, Westchester Co.—A gray or red augite associated with plagioclase occurs in the gabbros of the Cortlandt Series south of Peekskill. (Ref. 57 and 59). Both colors often appear in the same individual. The mineral shows no pleochroism, but frequently has a strong orthopinacoidal parting, and the metamorphism which the rock has undergone has often produced a peripheral granulation of the augite. The diorites of this region show excellent examples of the passage of pyroxene to compact brown hornblende.

The limestone around the Cortland area often contain a granular lime bearing pyroxene along and the near contact, and green pyroxene is similarly developed in the limestones at Stony Point on the West Shore Railroad. It is here associated with light green hornblende, zoisite, titanite, and much scapolite.

Rosetown, Rockland Co.—Green augite is a common constituent of the diorites near this locality (Ref. 22). It is closely associated with less basic hornblende which was formed before it. An analysis of this augite made by Prof. Kemp gave:

	Percentage.	Ratio.	Prop. parts.
SiO_2	46.00	.76	10
Al_2O_3	14.80	.134	2
Fe_2O_3	11.20	.07	1
MgO	4.75	.119	2
CaO	15.52	.277	4
Na_2O	3.20		
K_2O	4.70		
	100.17		

Tuxedo Township, Orange Co.—At the Sterling Iron Mines

dark green granular pyroxene is abundant, associated with hornblende, epidote, red and white feldspar, biotite and tourmaline. Much of the gneiss in the vicinity of the orebody is pyroxenic.

Tilly Foster, Putnam Co.—Although many mineral species have been described from the Tilly Foster Iron Mines, pyroxene has not yet been recorded from there. It is not common however. There is one group of small crystals in the collection of Columbia University.

The crystals are about $\frac{1}{4}$ inch long, green and transparent, with smooth faces. Some show a basal parting. The general combination of planes is $a\,(100)$ and $b\,(010)$ narrow, $m\,(110)$ broad, $c\,(001)$ large, $u\,(111)$, and $s\,(\bar{1}11)$, the latter so extended as to intersect the front prism faces (Pl. XIV, Fig. 12). The crystals are embedded in calcite.

A second and unique specimen is in the collection of Mr. F. L. Nason, of New Brunswick, N. J. It is a single individual about $\frac{3}{4}$ inch long and $\frac{1}{4}$ inch thick, and tabular parallel to b (010). There are terminal faces at one end, but the other is broken off. The planes of the prismatic zone are smooth and bright, while the terminal ones are slightly pitted. The combination of forms is $a\,(100)$, $b\,(010)$, $m\,(110)$, $f\,(310)$, $o\,(\bar{2}21)$ and $p\,(\bar{1}01)$ (Pl. 1, Fig. 1.) A very small dome face probably $e\,(011)$ is present. The orthoprism $f\,(310)$ is very narrow and is of interest as it is not known to occur on any other pyroxene from this State. It was determined with the reflection goniometer.

The extinction as measured through the transparent crystal is 41°11′.

Sp. Gr. 3.6

There have been recently added to the Columbia University collection some large crystals from this locality. The largest is a prismatic individual about two inches long and without terminations. It is permeated throughout with grains of pyrrhotite. Another but well-formed crystal, is about one inch long, $\frac{7}{8}$ inch broad and $1\frac{1}{2}$ inch thick. The faces are smooth and fairly bright in places. A strong basal parting is present and the crystal is slightly tabular parallel to $b\,(010)$. There is also an abundant deposition of fine grains of pyrrhotite along the parting planes. The following combination of forms occurs on this crystal and nearly all the smaller ones found attached to it. $a\,(100)$, $b\,(010)$ broad, $m\,(101)$, $c\,(001)$ small, $p\,(\bar{1}01)$ very large, $u\,(111)$ small,

$s(\bar{1}11)$ long and narrow, and $o(\bar{2}21)$ small, (Pl. IV, Fig. 9.). $z(021)$ was noticed on the large crystal, but the face is a very small triangular one. The small crystals are often transparent and exhibited a beautiful green color similar to the one in Mr. Nason's collection.

The pyroxene at Tilly Foster is associated with a large lenticular bed of magnetite occurring in the gray gneiss. In the lower portion of the orebody is a great mass of massive hornblendic rock. The associated minerals are serpentine, chondrodite, fluorite, garnet, pyrrhotite, amphibole, ripidolite, tourmaline and calcite.

Two Ponds, Monroe township, Orange Co.—Beck states that pyroxene of a gray-green, green or brown color occurs in limestone at Two Ponds, (Ref. 2, p. 291). It is associated with titanite, zircon and scapolite and is both massive and crystallized. The crystals are usually only prismatic with rough ends, but other combinations are $a(100)$, $m(110)$, $b(010)$ and $e(011)$; $a(100)$, $m(110)$, $b(010)$, $c(100)$ and $p(\bar{1}01)$; and $m(110)$, $p(\bar{1}01)$, $c(001)$.

Warwick Township, Orange Co.—Pyroxene is very abundant, near Edenville and Amity, and around Mts. Adam and Eve, a short distance to the north. It occurs either in the contact zones between the granite and the limestone or else disseminated through the latter at some distance from the contact. The conditions in passing from the granite to the limestones are as follows: (Ref. 23) Near the contact the granite either becomes an aggregate of green pyroxene and scapolite or a granite like zone formed of the two is present. The limestone near the contact is also charged with silicates in bunches or scattered through it. These bunches are composed chiefly of brownish-green hornblende, dark brown biotite or phlogopite, green pyroxene, (light green in section), titanite, pyrite, calcite and some scapolite. Chondrodite is also present sometimes and with it spinel. At one locality where the granite and limestone are in actual contact, the former contains pyroxene and scapolite and the latter coarsely crystalline calcite and phlogopite. Fifteen feet from the contact the granite has green pyroxene associated with quartz and microcline. On the southwest side of Mt. Adam, the scapolite zone contains large prisms of scapolite and pyroxene, the latter about half an inch in diameter and often several inches long. The

presence of fluorite, chondrodite and warwickite indicate mineralizers.

The pyroxene crystals occurring in the scapolite zone are dark green, and in section light green. The faces of the prismatic zone are *a* (100), *b* (010) and *m* (110), equally developed; they are smooth, but dull. As a rule terminal faces are rare, but when present the usual combination of forms is *u* (111), *o* ($\bar{2}21$), *s* ($\bar{1}11$), *c* (001) and *p* ($\bar{1}01$). The greater development of *p* ($\bar{1}01$) over *c* (001) is a characteristic feature of these crystals. A basal parting due to twinning is often apparent, especially in sections, and a prismatic cleavage is not rare, but likewise is often only to be seen in sections.

Pl. II, Fig. 7, shows the prismatic form and Pl. II, Fig. 6, the terminated form of these pyroxenes.

The composition of this dark green augite is:

	Percentage.	Ratio.	Prop. parts.
SiO_2	52.01	.866	206
FeO	6.86	.094	22
CaO	26.90	.480	100
MgO	11.26	.281	70
Fe_2O_3	.67	.0042	1
Al_2O_3	5.82	.0568	14
Alkalies	.50		
	99.92		

Sp. Gr. 3.6.

The formula obtained from the analysis is Ca_{100}, Mg_{70}, Fe_{22}, $\ddot{F}e_2$, Al_{28}, Si_{206}, O_{649}, or

22 (Ca Fe Si_2O_6).
Mg $\ddot{F}e_2$ SiO_6:
11 (Ca Al_2 SiO_6).
3 (Mg Al_2 SiO_6).
66 (Ca Mg Si_2O_6).
$c : t = 45° 15'$

Beck (Ref. 2) mentions the occurrence, one mile northwest of Edenville, of dark green or black crystals of pyroxene associated with apatite, hornblende, titanite and calcite. A form is also said to occur at Warwick Mountain, which has the forms *a* (100), *b* (010), *m* (110), *c* (001) and *e* (011).

This same township, Warwick, has furnished the well-known tabular crystals of Leucaugite which have attracted so much

attention among mineralogists. Beck (Ref. 2) gives their occurrence as $2\frac{1}{2}$ miles north of Edenville. The crystals are yellowish gray and have roughened faces. They are broadly flattened parallel to c (001) and show striations parallel to the base. In describing them Beck mistook the base for the orthopinacoid. The usual form of the Leucaugite is a combination of a (100), b (010), m (110), c (001), u (111), s ($\bar{1}11$) and o ($\bar{2}21$) (Pl. XIV, Fig. 1). G. V. Rath mentions a twin crystal (Ref. 39) of more prismatic habit, formed according to the common law, and which has the orthodome p ($\bar{1}01$) in addition to the above mentioned faces. The striations parallel to c (001) were at first considered by him to be due to irregularities of growth, but he subsequently correctly ascribed them to twinning. He also notes the surface alteration of these crystals to amphibole.

These tabular forms were also described by Des Cloiseaux (Ref. 12) who figured one with a hemihedral development in the direction of the vertical axis, there being at one end the forms p ($\bar{1}01$), s ($\bar{1}11$), o ($\bar{2}21$), e (011) and μ (121) and at the other end p ($\bar{1}01$), u (111) and a (312).

Prof. G. H. Williams has described a crystal from the Root collection which was of the usual habit with the forms, c (001), u (111), s ($\bar{1}11$), o ($\bar{2}21$), m (110), b (010), a (100), but below, toward the front, there was only o ($\bar{2}21$) and p ($\bar{1}01$), showing it to be hemihedral in the direction of the vertical axis. The lower back quarter is just like the front but reversed so that the lower half is a twin (Pl. XIV, Fig. 3).

The ordinary tabular form is to be seen in nearly every large collection. The Leucaugite also occurs in white granular masses in calcite as represented by several specimens in the collection of Columbia University.

Other specimens in the same collection and from Warwick township are a red-brown granular pyroxene from Amity, and a greenish-gray cleavage specimen with numerous small scales of graphite scattered through it.

Beck, (Ref, 2), notes a black pyroxene from Rocky Hill near Warwick. Specimens probably from this locality are in the Columbia University collection. They are small interlacing prismatic individuals about two-thirds of an inch long. A few of them show terminal faces probably unit pyramids, but they are too rounded for determination.

Much of the serpentine found at Amity may result from the alternation of pyroxene. (Ref. 33).

Several analyses of pyroxenes from Edenville have been published, but little information is given concerning the material from which they are made, or the exact locality. One of these is an analysis of pyroxene from Edenville, by Brewer, as follows (Ref. 4):

	Percentage.	Ratio.	Prop. parts.
SiO_2	36.94	.615	19
FeO	36.03	.109	14
CaO	12.71	.227	17
MnO	2.24	.0312	1
Al_2O_3	11.22	.109	4
	99.14		

This analysis gives

$Ca_7Fe_4MnAl_8Si_{19}O_6$ which we may consider as a mixture of

$4(CaFeSi_2O_6)$

$3(CaAl_2SiO_6)$

$Al_2Si_3O_9$

leaving $MnSi_3O_{11}$ or approximately $Mn_2Si_2O_6+3SiO_2$

Leucaugite.

Amity, Orange Co. Leucaugite of light brown color occurs in grains or rounded crystals, associated with calcite and seybertite, and is identical with leucaugite from Bathurst, W. Canada, (Ref. 31.)

	Percentage.	Ratio.	Prop. parts.
SiO_2	50.05	.834	238
CaO.	25.63	.458	131
Mgo	14.48	.362	103
Fe_2O_3	.56	.0035	1
Al_3O_2	7.16	.07	20
H_2O	1.66		
	99.54		

Sp. Gr. 3.26

From this analysis we obtain the formula

$Ca_{131}Mg_{103}\dddot{F}e_2Al_{40}Si_{238}O_{773}$ which is made up of

$Mg\,Fe_2\,SiO_6$

$20(Ca\,Al_2\,SiO_6)$

$Mg_{102}\,Ca_{111}\,Si_{216}\,O_{647}$

the latter being approximately $Mg\,Ca\,Si_2O_6$

The dolomitic limestones of Westchester, Dutchess and New York Counties often contain crystals of white pyroxene in great

abundance. These are almost invariably of the same habit, with a strong flattening parallel to the orthopinacoid. They occur as single individuals in zones or sometimes as Mr. F. L. Nason informs me, in rounded masses. The crystals are colorless to milkwhite and translucent to opaque. They might, perhaps, be classed with the diopsides judging from the appearance of some, but the higher percentage of alumina classes them with augite, and it seems to the writer that the variety name of Leucaugite may be appropriately applied to them.

Sing Sing, Westchester Co.—The usual combination of forms is a (100), b (010), m (110), v ($\bar{2}21$), and o ($\bar{2}21$) (Pl. XV, Fig. 4) less commonly c (001); p ($\bar{1}01$) is very rare and was noted on one specimen in the collection of Columbia University. u (111) is equally rare. In rare cases a (100) and b (010) are wanting or are very narrow, so that the crystal has a square appearance. One specimen in the same collection shows v (221) but not o ($\bar{2}21$), (Pl. XV, Fig. 2.)

A strong basal and orthopinacoidal parting, both due to twinning are present, but the latter is rare. The crystals are frequently superficially altered to tremolite, and nearly all are stained exteriorly with limonite. The prison quarry has yielded the best specimens in former years, but very few are found now. There is a granite dike cutting the limestone a few hundred feet south of the quarry, but there is no evidence to show that the crystals are the result of contact action.

An analysis was made of some nearly transparent pieces of a crystal from Sing Sing, with the following results:

	Percentage.	Ratio.	Prop. parts.
SiO_2	53.30	.8883	80
FeO	.80	.0111	1
CaO	24.82	.4432	40
MgO	16.18	.4045	36
Al_2O_3	4.11	.0401	4
H_2O	.15		
	99.36		

Sp. Gr. 3.18, Ries.
3.10, Beck.

The above calculated gives $Ca_{40}Mg_{36}Fe_1Al_8Si_{80}O_{249}$ or approximately,

$Ca\ Fe\ Si_2O_6$.
4 ($Ca\ Al_2\ SiO_6$).
35 ($Ca\ MgSi_2O_6$).
$Mg\ SiO_3$.

C: $\mathfrak{c}$.	40°	
a	1.6778	
β	1.6848	Na.
γ	1.7025	
$\gamma - a$	.0247	
2 W =	75° 50′	
2 V =	59°	

Kingsbridge, New York Co.—Most of the crystals from the dolomite are considerably decomposed and replaced by granular dolomite. They resemble the Sing Sing specimens exactly. There is one exceptionally large one in the Columbia University collection. It is four inches long and two inches wide and has a smaller one penetrating it.

Paterson, Dutchess Co.—The quarries northwest of the station have furnished a considerable number of these tabular leucaugites. Mr. Nason has in his collection a fine group of small glassy crystals from this locality. They show the usual combination, a (100), b (010), m (110), v (231), o ($\bar{2}21$) c (001), and p ($\bar{1}01$).

According to Beck (Ref. 2) crystals twinned parallel to both a and b (010) have been found in Knapp's quarry, at Paterson. The crystals often have the granular structure of the dolomite, and are sometimes broken into several pieces, the dolomite filling in the breaks.

Phillipstown, Putnam Co.—According to Beck (Ref. 2) white pyroxene has been found on the Hustis farm. It is translucent and sometimes light green. Serpentine and pale green apatite are occasionally associated with it.

Hudsonite (Hedenbergite?)

West Point, Orange Co.—A black lamellar variety of pyroxene associated with quartz, black or bronze mica, and feldspar occurs on the west bank of the Hudson river about three miles above West Point. A specimen analyzed by Vanuxem, (Ref. 53) gave:

	Percentage.	Ratio.	Prop. parts.
SiO_2	51.00	.850	25
CaO	21.00	.375	11
MgO	11.50	.287	9
Fe_2O_3	11.53	.072	2
Al_2O_3	3.50	.034	1
H_2O	1.00		
	99.53		

Sp. Gr. 3.5, Beck.

3.43–3.46, Brewer.

This analysis gives the formula $Ca_{11}Mg_9Fe_4Al_2Si_{25}O_{75}$ which does not appear to be a simple mixture of isomorphous silicates, but to consist of 9 $(CaMgSi_2O_6)+2\ Fe_2O_3+Al_2Si_3O_9$, leaving $Ca_2Si_3O_9$ or approximately 3 $(CaSiO_3)$. From the above formula deduced from Vanuxem's analysis the hudsonite could not be classed with hedenbergite, but the two analyses of Smith and Brush given below, place it intermediate between hedenbergite and augite.

The analysis of Smith and Brush (Ref. 47), is as follows:

SiO_2	39.30	38.58
Al_2O_3	9.78	11.05
FeO	30.40	30.57
CaO	10.39	10.32
MgO	2.98	3.02
MnO	.67	.52
K_2O	2.48	4.16
Na_2O	1.66	
H_2O	1.95	1.95
	99.61	100.17

These analyses of Smith and Brush cannot be calculated out in a satisfactory manner. They both, however, contain a considerable percentage of the hedenbergite molecule.

Smith and Brush claimed that their analyses showed that the Hudsonite was a variety of augite. Kengott, on the other hand, thought that according to the analyses Hudsonite belonged to the amphiboles. Both Dana and DesCloiseaux placed it among the augites on account of the cleavage. Kengott notes (Ref. 27) that Hudsonite has a cleavage parallel to the prism of 124°, but is near hedenbergite in composition. Dana, in commenting on this, states that none of the specimens which he has seen show such a prism angle.

From Vanuxem's analysis this mineral would be classed as an augite, but the high percentage of ferrous iron in the analyses of Smith and Brush tend to class it with hedenbergite. It does not agree with the theoretical composition of hedenbergite in that it contains too small a percentage of lime, and is, therefore, as stated above, intermediate between augite and hedenbergite.

There is a small specimen of this mineral in the Columbia University collection and another fine specimen in the collection of the New York State Museum at Albany.

Sahlite.

Willsborough, Essex Co.—A granular green pyroxene associated with granular garnet and wollastonite occurs in a vein at this locality (Ref. 2, p. 289). The grains are nearly transparent and the material has a semivitreous lustre. An analysis by Seybert gave:

	Percentage.	Ratio.	Prop. parts.
SiO_2	50.33	.839	60
FeO	20.40	.283	20
CaO	19.33	.345	25
MgO	6.83	.170	13
Al_2O_3	1.53	.914	1
H_2O	.66		
MnO	tr		
	99.08		

Sp. Gr. 3, 377.

The above analysis corresponds to the formula $Mg_3\ Fe_{20}\ Ca_{25}\ Al_1\ Si_{60}O_{179}$, which is intermediate in composition between sahlite and hedenbergite, but nearer to the former.

An analysis of pyroxene from Edenville, analyzed by G. W. Hawes (Ref. 19), was published, together with one of hornblende from the same locality, as proofs that "when parallel growths of two minerals occur, which under different conditions can be made to crystallize from the same material, chemical composition determines the difference."

	Percentage.	Ratio.	Prop. parts.
SiO_2	51.05	.85	100
Al_2O_3	2.02	.019	2
FeO	12.18	.169	20
CaO	22.07	.394	47
MgO	10.02	.250	30
Fe_2O_3	1.36	.0085	1
MnO	.12	.016	2
H_2O	.34		
	99.10		

This pyroxene also approximates sahlite in composition giving the formula

$$Mg_{30}Fe_{20}Ca_{47}Al_2Si_{100}O_{303}+Fe_2O_3$$

Diopside.

DeKalb, St. Lawrence Co.—The crystals from this locality are usually transparent and light green to colorless. They vary in size from a half inch to an inch and a half long. No doubly terminated ones have been seen. The faces of the prismatic zone are mostly smooth and bright, but sometimes have longitudinal striations. The terminal planes are invariably pitted, those on $u(111)$ and $\triangle(\bar{3}11)$ being more like deep interrupted striæ. A tabular habit parallel to $b(010)$ is frequent. Several combinations of forms occur, but the most general is $a(100)$, $b(010)$, $m(110)$, $c(001)$, $u(111)$, $s(\bar{1}11)$, $o(\bar{2}21)$, $\triangle(\bar{3}11)$ and sometimes $p(\bar{1}01)$ (Pl. XIII, Fig. 9). Other combinations are $a(100)$, $b(010)$, $m(110)$, $c(001)$, $u(111)$ (Pl. XVI, Fig. 4); $b(010)$, $m(110)$ and $u(111)$ (Pl. XVI, Fig. 8); and $u(111)$, $o(\bar{2}21)$, $c(001)$, $a(100)$, $b(010)$ and $m(110)$ (Pl. XVI, Fig. 3). The plane v is present on a few crystals, but is always very narrow. The clinodome $e(011)$ was seen on two crystals, one in the private collection of Prof. Egleston, and the other in the collection of Prof. A. H. Chester. It is a small triangular face. A common habit of the DeKalb diopsides is the unequal development of $u(111)$, the left-hand face being often large, while the right-hand one is so narrow as to appear wanting.

No basal parting has been observed in the fresh crystals, but is universally present in the altered ones, which are of a greenish white color and opaque.

The DeKalb diopsides have been described by V. Rath (Ref. 38), who noted the forms $a(100)$, $b(010)$, $m(110)$, $c(001)$, $u(111)$ and $v(221)$. He states that they are often intergrown with hornblende and also mentions a twinning parallel to $a(100)$. The pyramid $v(221)$ was first recorded by him from this locality.

The two forms of diopside figured by Prof. Penfield in Dana's System of Mineralogy are the same as the first two mentioned above by the writer.

This diopside is among the purest of pyroxenes found with the State, as the following analysis shows.

SiO_2	54.86
FeO	1.30
CaO	24.13
MgO	18.14
Al_2O_3	.75
Alkalies	.35
Ign.	.10
	99.89

Sp. Gr. 3.29.

This corresponds very closely with an analysis made by E. L. Sperry and given in Dana's System of Mineralogy, which is:

	Percentage.	Ratio.	Prop. parts.
SiO_2	55.12	.9186	235
Al_2O_3	.40	.0039	1
FeO	1.12	.0155	4
CaO	25.14	.449	115
MgO	18.15	.4537	116
K_2O	.02		
Na_2O	.45		
Ign	.17		
	100.47		

$=Ca_{115}\,Mg_{116}\,Fe_4\,Al_2\,Si_{235}\,O_{708}$.

Sp, Gr. 3.286.

The above analysis gives us the formula $Ca_{115}Mg_{116}Fe_4\,Al_2Si_{235}O_{708}$ which corresponds very closely to the diopside formula, $Ca\,Mg\,Si_2O_6$.

The optical constants of this diopside were determined as follows:

$C : \mathfrak{c} =$	40°
	Na.
α	1.6749
β	1.6852
γ	1.7013
$\gamma - \alpha$	.0264
2 W	77° 42′
2 V	59° 30′
2 E	114° 40′

It will be seen that the indices of refraction are somewhat higher than those given below.

K. Zimanyi (Ref. 60) obtained the following values for diopside from DeKalb. The determinations were made on plates cut perpendicular to the first and second middle lines, and were 5.8 and

6.10 mm. in diameter respectively. The temperature at which the measurements were made was 15.25°–25.75° C.

a	1.6674
β	1.6745
λ	1.6961
2 V =	60° 18′
2 E =	114° 29′

Direct measurement of the optic axes in Na light gave:

2 E =	114° 3′	22° C.
2 H =	60° 46′	
2 H =	122° 9′	

The indices of refraction as determined by Zimanyi are still lower than those of Ala, which Des Cloiseaux (Man. Min. 1862, 1 p. 55), Dufet, Bull. Fr. Min. Soc., 1887, X, p. 290, Wulfing and Schmidt, Zeitschr, fur. Krystu. Min. 1893, XXI.

Edenville, Orange Co.—Rammelsberg gives in his Mineralchemie (Ref. 37), an analysis of a large bluish crystal from Edenville, which is as follows:

	Percentage.	Ratio.	Prop. parts.
SiO_2	55.01	.917	13
FeO	4.95	.099	1
CaO	22.80	.407	6
MgO	16.95	.424	6
H_2O	.36		
	100.07		

Sp. Gr. 3.94.

The above analysis calculated out gives $Ca_6Mg_6FeSi_{13}O_{39}$ which corresponds pretty closely to the formula Ca Mg Si_2O_6.

Edwards, St. Lawrence Co.—The only specimens which the writer has seen from this locality are some crystals in the collection of Prof. Egleston. They are of simple habit and the combination of forms is a (100) and b (010) broad, m (110) narrow u (111) and c (001). The faces have altered to tremolite.

Macomb St. Lawrence Co.—There is one group of small glassy crystals in the Columbia University collection. The crystals are tabular parallel to b (010) and have the faces a (100), b (010), m (110) c (001)and u (111). The associated minerals are albite, calcite and graphite.

Pierrepont, St. Lawrence Co.—Transparent crystals tabular parallel to b (010) are common. They occur mostly as small groups of interlacing crystals. Basal and orthopinacoidal twin-

ning and the accompanying parting are common. The general combination of forms is *a* (100), *b* (010), *m* (110) and *c* (001.) Another form figured by Prof. Penfield in Dana's System of Mineralogy, 1893 shows *a* (100), *b* (010), *c* (001), *u* (111), *v* (221) and *p* ($\bar{1}$01.) Parallel growths of pyroxene with hornblende are frequent. (Ref. 38) and G. V. Rath has described crystals from Pierrepont, whose prism faces were covered with numerous small individuals. (Ref. 38.) The extinction angle of the Pierrepont diopsides is 37°.

Pitcairn, St. Lawrence Co.—An unusual form from this locality, and belonging probably with the diopsides, is a small group of crystals in the collection of Cornell University. The crystals are $\frac{1}{3}$–$\frac{1}{2}$ an inch long, with bright faces. They are of very simple form showing only the planes *m* (110), *u* (111) and *s* (111), (Pl. I, Fig. 8).

Port Henry, Essex Co.—The occurrence of white pyroxene as an unaltered core of the serpentine grains and masses in the ophicalcites of the eastern Adirondacks has long been known, but so far as the writer is aware the occurrence of white pyroxene crystals free from serpentine is uncommon. During the summer of 1893, Prof. Kemp found a great quantity of this interesting variety in a limestone quarry north of Port Henry, where it occurs together with yellow titanite, hairbrown amphibole and graphite. The amphibole is idiomorphic with respect to the pyroxene and titanite. Scales of graphite surround the pyroxene and penetrate it, and shots of the same mineral often appear on the faces in the prismatic zone, but none were noticed on the terminal faces, neither were there any on the amphibole or titanite.

The diopside individuals though usually white are sometimes pink. They are translucent, and vary in length from one-tenth to half an inch, with smooth bright faces. A strong basal parting is not uncommon, but is wanting in the perfectly fresh and transparent individuals. An orthopinacoidal parting is occasionally met with.

The general combinations of forms occur, viz., *a* (100), *b* (010), *m* (110), *c* (001), *u* (111), *s* ($\bar{1}$11) and *p* ($\bar{1}$01). (Pl. II, Fig. 10), and *a* (100), *b* (010), *m* (110), *c* (001), *e* (011) and *p* ($\bar{1}$01). (Pl., II, Fig. 9). The pyramids and clinodomes rarely occur on the same crystal. One specimen in the private collection of Prof. Kemp has the face *o* ($\bar{2}$21).

An analysis of the fresh material gave

	Percentage.	Ratio.	Prop. parts.
SiO_2	54.57	.9095	70
FeO	1.80	.0250	2
CaO	23.25	.4151	32
MgO	17.78	.4432	35
Al_2O_3	1.12	.0129	1
K_2O	.7		
Ign.	.38		
	99.80		

Sp. Gr. 3.27.

The above analysis corresponds to the formula $Ca_{32}Mg_{35}Fe_2AlSi_{70}O_{212}$ which is practically that of diopside. The optical constants are

C : ℄	41°
	Na.
α	1.6683
β	1.6730
γ	1.6902
$\gamma - \alpha$	.0219
2 W =	73° 21′
2 V =	56° 30′

The white pyroxenes of this region are of interest as being the source of much of the serpentine in the ophicalcites of Port Henry, Essex Co., and Bolton, Thurman and Warrensburg in Warren Co.

This process of alternation has been studied and described in detail by G. P. Merrill. (Ref. 34). The blotches of yellowish and greenish serpentine, or serpentine and white pyroxene occur in the ophicalcite near Port Henry from an inch to a foot or more in diameter. In the quarry of the Ophite Marble Co., the serpentine with white pyroxene nuclei is said to be very common, and all stages of alternation can be traced. The following is an analysis from Dr. Merrill's paper of the fresh pyroxene and the serpentine crust.

	Pyroxene.	Serpentine.
SiO_2	55.26	42.17
Al_2O_3	.22	.30
Fe_2O_3	.22	1.57
FeO	.57	.64
CaO	24.48	
MgO	19.53	41.33
MnO	tr.	
H_2O		13.72
	100.28	99.73

The pyroxene is therefore, as pointed out by Dr. Merrill, a very pure lime magnesian variety, corresponding pretty nearly to the formula of diopside $CaMgSi_2O_6$, and its conversion into serpentine consists in the assumption of water and the giving up of its lime, which crystallizes as calcite. A comparison of the preceding analysis with that of the white pyroxene analyzed by the writer, and given on a previous page, shows a close similarity in composition. The latter corresponds still more closely, however, with the white pyroxene which Dr. Merrill has described from Montville, N. J. The composition of the latter is:

SiO_2	51.45	48.17
Ignit.	1.08	.12*
CaO	24.02	21.96
$CaCO_3$		10.44
MgO	18.43	17.61
$MgCO_3$		.71
Al_2O_3	2.94	.52
Fe_2O_3	1.06	.18
FeO	.96	.24
MnO	tr	
SO_3	tr	tr
K_2O	und.	und.
Na_2O	und.	und.
	99.94	99.95

In this connection there may be mentioned the serpentine which was found in aqueduct shaft 2 (Ref. 33) in New York city. It results from the hydration of a white monoclinic pyroxene, showing under the microscope nearly rectangular prismatic cleavages, and giving extinction angles as high as 44°. The alteration is accompanied with the formation of abundant secondary calcite.

Beck (Ref. 2, p. 289) has noted a light green pyroxene from a locality half a mile north of Port Henry. It is said to be intimately mixed with secondary calcite.

Russel, St. Lawrence Co.—In addition to the greenish-black crystals from this locality which were mentioned under the head of augite, there are found greenish-white crystals resembling the forms from DeKalb and also green glassy ones of prismatic habit.

The greenish-white ones are nearly always strongly tabular parallel to *b* (010), and were observed to have the following com-

* H_2O.

bination of forms: *a* (100), *b* (010), *c* (001) (Pl. I, Fig. 4); *b* (010), *m* (110), *c* (001) (Pl. I, Fig. 3); *a* (100), *b* (010), *m* (110), *c* (001) and *u* (111), similar to form from Gouverneur shown in Pl. IV, Fig. 4.

Nearly all of the individuals show a strong basal parting, due to twinning. Uralitization is probably better developed in these crystals than those from any other locality in the State. All stages of transition can be seen from the pyroxene crystal, whose faces present a slightly fibrous appearance, to one whose whole mass has been converted into fibrous amphibole. Sometimes the crystals are cracked apart and the separated portions held together by amphibole fibres. Penetrations of one diopside crystal into another are not uncommon. One crystal from this locality in the Root collection at Hamilton College is 4 x 4 x 12 inches in size. Another in the Columbia University collection had a small, perfectly formed crystal of mica similarly oriented included in it.

The green glassy crystals are all of simple prismatic habit, and show only the forms *a* (100), *b* (010), *m* (110). They are terminated by parting planes parallel to the base. The faces of the prismatic zone sometimes show traces of uralitization, but decomposition takes place usually along the parting planes, resulting in powdery alteration product, probably serpentine. Twinning parallel to *a* (100) and *c* (001) is seen in nearly every specimen, and a strong prismatic cleavage is frequent.

The following analysis shows the composition of this green glassy diopside.

	Percentage.	Ratio.	Prop. parts
SiO_2	54.94	.9156	50
FeO	1.29	.0179	1
CaO	25.38	.4156	23
MgO	17.60	.4400	24
Al_2O_3	2.42	.0236	1
Alkalies	.28		
	99.91		

$= Mg_4\ Ca_3\ Fe_1\ Al_2\ Si_{50}O_{151}$

or $Mg\ Al_2\ SiO_6$

$Fe\ Ca\ Si_2O_6$

$22\ (Ca\ Mg\ Si_2O_6)$

Sp. Gr. 300.

The optical constants of the Russel diopside were determined to be,

C : r	37°
	Na
α	1.6626
β	1.6718
γ	1.6940
$\gamma - \alpha$	.0314
2W	77° 34′
2V	58° 5 6′

Parallel growths of amphibole and pyroxene are common at this locality and the late Prof. G. H. Williams has called attention to the fact that the lesser extinction angle always lies on the same side of the vertical axis. Prof. Williams has also described and figured a remarkable growth of dark green hornblende from Russel, around a crystal of pale green pyroxene. Both crystals have the clinopinacoids parallel, as is also the parting which is present in both. The specimen is about three inches long and is in the collection of Mr. C. Bement of Philadelphia.

Genesis of the New York Pyroxenes.

As previously stated, the pyroxenes occur under the following conditions:

1. As primary constituents of the igneous rocks.
2. In contact zones between the igneous rocks and the limestones.
3. Disseminated through the limestones in regions which have been subjected to dynamic metamorphism.
4. Associated with the bodies of magnetite ore.

The first case includes pyroxene occurring both in dikes and intrusive masses, and the mode of formation is apparent, the pyroxene representing one of the products of crystallization from an igneous magna. It is among the earliest minerals to crystallize out, and is preceded by magnetite, apatite, zircon and sometimes biotite.

When thus occurring as a constituent of the igneous rock it belongs to the variety augite, which is essentially a mineral of igneous rocks. The experiments of Berthier, and Fouque and Levy (Synthese des Mineralogie des Roches, Paris, 1882) have shown that augite can be easily produced artificially from a fused

mixture, in microlites and large crystals, and associated with the various minerals which accompany it in nature. Both temperature and chemical compositon exert an influence. Augite being more stable at high temperatures will separate under such conditions, whereas if the crystallization takes place at a lower temperature hornblende is more likely to result. According to Vogt (Zeitschr. fur. Kryst. u. Min.), if the relation of CaO to MgO becomes as 1–3 orthorhombic pyroxene separates instead of the monoclinic form.

When an igneous rock intrudes itself into a limestone or dolomite, a change usually takes place in the latter along and near the line of contact. This change consists first in an increase in the coarseness of the limestone and secondly in the abundant development of minerals in the contact zones or disseminated through the limestone near it. This production of contact minerals has been frequently noticed and described.

In contact metamorphism the intensity and extent of the change depends on the temperature, mineralogical and structural character of the eruptive rock, also on the duration of its action and the area and conductivity of the rock affected.

The contact changes are brought about partly by the intrusion of the igneous mass, and partly by the action of mineralizers. The former can and have been produced artificially.

The minerals of the contact zones derive their material 1. from the igneous rocks, 2. from the limestone, 3. from below, being brought up by solutions stimulated by the intrusion of the igneous rock. The greatest development of contact minerals occurs in an impure limestone, or if the eruptive rock mingles with the limerock. (J. Roth p. 175.)

We should thus expect to find minerals rich in lime and magnesia, such as garnet, vesuvianite, pyroxene, wollastonite, amphibole, chondrodite, etc.

The presence of mineralizers is often shown by the occurrence of fluorite, tourmaline and chondrodite, and indeed it has been found that the presence of mineralizers is an essential factor in aiding the formation of some of these minerals.

Diopsides and augites poor in alumina are especially abundant in the limestone contact zone, and their frequent occurrence at such localities lining the sides of fissures filled with quartz or calcite, rather point to a possible formation sometimes by wet

methods, under great pressure and high temperature no doubt, as has been done artificially.

In some cases the effect of the igenous rock seems to be to cause a molecular rearrangement in the limestone, resulting in the formation of new minerals by segregation. Thermal metamorphism does not seem to involve any alteration in the bulk of the rock affected. Whatever part water plays, it does not act as a medium in the transfer of material, and it is also probable that the transportation is confined within narrow limits (A. Harker—The Migration of Material During the Metamorphism of Rock Masses, Jour. Geol. I, p. 574).

The ophicalcites of the eastern Adirondacks furnish an excellent example of the mode of formation of pyroxene by segregation resulting from the intrusion of the gabbros (Ref. 26). These ophicalcites contain great masses of silicates, which have been distorted by the violent dynamic metamorphism which the rock has been subjected to. They also indicate the flowing of the limestone under pressure. These limestones were originally magnesian limestones containing great quantities of impurities, which have segregated to form the pyroxenes and other silicates. These silicates often form masses 23–30 feet thick.

In support of the theory that the pyroxene results from a magnesian limestone, Prof. Kemp gives the following two analyses made by the writer, the first that of pieces of the white limestone at Port Henry, which were free from silicates and the second analysis, that of the white pyroxene occurring in it.

	Limestone.	Pyroxene.
SiO_2		54.57
Al_2O_3	1.72	1.32
Fe_2O_3		
FeO		1.62
CaO	46.79	23.23
MgO	5.10	17.78
K_2O		.70
Na_2O		.32
H_2O	42.42	
	96.03	99.54

From the above analyses it will be seen that the bases and silica have collected to form the pyroxene.

The common occurrence of white pyroxene in the metamor-

phosed magnesian limestones of West Chester, Dutchess and Putnam Counties has been described and it was mentioned that the pyroxenes occurred in bunches filling cavities or in streaks associated with quartz. So far as the writer is aware, none of the occurrences in these localities are associated with igneous intrusions, and the probability, therefore, is that these pyroxenes were produced by the regional metamorphism to which these dolomites were subjected. Two methods of formation are, therefore, possible: 1. Segregation from the surrounding rock; 2. Deposition from solutions which brought the material from a deep-seated source. The presence of associated quartz and the occurrence of the crystals in veins or cavities would seem perhaps to favor the second hypothesis and still it is possible that the pyroxene in these dolomites has been caused by a segregation of material from the surrounding limestone which contains all the elements needed in the formation of these leucaugites.

The formation of pyroxene by regional metamorphism has been described by Westgate from Warren Co., N. J. (Amer. Geol., 1894). W. H. Hobbs has also described the formation of tremolite and large pyroxene crystals along the Housatonic fault, in Massachusetts (The Structure of the Housatonic Valley lying east of Mt. Washington, Jour. Geol.), and Fairbanks mentions a similar case of the formation of green pyroxene in California (Geol. of the Coast Ranges of Cal., B. G. S. A., VI, p. 71).

In the last class of occurrences mentioned, viz., the formation of pyroxene around ore bodies, there is still considerable doubt as to the theory of the origin of most of the pyroxenes. They may have been formed by segregation, but this is a point for further investigation.

EXPLANATION OF THE PLATES.

PLATE XIII.

1. Augite, Monroe Township, Orange Co.—*a* (100), *b* (010), *m* (110), *u* (111), *s* ($\bar{1}11$), *o* ($\bar{2}21$), *p* ($\bar{1}01$).

2. Tilly Foster, Putnam Co.—*a* (100), *b* (010), *m* (110), *f* (310), *o* ($\bar{2}21$), *p* ($\bar{1}01$).

3. Russel, St. Lawrence Co.—*b* (010), *m* (110).

4. Diopside, Russel, St. Lawrence Co.—*a* (100), *b* (010), *c* (001).

5. Monroe Township, Orange Co.—*a* (100), *b* (010), *m* (110), *u* (111), *s* ($\bar{1}11$), *o* ($\bar{2}21$), *z* (021).

6. Augite, St. Lawrence Co.—*m* (110), *b* (010), *u* (111), Δ ($\bar{3}31$).

7. Augite, Pitcairn, St. Lawrence Co.—*a* (100), *b* (010), *m* (110), *c* (001), *u* (111), *s* ($\bar{1}11$), *o* ($\bar{2}21$).

8. Diopside, Pitcairn, St. Lawrence Co.—*m* (110), *u* (111), *s* ($\bar{1}11$).

9. Diopside, DeKalb, St. Lawrence Co.—*a* (100), *b* (010), *m* (110), *c* (001), *u* ($\bar{1}11$), *v* ($\bar{2}21$), *o* ($\bar{2}21$), Δ ($\bar{3}31$), *p* ($\bar{1}01$).

PLATE XIV.

1. Leucaugite, Edenville, Orange Co.—*a* (100), *b* (010), *m* (110), *c* (001), *u* (111), *s* ($\bar{1}11$.)

2. Augite, Rossie, St. Lawrence Co.—Shows hemihedral distribution of planes.

3. Leucaugite, Edenville, Orange Co.—shows hemihedral distribution of planes, and twinned lower half of crystal.

4. Augite, Gouverneur, St. Lawrence Co.—*a* (100), *b* (010), *m* (110), *u* (111), *s* ($\bar{1}11$).

5. Augite, Highlands of Hudson, Orange Co.—*a* (100), *b* (010), *m* (110), *c* (001), *e* (101.)

6. Augite, Warwick, Orange Co.—*a* (110), *b* (010), *m* (110), *c* (001), *u* (111), *s* ($\bar{1}11$), *o* ($\bar{2}11$) *p* ($\bar{1}01$.)

7. Augite Warwick, Orange Co.—*a* (100), *b* (010), *m* (110), *c* (001.)

8. Augite, Cheever Mine, Pt. Henry, Essex Co.—*a* (100), *b* (010), *m* (110), *c* (001), *u* (111), *s* ($\bar{1}11$.)

9. Diopside, Pt. Henry, Essex Co.—*a* (100), *b* (010), *m* (110), *c* (001), *e* (011), *p* ($\bar{1}01$.)

10. Diopside Pt. Henry, Essex Co.—*a* (100), *b* (010), *m* (110), *c* (001), *u* (111), *s* ($\bar{1}11$), *p* ($\bar{1}01$.)

11. Black augite, Hammondville, Essex Co.—*a* (100), *b* (010), *m* (110), *c* (001), *s* ($\bar{1}11$.)

12. Tilly Foster, N. Y.—*a* (100), *b* (010), *m* (110), *c* (001), *s* ($\bar{1}11$.)

PLATE XV.

1. Augite, Monroe Township, Orange Co.—Twinned parallel to *a*. Shows *a* (100), *b* (010), *m* (110), *e* (011).

2. Leucaugite, Sing Sing, Westchester Co.—*a* (100), *b* (010), *m* (110), *o* ($\bar{2}21$).

3. Augite, Monroe Township, Orange Co.—*a* (100), *b* (010), *m* (110), *c* (001), *e* (011).

4. Leucaugite, Sing Sing, Westchester Co.—*a* (100), *b* (010), *m* (110), *v* (221), *o* ($\bar{2}21$), *c* (001).

5. Augite, St. Lawrence Co.—*m* (110), *b* (010), *u* (111), *o* ($\bar{2}21$), λ ($\bar{3}11$).

6. Leucaugite, Paterson, Dutchess Co.—*a* (100), *b* (010), *m* (110), *v* (221), *o* ($\bar{2}21$), *p* ($\bar{1}01$), *c* (001).

7. Augite, Russel, St. Lawrence Co.—*a* (100), *b* (010), *m* (110), *p* (101), *u* (111).

8. Augite, Diana, Lewis Co.—Twinned parallel to *a* (100). Shows *a* (100), *b* (010), *m* (110), *p* ($\bar{1}01$), *o* ($\bar{2}21$), λ ($\bar{3}11$).

9. Augite, Natural Bridge, Lewis Co.—*a* (100), *b* (010), *m* (110), *u* (111), *s* ($\bar{1}11$), *o* ($\bar{2}21$).

PLATE XVI.

1. Diana, Lewis Co.—*a* (100), *b* (010), *m* (110), *c* (001), *u* ($\bar{1}11$), *e* (011).

2. Augite, Keene, Essex Co.—*a* (100), *b* (010), *m* (110), *s* ($\bar{1}11$), *o* ($\bar{2}21$).

3. Diopside, DeKalb, St. Lawrence Co.—*a* (100), *b* (010), *m* (110)), *c* (001), *u* (111), *o* ($\bar{2}21$).

4. Diopside, DeKalb, St. Lawrence Co.—*a* (100), *b* (010), *m* (110), *c* (001), *u* (111).

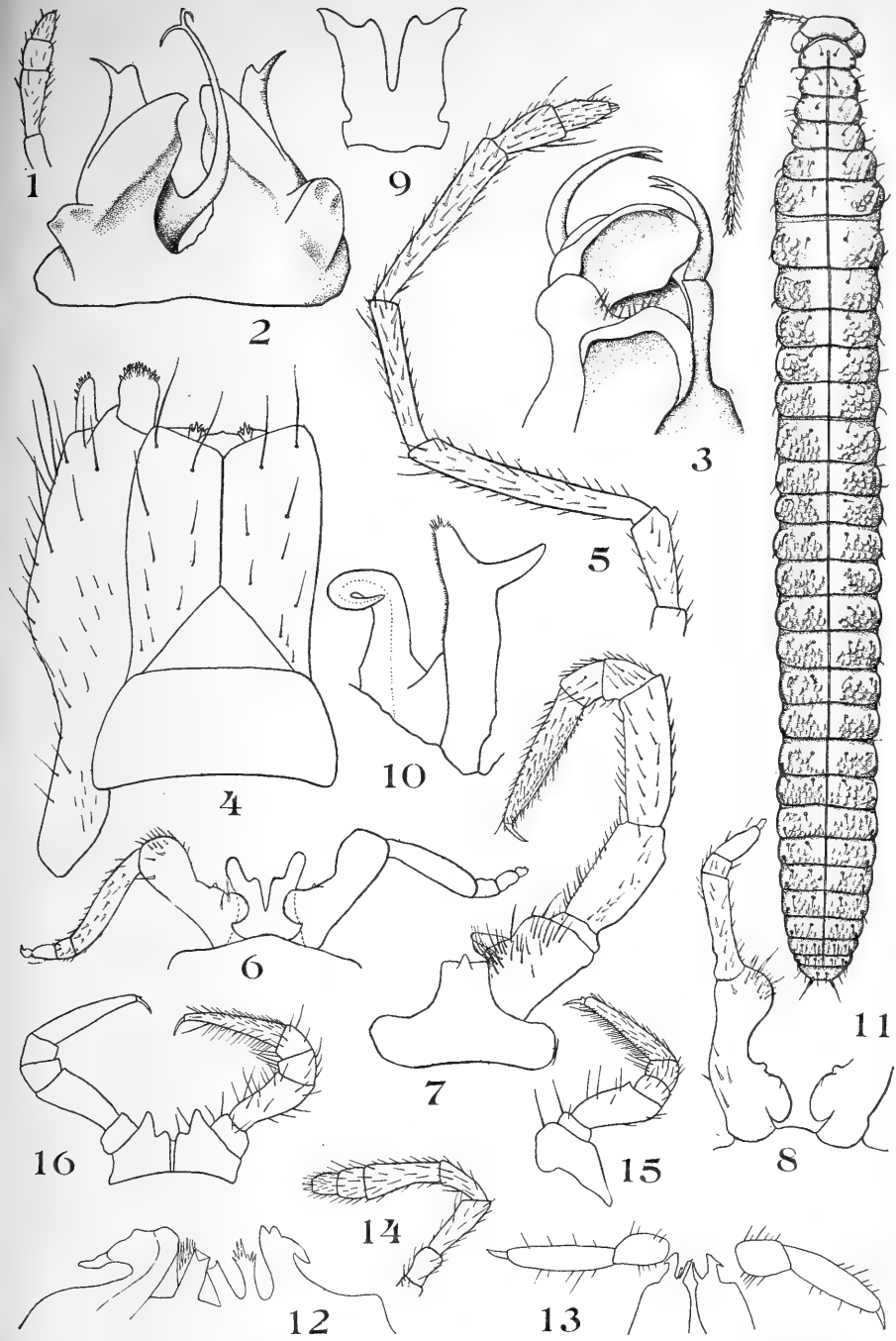
5. Augite, Rossie, St. Lawrence Co.—*a* (100), *b* (010), *m* (110), *u* ($\bar{1}11$), *v* ($\bar{2}21$).

6. Augite, Diana, Lewis Co.—*a* (100), *b* (010), *m* (110), *u* (111), *s* ($\bar{1}11$), *o* ($\bar{2}21$), *z* (021).

7. Augite, Adams Lake.—*a* (100), *b* (010), *m* (110), *u* (111), *s* ($\bar{1}11$), *o* ($\bar{2}12$), *p* ($\bar{1}01$).

8. Diopside, DeKalb, St. Lawrence Co.—*b* (010), *m* (110), *u* (111).

9. Augite, Tilly Foster, Putnam Co.—*a* (100), *b* (010), *m* (110), *u* (111), *s* ($\bar{1}11$), *o* ($\bar{2}21$), *p* ($\bar{1}01$).

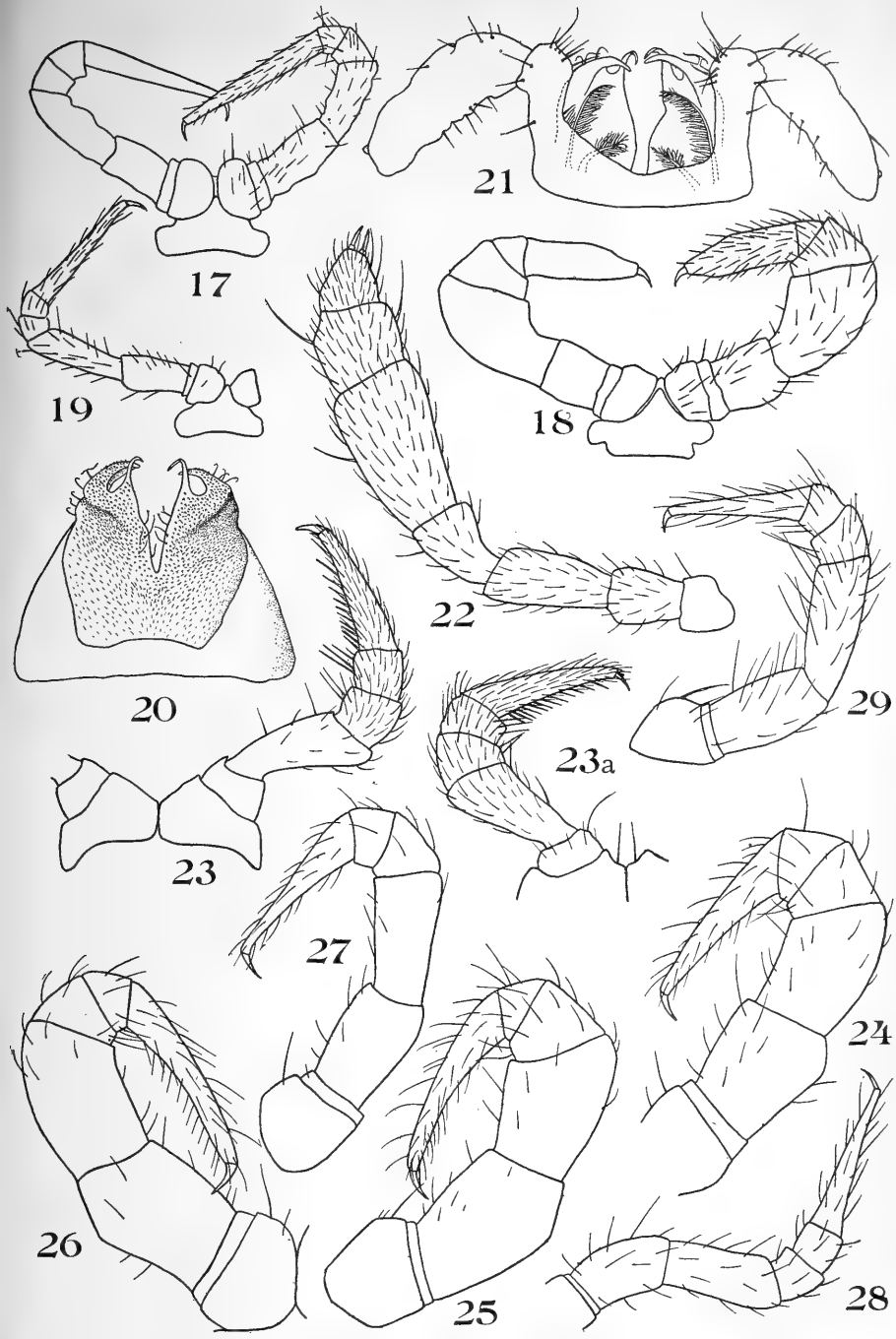


BRANNERIA. (fig. 1.)

PSEUDOTREMIA. (figs. 2–11.)

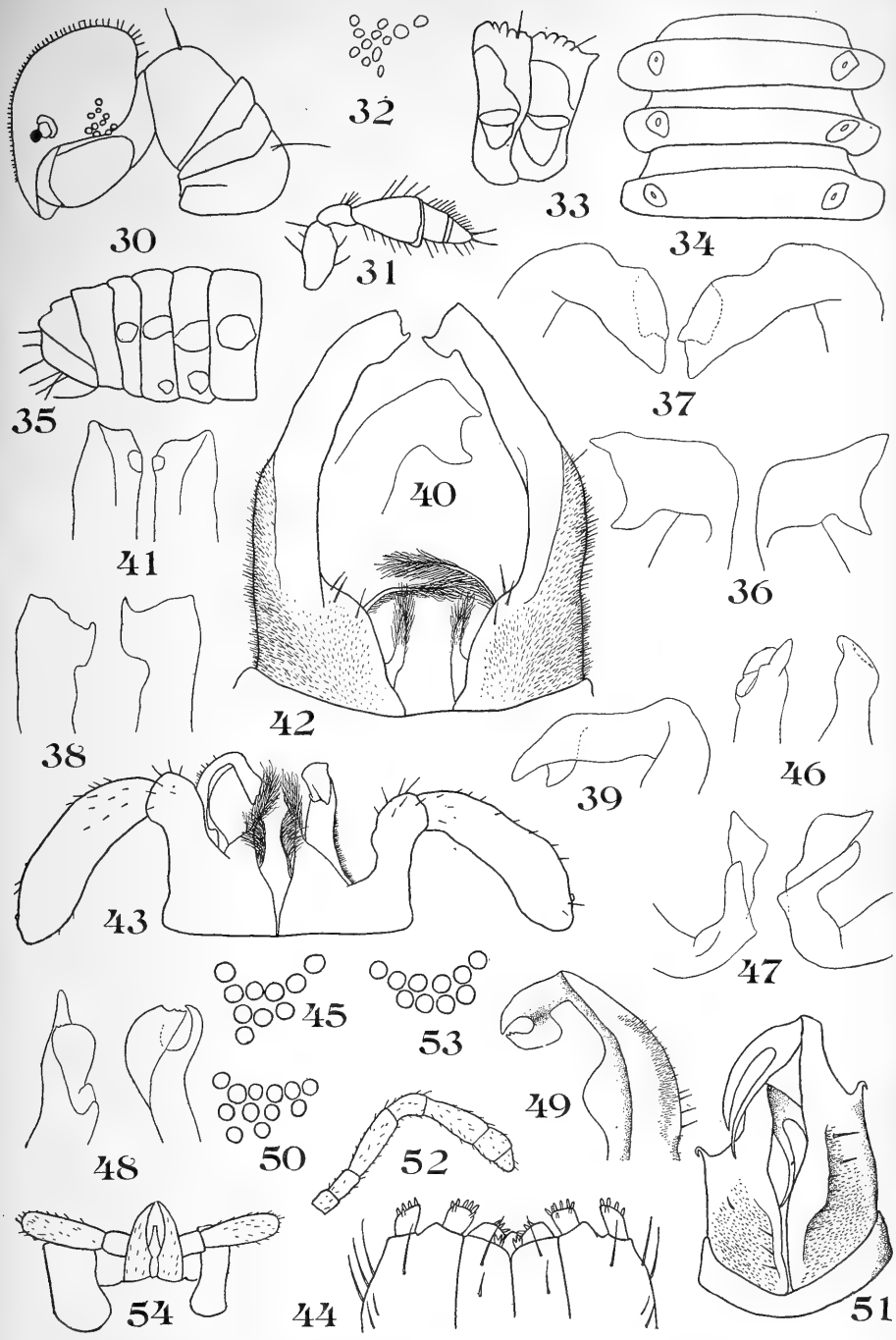
SCOTERPES. (figs. 12–13.)

ZYGONOPUS. (figs. 14–16.)

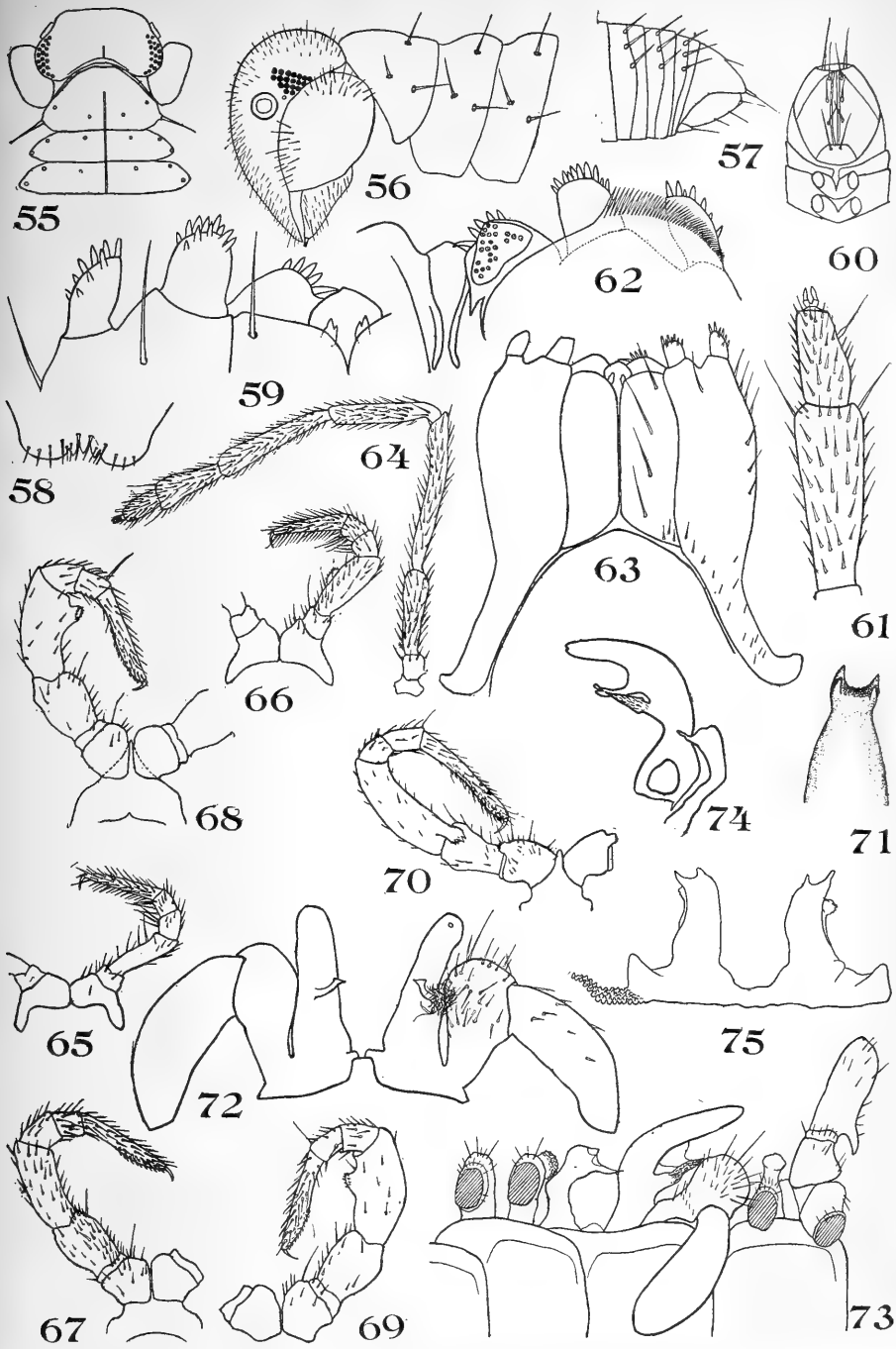


ZYGONOPUS.
(figs. 17-21.)

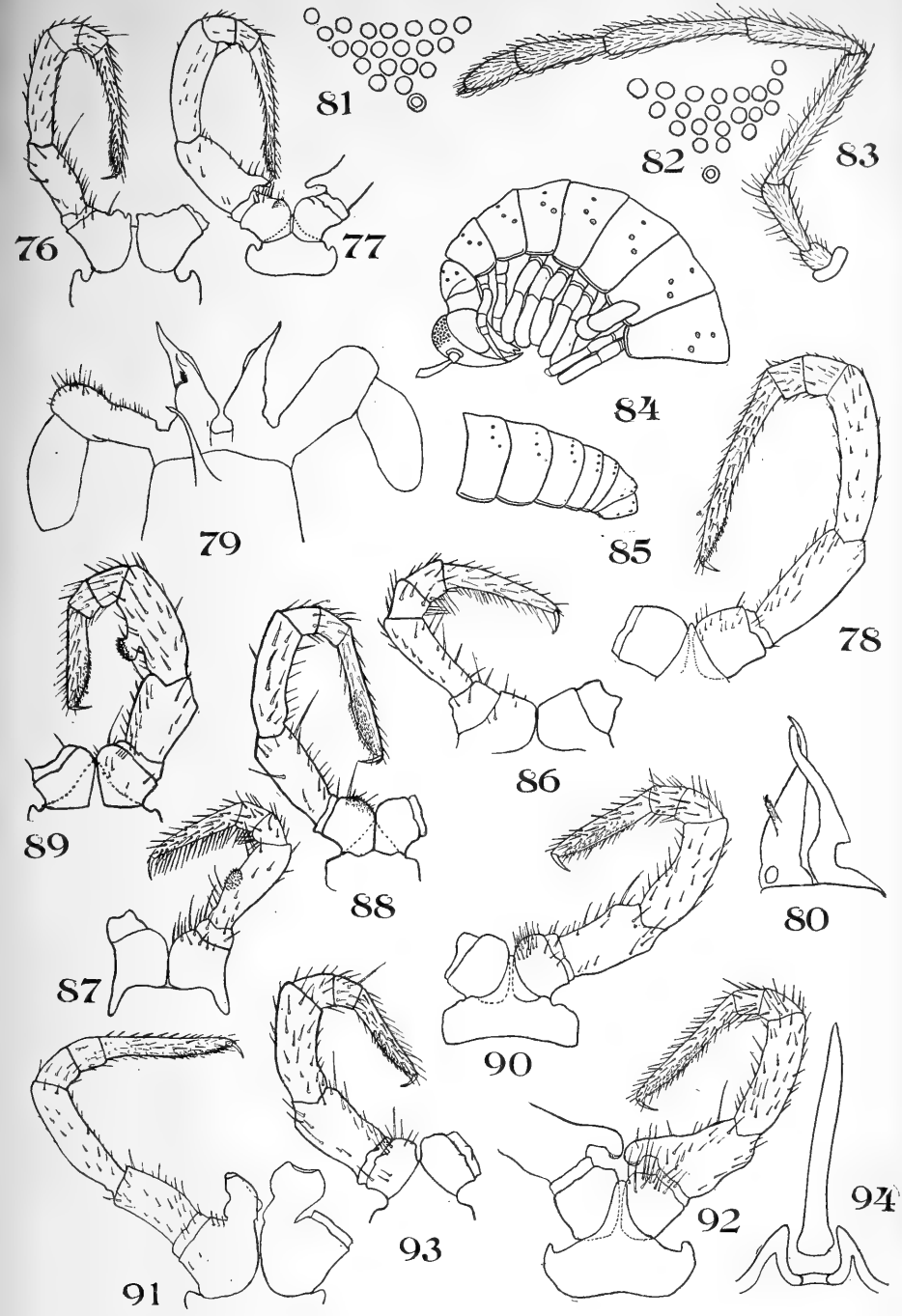
TRICHOPETALUM.
(figs. 22-29.)



TRICHOPETALUM.



CONOTYLA.



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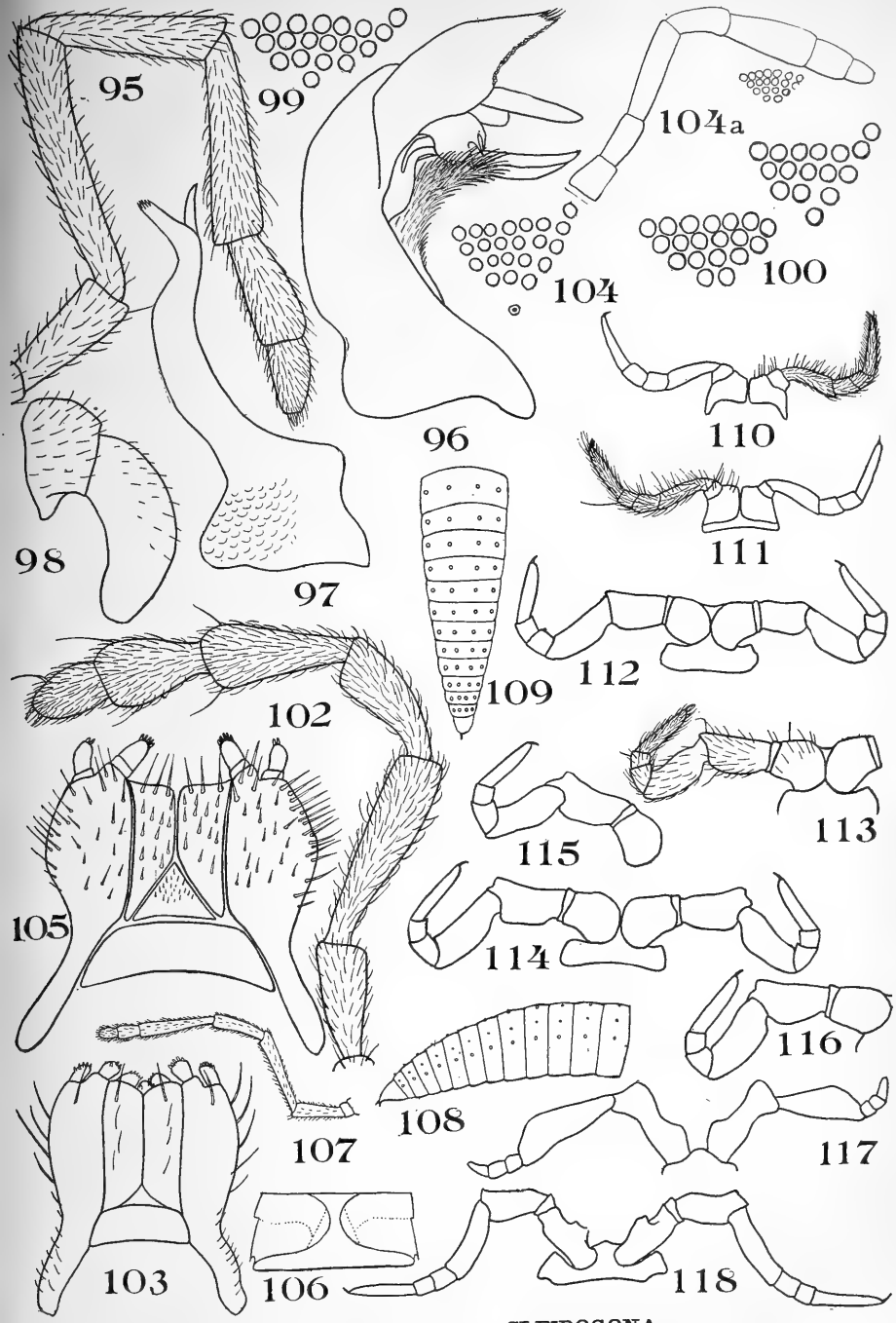
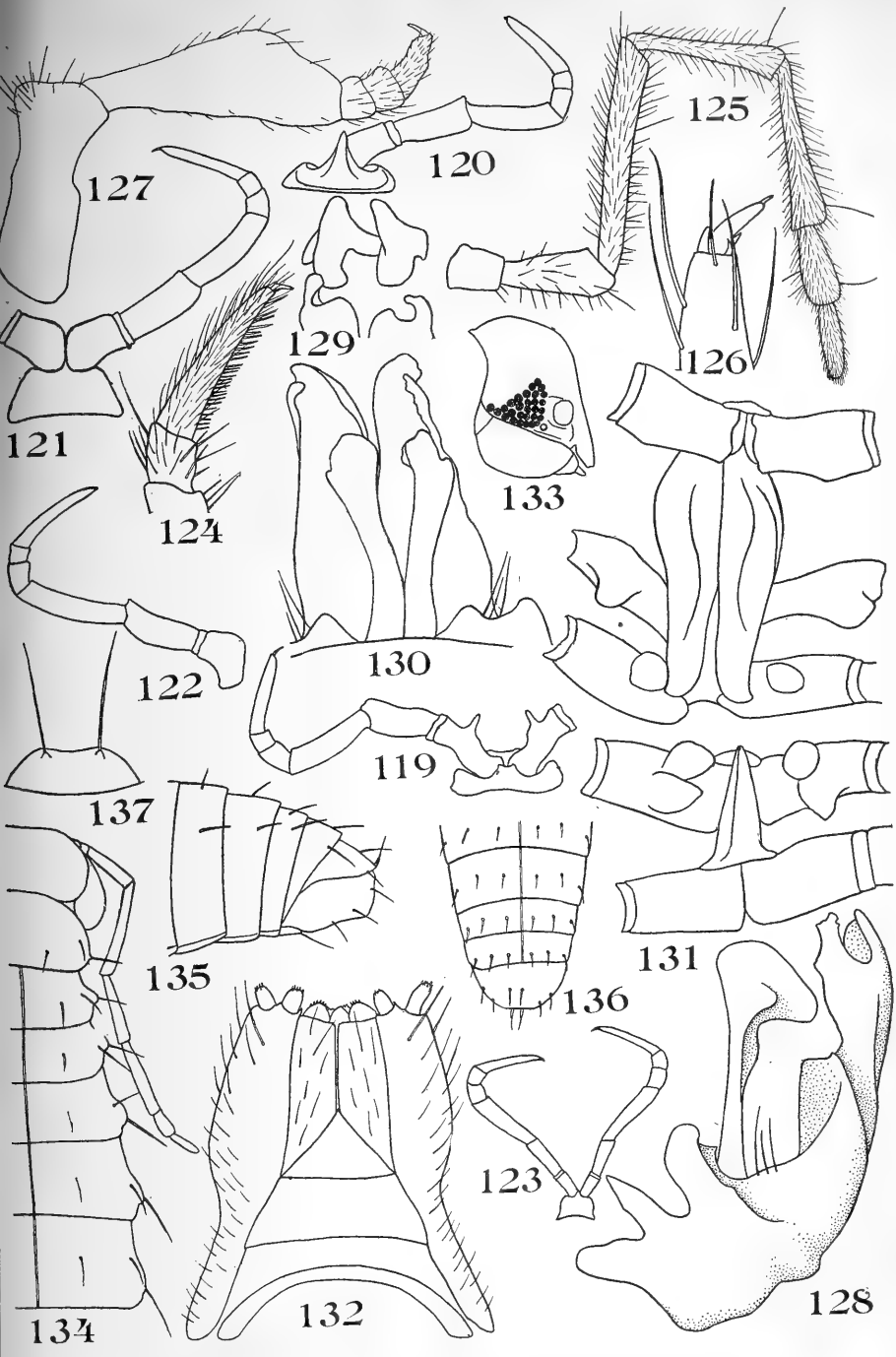


CONOTYLA.
(figs. 95–104.)

CLEIDOGONA.
(figs. 105–118.)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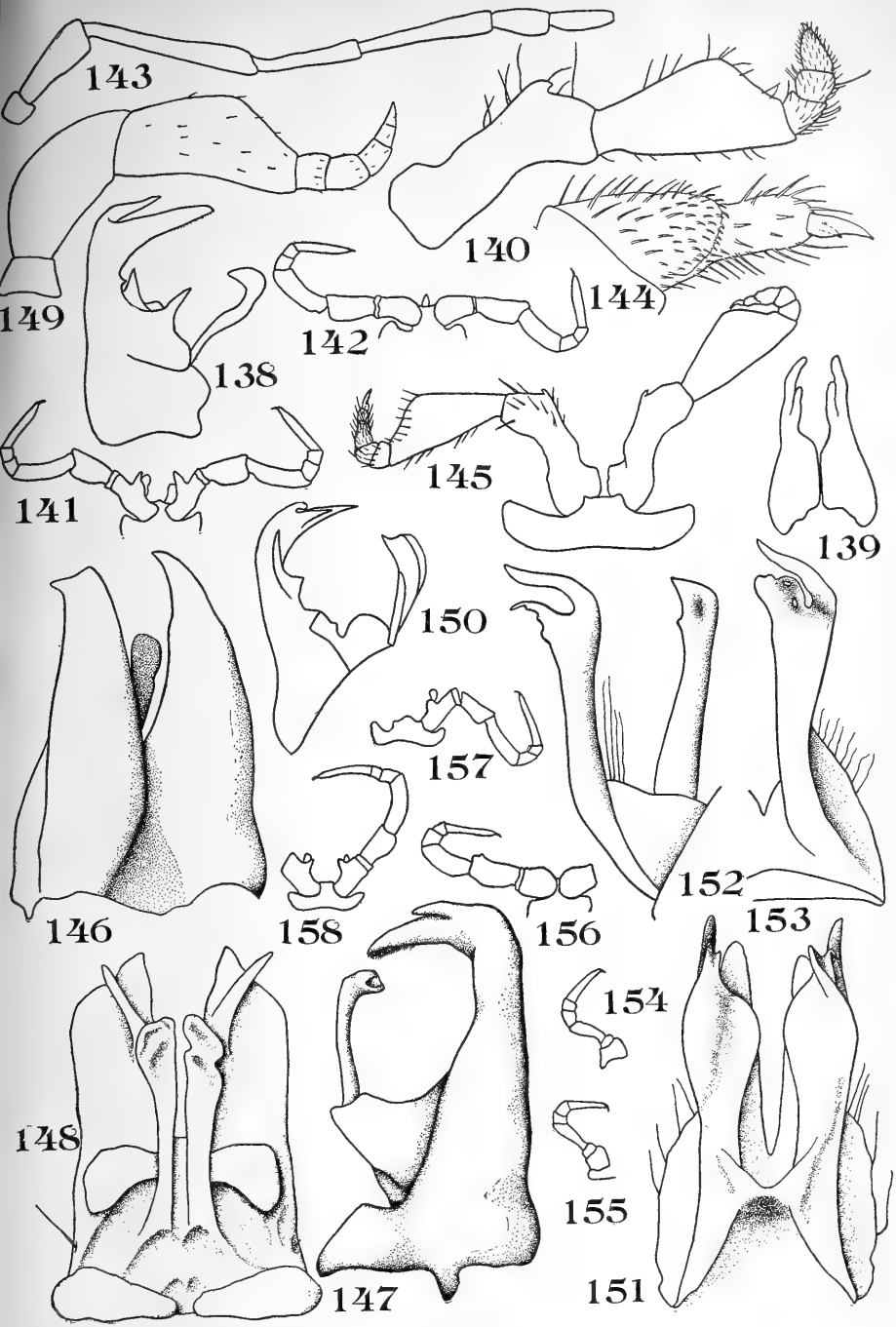
CLEIDOGONA.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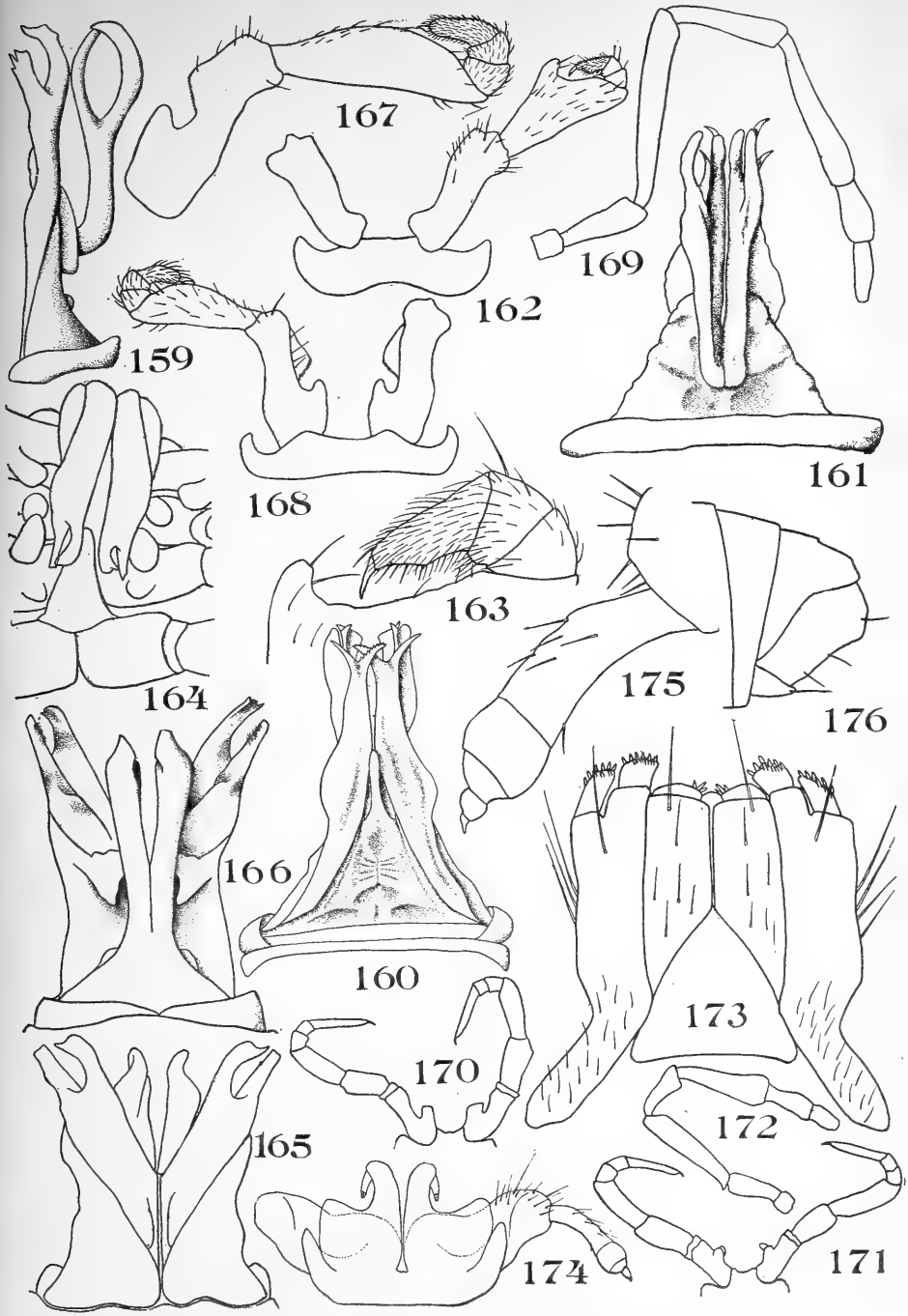
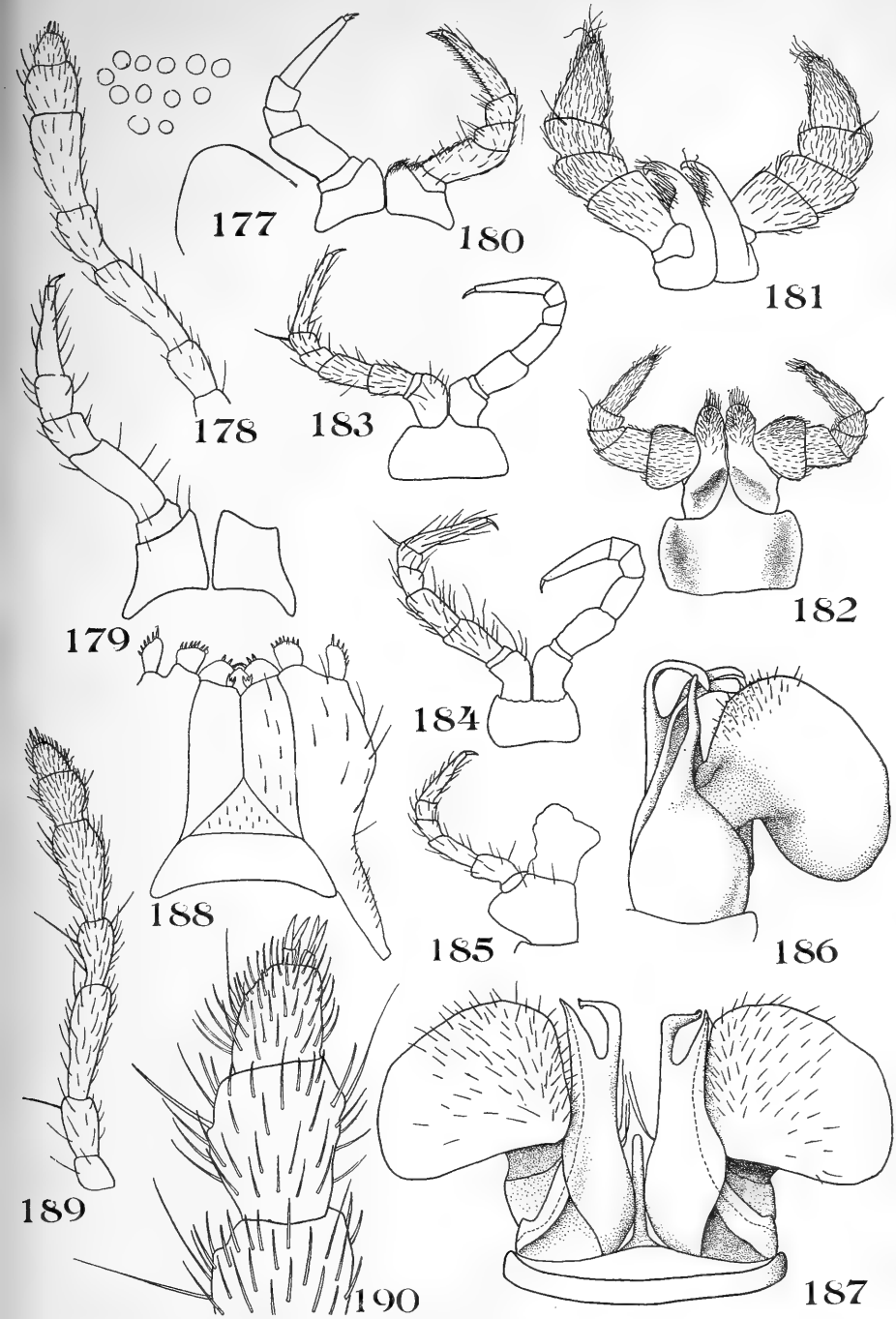


(figs. 159–171.)
CLEIDOGONA.

(figs. 172–176.)
BACTROPUS.



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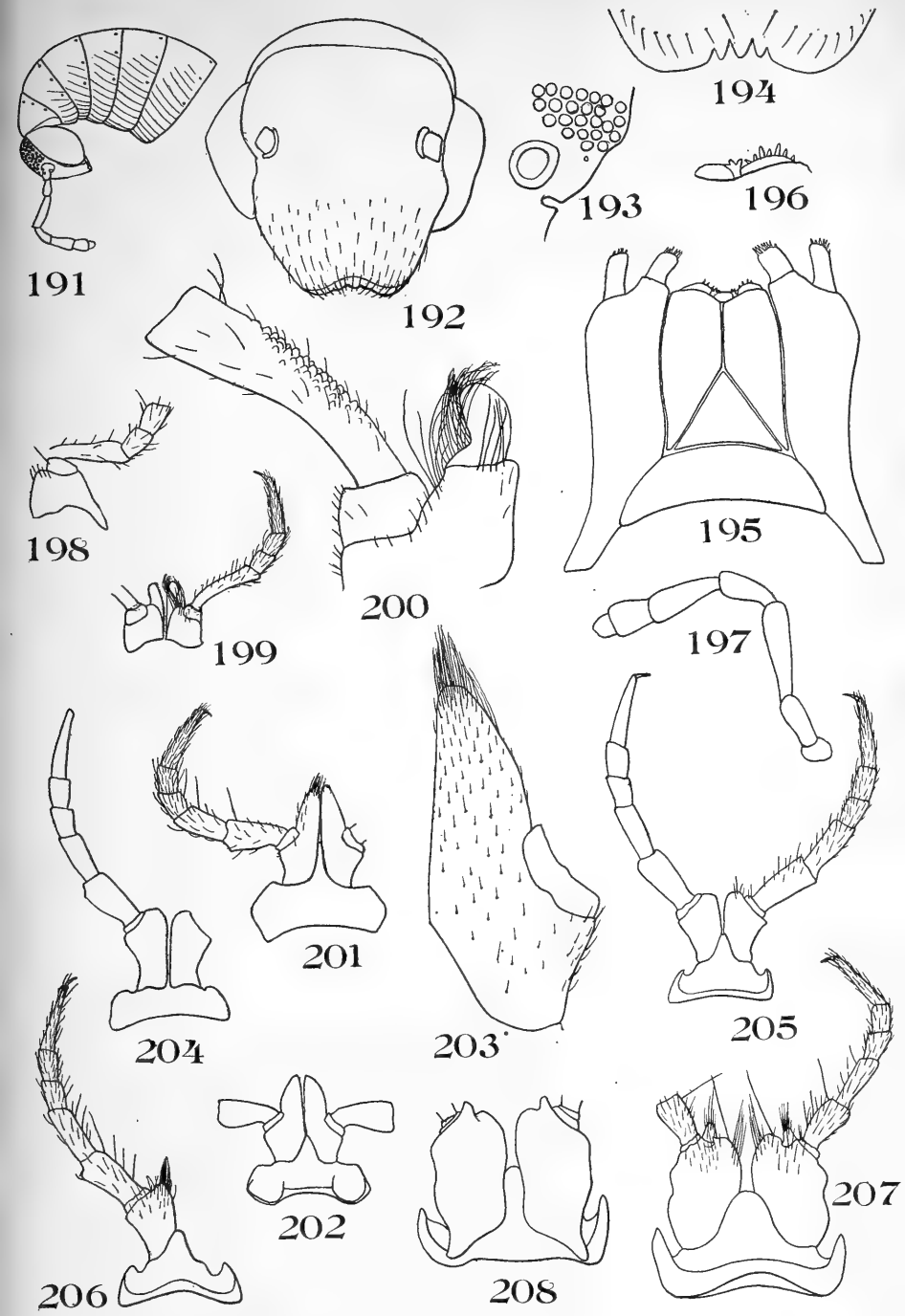
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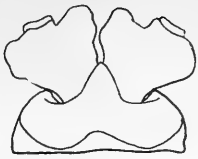

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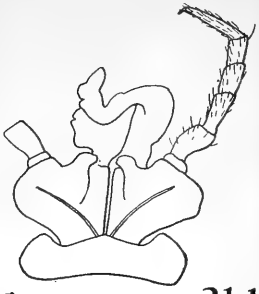

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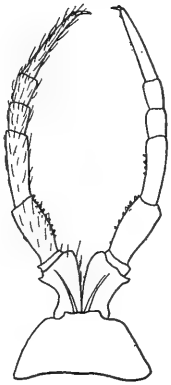

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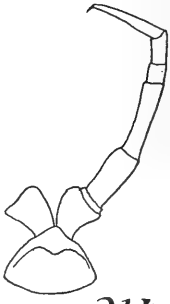

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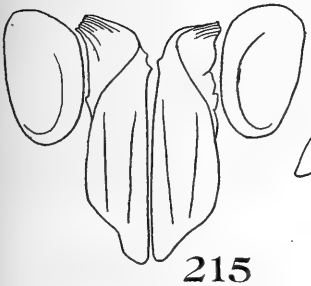

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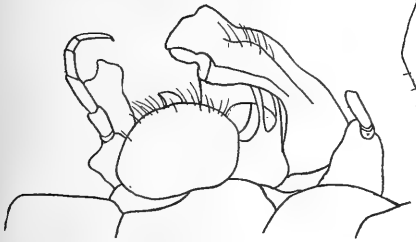

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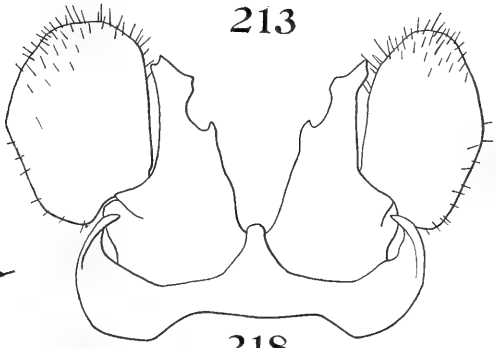

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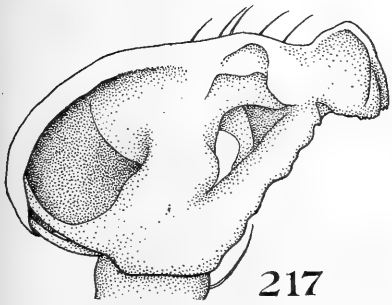

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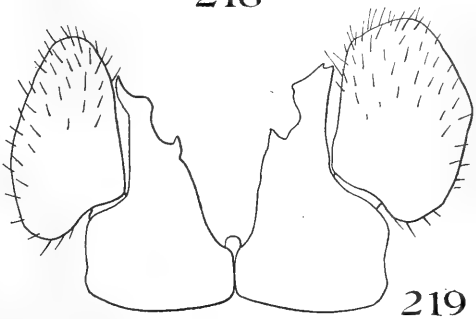

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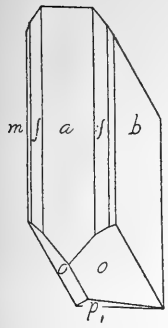
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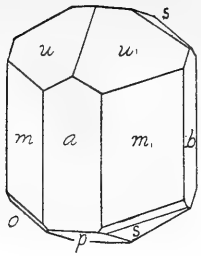
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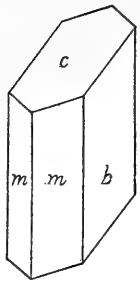
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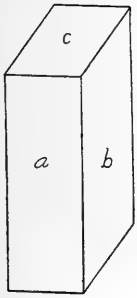
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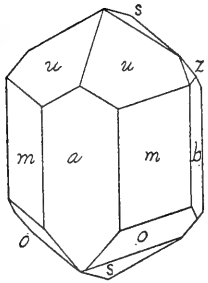
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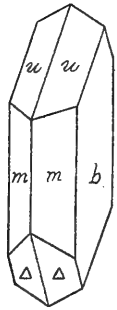
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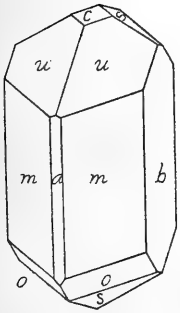
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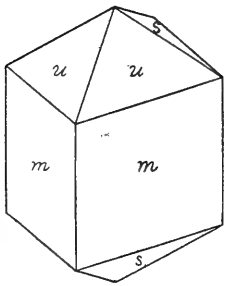
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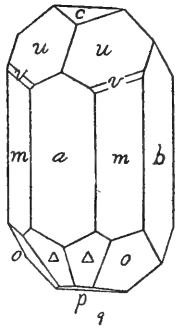
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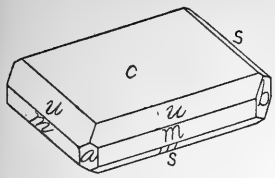

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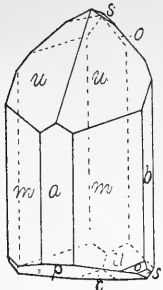

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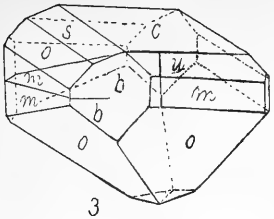

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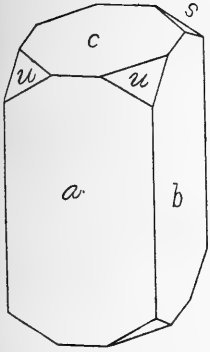

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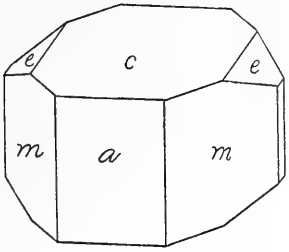

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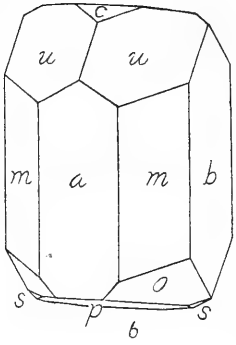

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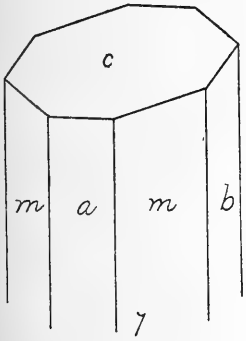

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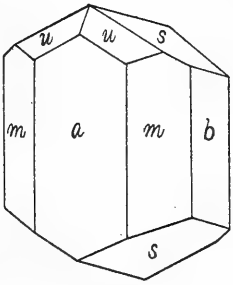

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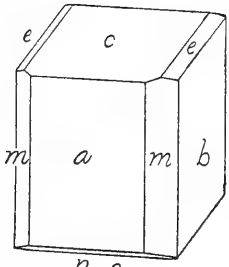

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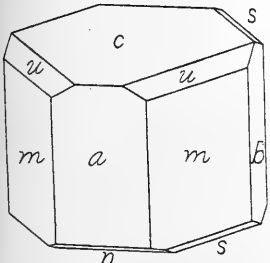

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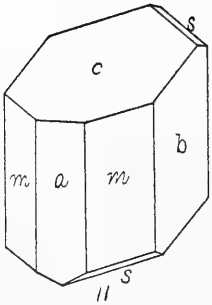

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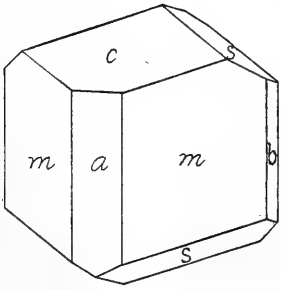

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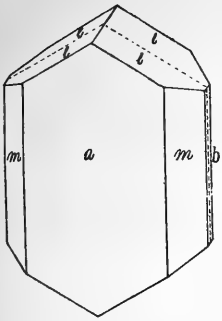
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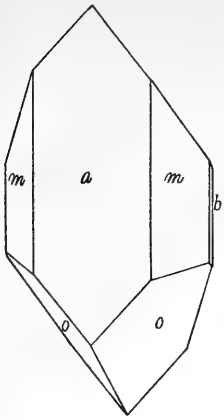
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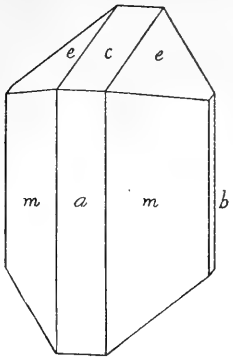
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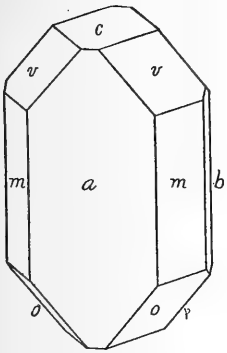
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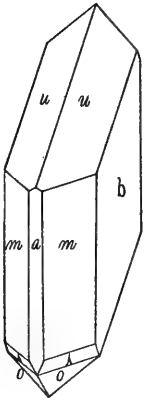
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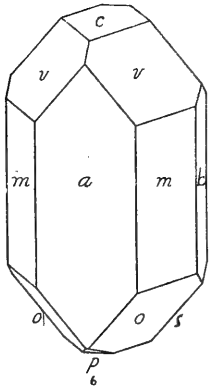
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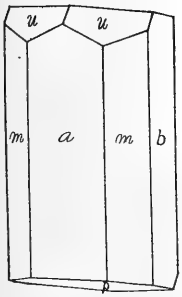
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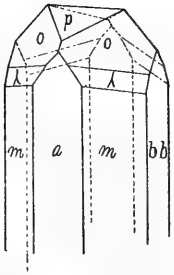
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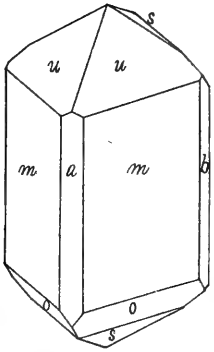
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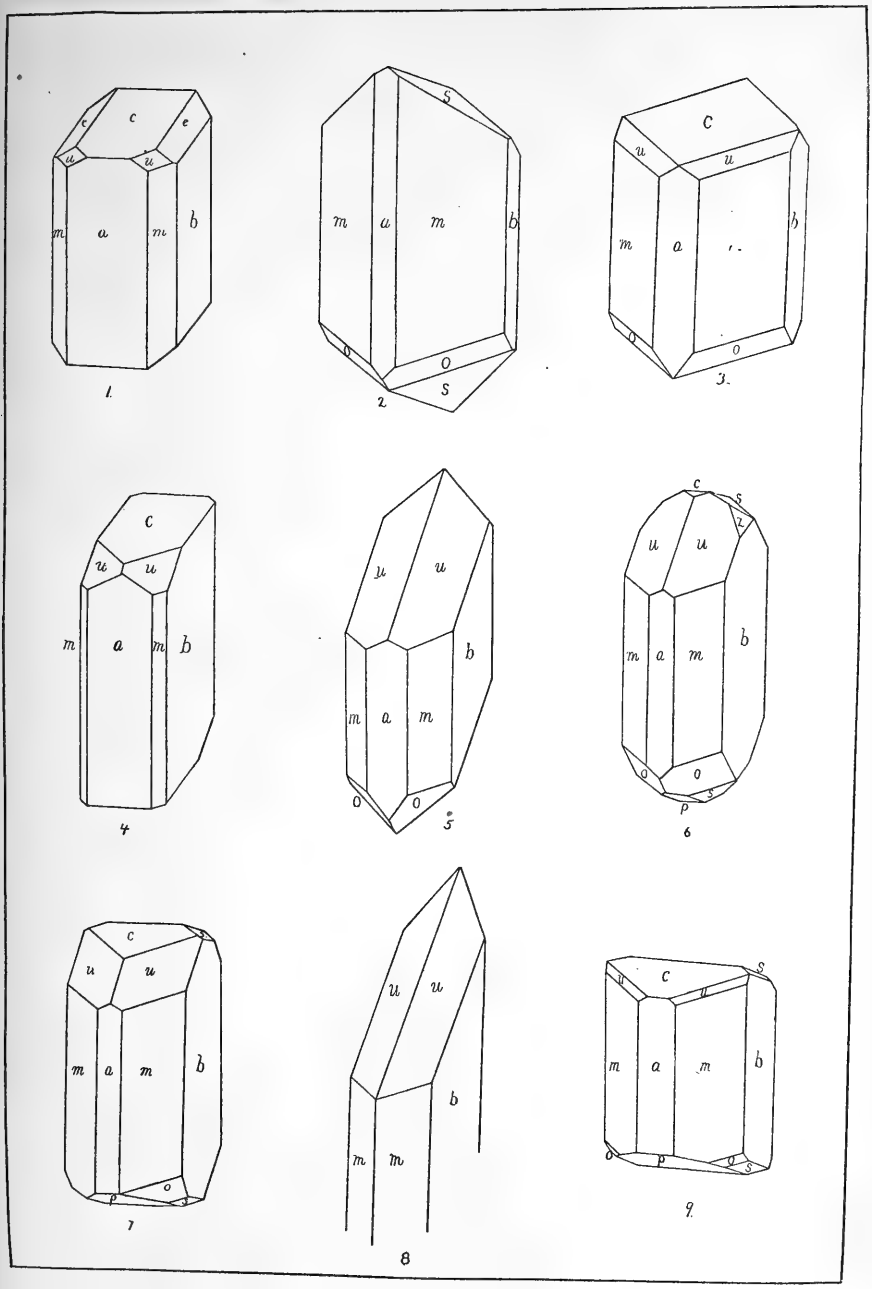
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IV.—*Notes on some Actinians from the Bahama Islands, collected by the late Dr. J. I. Northrop.*

BY J. PLAYFAIR M'MURRICH, PH. D.

Read April 11, 1896.

The Actinians which form the subject of this paper were collected by the late Dr. J. I. Northrop, of Columbia College, during a visit to the Bahama Islands some years ago. It had been Dr. Northrop's intention to work over the collection himself. Before his lamented death he had studied several species more or less thoroughly. The drawings and preparations which he had made were entrusted to me, together with the collection, by Mrs. Northrop, and have proved of great assistance in determining the affinities of certain forms. Especially was this true in regard to *Heteractis lucida*, whose systematic position Dr. Northrop had correctly determined, and the notes on *Diplactis bermudensis* and *Isaurus Duchassaingi* were also very full.

I have taken pains to verify all the important facts contained in the notes, and it has seemed more convenient for the present purpose to describe in my own words the various forms to be considered, rather than to attempt a rearrangement of Dr. Northrop's notes with such additions as might seem necessary.

The following is a list of the species in the collection.

HEXACTINIÆ.

Suborder **Actininæ.**

Family SAGARTIDÆ.

1. *Aiptasia tagetes* (D & M.) Andr.
2. *Heteractis lucida* D. & M.

Family ANTHEADÆ.

3. *Condylactis passiflora* D. & M.

Family DENDROMELIDÆ.

4. *Lebrunea neglecta* D. & M.

Family PHYLLACTIDÆ.

5. *Diplactis bermudensis* McM.

Suborder **Stichodactylinæ.**

Family DISCOSOMIDÆ.

6. *Discosoma anemone* (Ellis) Duch.

Family RHODACTIDÆ.

7. *Rhodactis Sancti-Thomæ* (Duch. & Mich.) McM.
8. *Ricordea florida* Duch. & Mich.

Family PHYMANTHIDÆ.

9. *Phymanthus crucifer* (Lesueur) Andr.

ZOANTHEÆ.

10. *Zoanthus sociatus* (Ellis) Lesueur.
11. *Zoanthus nymphæus* (Lesueur.)
12. *Isaurus Duchassaingi* (Andres.)
13. *Palythoa flava* (Lesueur) Duch. & Mich.
14. *Gemmaria isolata*, McM.

Certain of these forms I have already described ('89), and consequently shall not consider in detail here; a few others require but brief notice, while three others require a more thorough description. I shall consider the forms belonging to the last two groups in the order in which they are named in the above list.

Family SAGARTIDÆ.

Heteractis lucida Duch. & Mich.

Synonyms: *Capnea lucida*, Duchassaing & Michelotti. 1860 (Pl. VI., Figs. 9 and 12.
Heteractis lucida, Duchassaing & Michelotti. 1866.
Ragactis lucida, Andres. 1883.

Several specimens of this form were contained in the collection which offered accordingly opportunities for an accurate determination of its systematic affinities.

In the contracted condition the animal is generally somewhat flattened, measuring in height 1.5–2.0 cm., and in diameter about 2 cm. The base being usually a little smaller than the upper part of the column. Dr. Northrop's notes contain no statement as to the coloration of the living animal, but according to Duchassaing & Michelotti the mouth is white, surrounded by a

band of brilliant yellow, and the tentacles have the appearance of white glass.

The mesogloea of the column walls is rather thin and in much contracted forms may appear as if provided on its endodermal side with numerous distinct processes, which give to the column wall a ridged or chequered appearance. Toward the upper part of the column are numerous cinclides, not readily distinguishable in all preserved specimens and apparantly without any very definite arrangements, though they are confined entirely to the upper part of the column, none being found below the middle.

There is a distinct collar and fosse in the preserved specimens just above the cinclidal region of the column, and at that portion of the wall which forms the floor of the fosse the endodermal muscle processes are considerably higher than elsewhere in the column wall, and form what may be termed a diffuse endodermal sphincter. The true sphincter lies however higher up, just below the point where the tentacles arise, and is a weak structure imbedded in the mesogloea, which is hardly appreciably thickened for its reception. It consists of a few rather scattered cavities, arranged practically in a single row and containing the remains of muscle cells; it is not strong enough to produce complete enclosure of the tentacles.

On account of the position of the sphincter the collar cannot be regarded as the margin. Indeed there is no distinct margin, the upper part of the column wall passing directly over into the bases of the tentacles, so that, in the usual formula it is necessary to say that the margin is tentaculate. The tentacles are rather numerous, apparently somewhere in the neighborhood of 192, though an acurate count is difficult in the preserved specimens on account of the manner in which the cycles are crowded together towards the margin. They vary somewhat in length in the various specimens I have examined, owing to diffierence of contraction, but the average may be put at 1 cm. The most interesting feature of the tentacles is however the occurrence upon them of a large number of spherical protuberances scattered over their surface without any apparent regularity, though more abundant upon the oral than on the aboral surfaces. In section (Pl. fig 1.) these are seen to be hollow outpushings of the wall of the tentacles. The wall of the tentacle proper has a moderately thick mesoglœa, the ectodermal and endodermal muscle pro-

cesses being rather low, the ectoderm possessing but few nematocysts, and the endoderm being thin with only a few Zoöxanthellæ. The wall of the protrusion differs not a little from this; thus the mesoglœa is much thinner, the muscle processes are aborted, the ectoderm is richly provided with nematocysts, so that the protrusions might be termed batteries of nematocysts, and the endoderm is thick and abundantly packed with Zoöxanthellæ.

The tentacles leave exposed a considerable portion of the disc, perhaps about half its breadth, and this portion is smooth and slightly concave. Its mesoglœa is rather thin and the muscle processes are but moderate in length. No muscle cells are enclosed within the mesoglœa. The mouth is not elevated above the disc and is almost circular in the preserved specimens, the gonidial angles being but slightly marked.

In the single specimen in which I counted the mesenteries there were forty-eight pairs, a number which agrees with that found by Dr. Northrop in another specimen. Of these forty-eight pairs but six are perfect, forming the first cycle; the six pairs of the second cycle nearly equal the first cycle in size, but are imperfect; the twelve of the third cycle are considerably smaller, though still quite muscular; while the twenty-four pairs of the fourth cycle, though extending some distance in from the body wall, yet have their musculature but feebly developed. Two pairs of directives are present and are attached to a greater extent of the stomatodæum than are the other mesenteries of the first cycle. The longitudinal muscles are well developed and have in section the form represented in fig. 2. The parieto-basilar muscles are but feebly represented and do not require special description. Numerous acontia occur, a fact that was discovered by Dr. Northrop. None of the specimens examined possessed reproductive organs, so that nothing can be said regarding the distribution of these organs.

There seems to be no room for doubt but that this form is identical with that described by Duchassaing and Michelotti in their first paper ('60) as *Capnea lucida* though later ('66) assigned to the genus Heteractis, a genus established by Milne-Edwards for the reception of the *Actinia aurora* of Quoy and Gaimard. Andres ('83) has referred it to the genus Ragactis, which he established for a species, *R. pulchra*, discovered by him in the

Mediterranean. The distinction between Ragactis and Heteractis concerns practically the tentacles only, the evaginations upon these structures being in the former genus small and appearing as tubercles, while in the latter they involve the entire circumference of the tentacle, which thus becomes moniliform. How far this distinction is valid can only be determined by further examination of the anatomy of the various species assigned to the two genera, and for the present it seems to me more convenient to retain for the species under discussion the name proposed by its sponsors.

An interesting fact which has developed from the examination of *H. lucida* is that it is unquestionably a Sagartid. The occurrence of acontia (to which my attention was first called by Dr. Northrop) and of cinclides, the existence of only six perfect mesenteries and the mesoglœal sphincter point indubitably to this relationship, and it will be interesting to know whether *Ragactis pulchra* and the other species assigned to the genus Heteractis are likewise Sagartids. Andres has grouped together in the family Heteractidæ several genera, *e. g.*, in addition to the two already mentioned, Eloactis, Rhopalactis and Stauractis. Of these, as I have already suggested ('93), the genus Eloactis, as judged by the species *E. Mazeli*, is probably with greater propriety referable to the family Halcampidæ, and I have now shown that one at least of the members of the genus Ragactis must also be transferred to another family. Families based upon mere external characters have no firm foundation, tentacles may vary enormously in shape, warts or tubercles may be absent or present within the limits of the same family, and cases like the present show, if proof be still wanting, that the criteria for a proper classification of the Actiniaria are to be obtained only by the careful study of the internal anatomy of the various forms.

We must add then, provisionally, to the genera included in the family Sagartidæ, the genus Heteractis, since one of the forms assigned to it has proved to be a typical Sagartid. Whether, however, the type species of the genus, *H. aurora*, will also prove to be a Sagartid, or whether it will be necessary to remove *H. lucida* from the genus Heteractis, remains to be determined. And furthermore the affinities of *Ragactis pulchra* must also be accurately studied before the proper generic term for *H. lucida* can be finally determined.

Family DENDROMELIDÆ.

In my earlier paper ('89) on West Indian Actiniaria I proposed a new sub-tribe Dendromelinæ for the reception of the peculiar form *Lebrunea neglecta* discovered by Duchassaing and Michelotti ('60) and proposed to place in it also the genus Ophiodiscus described by R. Hertwig ('82). Since that time I have come to the conclusion that I gave the group too high a mark and have suggested ('93) its reduction to a family of the sub-tribe Actininæ. With the two forms already mentioned it seems that a third should be associated, namely, the *Hoplophoria coralligens* described by H. V. Wilson ('90), which, as I have already pointed out elsewhere ('93), seems to be identical with the *Viatrix globulifera* described by Duchassaing and Michelotti ('60).

Lebrunea neglecta Duch. & Mich. (1860).

A single specimen of this form was in the collection and being unwilling to injure it, I have nothing to add to the description of the structure given in my earlier paper. It may be stated, however, that the number of pseudotentacles is in this individual six, just as they were in the other specimens examined; one, however, is considerably smaller than the others.

Family PHYLLACTIDÆ.

Diplactis bermudensis McMurrich. (1889).

This species I described ('89a) originally from alcoholic specimens from the Bermudas and was pleased to find it represented in the present collection by several specimens, together with a drawing (here reproduced in pl. xvii, fig. 3) and a description of the living animal. I have nothing to add to my original account of the anatomical characteristics of the species, but am able to complete it by abstracting from Dr. Northrop's notes a description of the coloration and form of the living animal.

The column is chocolate brown in color, and when the animal is expanded has a greater diameter at the base and at the upper part than in the middle of its length, the upper part forming a slight parapet projecting above the level of the disc. The tentacles are brownish red in color and the disc rufous, that is to say, somewhat paler than the tentacles. The papillæ which represent the fronds Dr. Northrop apparently overlooked, inasmuch as they

would be completely hidden by the expanded tentacles, and even in preserved specimens they are only to be found by careful examination. What their appearance and form may be in the living condition cannot therefore be stated here.

The occurrence of this species in the Bahamas as well as in the Bermudas suggests the possibility of its identity with one of the forms described by Duchassaing and Michelotti, and in studying their descriptions two species are found to be worthy of remark in this connection. The first of these is the *Actinia aster* mentioned by Ellis ('86) and described by him as having "a thick, fleshy, smooth and almost cylindrical stem, ending abruptly at the top, which is provided with circular rows of tentacles." This description contains nothing that is particularly distinctive, but nevertheless Duchassaing and Michelotti ('66) have identified with it a form which they describe as about an inch in height and with the tentacles ringed with white and brown, while the body and disc are "colorés en rougeâtre et en bleu très-clair." Taking this latter description as a guide for the identification of *A. aster* it will be seen that while making the necessary allowances for the uncertainties which are associated with color descriptions, there is a certain vague approximation of the coloration to that of *Diplactis bermudensis*; nevertheless the discrepancies are too great to allow of an identification of the two forms. Dr. Northrop's notes contains no statements as to variations in color of *D. bermudensis*, and until it is found that these exist and that they approximate the coloration described for *A. aster*, it seems better to consider the two forms distinct.

Another form also presents possibilities in this connection, viz., the *Anemonia depressa* of Duchassaing and Michelotti ('60), a form with a large disc yellowish in color, with tentacles shorter than the diameter of the disc, and tinted with shades of blue and reddish ("leurs nuances sont le bleu et le rougeâtre"). A figure is given of the disc and tentacles of this form and might answer for those of *D. bermudensis*, and if the mention of "le bleu" were omitted, the color descriptions would correspond fairly well. Of the two possibilities I think the identity of *D. bermudensis* with *A. depressa* is the more probable one, but even here the uncertainty is too great to justify the identification without further evidence, and for the present it seems wiser to allow the name used here to stand.

Family RHODACTIDÆ.

Ricordea florida, Duch & Mich. 1860.

Synonym:—*Heteranthus floridus* (*D. & M.*) McMurrich. 1889.

In my paper on the Bahama Actiniaria I described this form as a species of Klunzinger's genus Heteranthus, disregarding the name bestowed upon it by Duchassaing and Michelotti on the ground that the characters assigned to the genus by those authors were specific rather than generic, and therefore insufficient, while Klunzinger's definition of his genus was quite adequate. Although this criticism still seems to me to be just, yet nevertheless according to the strict laws of priority Duchassaing and Michelottis' name is the one which should be employed, and I take this opportunity of correcting my error in the matter.

Attention may also be called to the probability of the genus Homactis established by Verrill ('69) being identical with Klunzinger's Heteranthus, so that it too has a claim prior to Heteranthus, their latter genus not having been established until 1877. Ricordea is, however, prior to both, and therefore should supplant them.

Family ZOANTHIDÆ.

Zoanthus nymphæus (Les.).

Synonyms:—*Mammillifera nymphæa*, Lesueur, 1817.
Palythoa nymphosa, Dana, 1849.
Polythoa (*Mammothoa*) *nymphosa*, Andres, 1883.

In 1817 Lesueur established the genus Mammillifera for the reception of two Zoanthids (which he named *M. auricula* and *M. nymphœa*), and characterized the genus as containing those forms which possess "a large cuticular expansion, serving as the base of numerous animals, which, when contracted, assume the form of mammæ." Andres ('83) unites this genus with Palythoa, making it a subgenus for which he proposes the name Mammothoa, but this is evidently an error, since he characterized the genus Palythoa as having sandy incrustations in the column walls, while Lesueur distinctly gives it to be understood that his species of Mammillifera have fleshy walls. Erdmann in '85 revived Lesueur's genus, though, as Haddon and Shackleton ('91) have pointed out, it is questionable if the form he referred to the genus can be associated with Lesueur's type species, and it is interest-

ing accordingly to have an account of the structure of one of Lesueur's species, in order that the true position of his genus may be determined.

Among the slides which Dr. Northrop had prepared, I find a number of a Zoanthid which he had provisionally designated No. 3, and also a number of drawings of the same form, one of which was the figure of the group of individuals taken from preserved specimens (fig. 4). Unfortunately, in the material forwarded me there were no examples of this No. 3, but there were specimens of a form which the accompanying label stated to have been collected by Dr. E. A. Andrews at Green Turtle Bay, Bahama Islands. This form resembled in general appearance the drawing of No. 3, and preparations which I made of it demonstrated with certainty its identity with Dr. Northrop's No. 3.

As regards its identity with Lesueur's *M. nymphœa*, there must necessarily be a certain amount of uncertainty. It agrees with the figure of *M. auricula* given in Lesueur's paper and it answers the generic description; unfortunately, I find no memoranda of its coloration and base the identification with *nymphæa*, rather than with *auricula*, on the number of tentacles, which is about fifty, and which Lesueur states to be about fifty in the former species and from twenty-six to thirty in the latter.

The individual polyps composing a colony are seated close together upon a cœnenchymatous expansion, and reach in preserved specimens a height of about 2.0–3.5 mm., the measurement being taken from the point of attachment to the cœnenchyme. The diameter of the column is about 3 or 4 mm. at the top, slightly less lower down, and the capitulum shows clearly a number of radiating ridges.

The column wall is smooth and without imbedded particles of foreign matter. In structure it resembles closely what has been described for *Zoanthus sociatus*, the same large lacunar spaces occuring in the mesoglœa, while the ectoderm is enclosed within the outermost portion of the mesoglœa, being covered by a mesoglœa, subcuticula and by a cuticle, much more distinct in some specimens than in others. The sphincter muscles, which, for diagnostic purposes, seem to be of great importance in the Zoantheæ, is double, the two parts being well marked off from one another. The arrangement is shown in fig. 5, and from this it will be seen that the upper portion of the sphincter is small, while

the lower is of some length and in its upper part is composed of a few large cavities which occupy the entire thickness of the mesoglœa, lower down the cavities becoming smaller, but being for the most part more or less circular. The figure will however give a better idea of its arrangement than many lines of description, and from it it will be seen that in the number and arrangement of the muscle cavities the sphincter differs from that of any other form which has hitherto been described, particularly from that of the form described by Hertwig ('88), as *Z. Danæ*, the sphincter of which has been described by Erdmann ('85), and which might possibly be considered identical with the form under consideration.

The tentacles are completely infolded in the majority of the individuals of the colonies I have examined, being visible, however, in a few cases. They are short, as is usual in Zoanthids, and are arranged in two cycles, their number being in the neighborhood of fifty, fifty-six in one specimen in which they could be counted. Nothing worthy of note was observed in connection with the disc, but in connection with the stomatodæum it may be stated that its siphonoglyph was deep, about one-third of the total surface of the stomatodæum being occupied by its smooth walls.

The mesenteries are arranged in the microtype (brachycnemic, Haddon), and there are about 28 to 32 pairs. Each has a single lacunar space near its point of attachment to the column wall, and its mesoglœa is thinner than is usual. Three of the individuals were sexually mature and it is interesting to note that both ova and spermatozoa were present in the same individual, this species like that observed by Erdmann ('85) being hermaphrodite.

Isaurus Duchassaingi (Andres).

Synonyms: *Zoanthus tuberculatus.* Duchassaing & Michelotti. 1860.
Antinedia tuberculata. Duchassaing & Michelotti. 1864.
Antinedia Duchassaingi. Andres. 1883.

This species was originally described by Duchassaing, in a paper ('50) to which I have not access at present as *Zoanthus tuberculatus*, the generic name being supplanted in a subsequent paper ('64) by Antinedia. In my paper on the Actiniaria of the Bermudas ('89a) I considered this latter genus to be identical with the genus Mammillifera as defined by Erdmann ('85); since then Haddon, in a paper written in conjunction with Miss Shackleton,

('91) has shown that there is little probability that the species assigned to the genus Mammillifera by Erdmann present the characters of the forms upon which that genus was founded by Lesueur ('17), and employs the generic term used by Gray ('28) for a tuberculate Zoanthid. I agree with Haddon's conclusions as to this matter and have therefore followed his example in using the name Isaurus.

The form described by Gray was from an unknown locality and was given the specific name *tuberculatus*. I found among the Bermudan forms which I studied a species which seemed to agree closely with Gray's descriptions and I identified it with his species. At the same time I also identified the species described by Duchassaing aud Michelotti with this same form, an identification I now find to have been erroneous. The tuberculate Zoanthid in the Northrop collection is undoubtedly identical with the form described by Duchassaing and Michelotti, but it presents unmistakable differences from the Bermuda species, and must be regarded as distinct from it. The specific name given by Duchassaing and Michelotti being preoccupied by Gray's species, a new name must be bestowed, and the term proposed by Andres ('83) seems most appropriate. Duchassaing and Michelotti's species may therefore be known as *Isaurus Duchassaingi*.

The appearance of the living animal in its contracted condition is shown in fig. 6, and I take the following description of it from Dr. Northrop's notes. The animals are found growing in groups of five or six, for the most part disconnected, though one specimen had connected with it a smaller individual, evidently produced by budding, and it may be presumed that each group owes its existence to this process, the various individuals separating from one another after a time. Duchassaing and Michelotti figure two individuals united by a stolon-like cœnenchyme, but in the preserved individuals I examined, separation had taken place. In color the polyps were yellowish, closely resembling their surroundings, the disc and tentacles being of the same color as the column. The base is firmly adherent and the column is "nearly cylindrical, but generally contracted near the base and often at intervals above, giving the animal a rather grotesque appearance. When slightly contracted the column bears a number of tubercles, which, though irregularly distributed, are more numerous near the top. In preserved and contracted specimens these tubercles

are quite conspicuous." I can add to this statement as to the distribution of the tubercles the fact that the tubercles are more numerous and more perfectly developed upon one side of the column than on the other, the arrangement described by Haddon and Miss Shackleton ('91) for *I. asymmetricus* being thus recalled.

The column wall is very much thinner than that of *I. tuberculatus* and in addition does not show any of the large canals filled with cells, so abundant in the Bermudan form. Numerous canaliculi and scattered cells, the latter frequently placed in the canaliculi, occur, the mesoglœa being otherwise structureless. The ectoderm of the column presents the arrangement which is usual in Zoanthids, being covered by a layer of mesoglœa, the subcuticula, from which trabeculæ extend inwards to unite with the general mesoglœa, cavities being thus formed which enclose packets of ectoderm cells (fig. 7). Externally to the subcuticula is a delicate cuticula to which foreign particles adhere, and the ectoderm cells contain numerous Zoöxanthellæ. This arrangement is identical with what I have described for *I. tuberculatus* ('89a), and agrees in its essential particulars with the accounts of the majority of the authors who have given the matter their attention. Quite recently von Heider ('95), in his account of *Zoanthus chierchiæ*, has come to the conclusion that the trabeculæ which separate the various packets of ectoderm are cells and that the subcuticula is formed by the fusion of their outer ends. Such an interpretation of the appearances is certainly not applicable to either of the species of Isaurus I have examined; the trabeculæ are so thick that their continuity with the mesoglœa is beyond question, and, furthermore, the structure of the subcuticula shows it to be identical with the matrix of the mesoglœa. Nor do the appearances presented by such a form as *Zoanthus sociatus* warrant the belief that the trabeculæ are otherwise constituted than in Isaurus, and so far as my observations are concerned they tend to show that the conclusions of von Heider are erroneous.

The tubercles are thickenings of the mesoglœa, but each contains also a cavity lined with cells continuous with the endoderm. Dr. Northrop's notes contain the following description of the tubercles: "In places the mesoglœa contains on its inner side deep cavities which are lined by the endodermis. The muscular layer of the mesoglœa, however, does not enter the cavity, but

forms a ring around its base (*i. e.*, its mouth), so that when contraction takes place the base of the cavity is drawn up like a purse and the body wall bulges out and forms a tubercle."

The upper portion of the column, which, in completely contracted individuals, forms the apex, is destitute of tubercles and is furnished with numerous longitudinal ridges. The sphincter muscle is strong and has the form represented in fig. 8, being simple, though showing a tendency to be divided into two parts, an evident constriction (*cr*) occurring upon it. This is not an individual peculiarity, as I have found it in three individuals examined, and it is interesting as forming an intermediate condition between the simple sphincter of *I. tuberculatus* and the double one of the genus Zoanthus.

The tentacles are arranged in two rows and their number seems to be double that of the pairs of mesenteries.

The mesenteries are arranged on the microtype, and vary in number in the different individuals from eighteen to twenty-three pairs. They are much more slender than those of *I. tuberculatus*, and though thickened towards their insertion with the column wall, yet this thickening is slight when compared with that of *tuberculatus*. Two or three slightly elongated (in section) canals are found in the thickened portion of the perfect mesenteries, the imperfect ones containing but one canal. No reproductive organs occurred in any of the specimens examined.

The stomatodæum presents a well developed siphonoglyphe and its surface is thrown into numerous marked ridges which correspond in a general way, but not accurately, with the intervals between successive pairs of perfect mesenteries.

LIST OF REFERENCES.

1886. Ellis, J.—The Natural History of many curious and uncommon Zoöphytes collected from various parts of the Globe systematically arranged and described by Daniel Solander. *London.* 1786.

1817. Lesueur, C. A.—Observations on several species of the genus Actinia; illustrated by figures.—*Journ. Acad. Nat. Sci. Philadelphia. Vol. I.* 1817.

1828. Gray, J. E.—Spicilegia Zoölogica. *London.* 1828.

1850. Duchassaing, P.—Animaux radiaires des Antilles. *Paris.* 1850.

1860. Duchassaing, P. et Michelotti, G.—Memoire sur les Coralliaires des Antilles—*Mem. de l'Acad. Sci. Turin. Ser. II. Tome XIX.* 1860.

1864. Duchassaing, P. et Michelotti, G.—Supplément an Memoire sur les Coralliaires des Antilles—*Mem de l'Acad. Sci. Turin. Ser. II. Tome XXII.* 1864.

1882. Hertwig, R.—Report on the Actiniaria—*Scient. Results of the Voyage of H. M. S. Challenger during the years 1873–76. Zoölogy. Vol. VI, Part XV.* 1882.

1883. Andres, A.—Le Attinie—*Atti dei Lincei. Ser. 3. Vol. XIV.* 1883.

1885. Erdmann, A.—Ueber einige neue Zoantheen. Ein Beitrag zur anatomischen und systematischen Kenntniss der Actinien. *Jenaische Zeitschr. Naturwiss. Bd. XIX.* 1885.

1888. Hertwig, R.—Report on the Actiniaria. Supplement—*Scient. Results of the Voyage of H. M. S. Challenger during years 1873–76. Zoölogy, Vol. XXVI, Part LXXXIII.* 1888.

1889. McMurrich, J. P.—The Actiniaria of the Bahama Islands, W. I.—*Journal of Morphology. Vol. III.* 1889.

1889a. McMurrich, J. P.—A contribution to the Actinology of the Bermudas. —*Proc. of the Acad. Nat. Sci. Philadelphia.* 1889.

1890. Wilson, H. V.—On a new Actinia, Hoplophoria coralligens.—*Studies from the Biolog. Labor. Johns Hopkins Univ., Vol. IV.* 1890.

1891. Haddon, A. C., and Shackleton, Alice M.—Reports on the Zoölogical collections made in Torres Straits, by Professor A. C. Haddon, 1888–1889. Actiniæ. I. Zoantheæ. *Scient. Trans. Royal Dublin Soc. Ser. II, Vol. IV.* 1891.

1893. McMurrich, J. P.—Report on the Actiniæ collected by the U. S. Fish Commission Steamer Albatross, during the winter of 1887–1888. *Proc. U. S. Nat. Museum. Vol. XVI.* 1893.

1895. Von Heider, A.—Zoanthus Chierchiæ, n. sp. — *Zeitschr für wiss. Zoologie. Bd. LIX.* 1895.

EXPLANATION OF PLATE XVII.

Fig. 1. Transverse section through tentacle of *Heteractis lucida. tb*=tubercle. Zeiss C 2.

Fig. 2. Transverse section through a pair of mesenteries of the first cycle of *Heteractis lucida.* Zeiss A 2.

Fig. 3. *Diplactis bermudensis*, natural size. Drawn by Mrs. Northrop.

Fig. 4. *Zoanthus nymphœus*, x 3. Drawn by Mrs. Northrop.

Fig. 5. Longitudinal section through the upper part of the column wall of *Zoanthus nymphœus*, showing the sphincter. *sp'*=upper and *sp*=lower part of the double sphincter. Zeiss a 2.

Fig. 6. *Isaurus Duchassaingi*, natural size. Drawn by Mrs. Northrop.

Fig. 7. Portion of a transverse section through the column wall of *Isaurus Duchassaingi. cu*=cuticula; *scu*=subcuticula; *ec*=ectoderm; *mg*=mesoglœa.

Fig. 8. Longitudinal section of the upper part of the column wall of *Isaurus Duchassaingi*, showing the sphincter. *cr*=constriction almost dividing the sphincter.

Fig. 8.

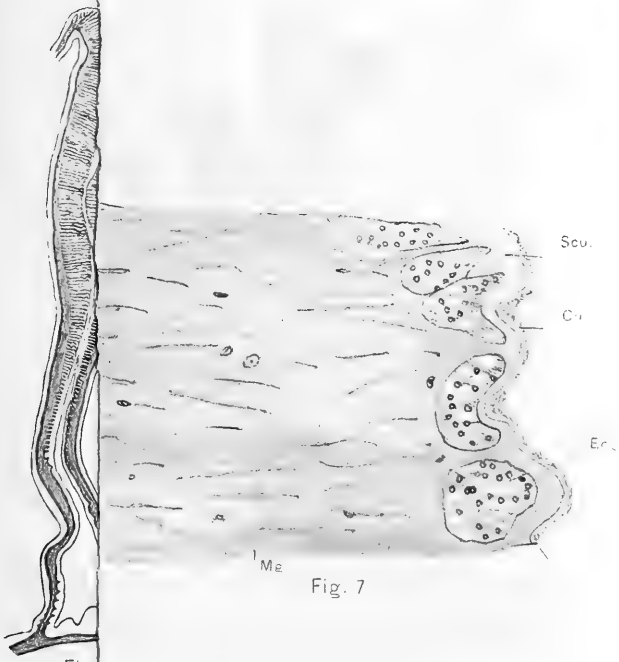


Fig. 7

Fig

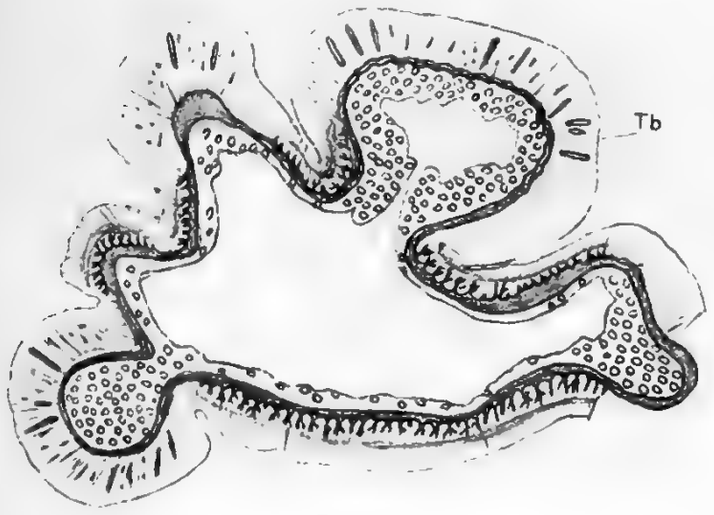


Fig. 1

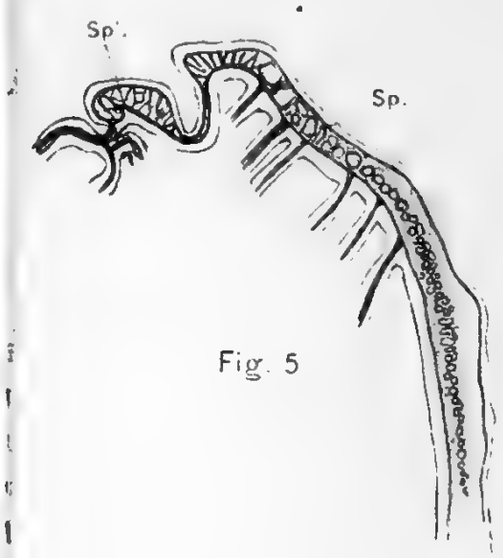


Fig. 5

Fig. 8.

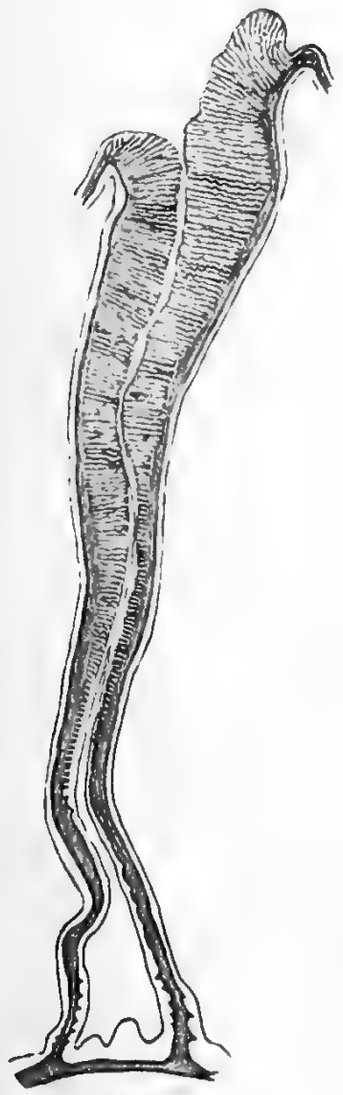


Fig. 2.

Fig. 6.

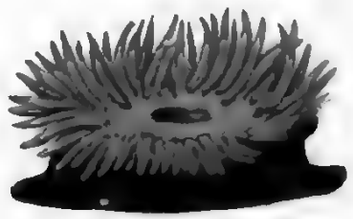


Fig. 3.

Fig. 4.

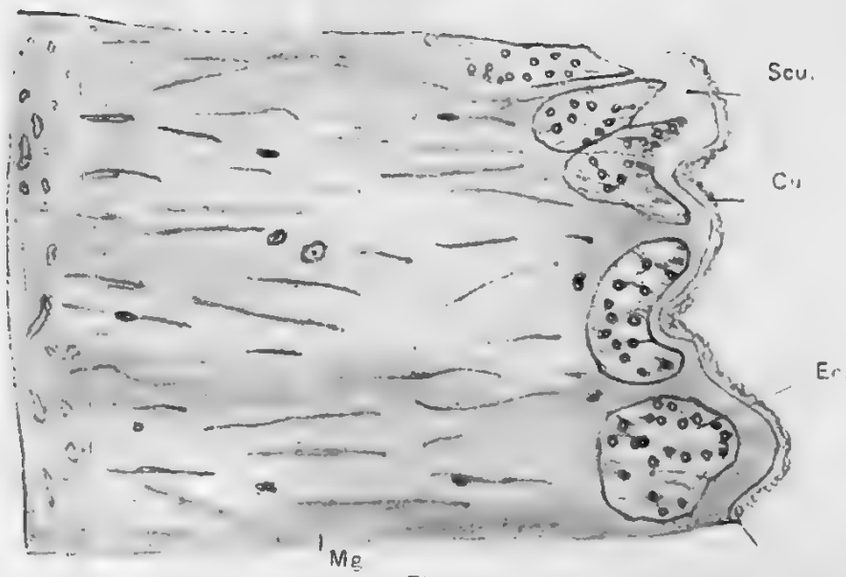


Fig. 7

V.—*On the Permanence of the Rutherfurd Photographic Plates.*

BY HAROLD JACOBY.

Read April 6th, 1896.

1. It has been evident for some time that the great mass of photographic plates which have been accumulating in the hands of astronomers can not be subjected to measurement without considerable delay. Indeed, this delay will probably be as great as a quarter of a century in the case of some of the plates which will ultimately be measured with precision. In other cases, no doubt, the measurement will never be made. It is clear that very great interest attaches to the question of how long the plates can be kept without impairing the degree of precision attainable in their measurement. In the case of the Rutherfurd plates this question is especially important, because the major portion of the whole collection of plates is still unmeasured. If these plates admit of accurate measurement they furnish us with a source of information of the greatest value, since they are now about a quarter of a century old, and will therefore supply a unique contribution toward the study of inter-stellar motion.

It is fortunately possible to decide this question in a very simple manner, as far as the Rutherfurd plates are concerned. It is merely necessary to remeasure some of the plates which were very carefully measured under Mr. Rutherfurd's direction soon after they were made. A simple comparison of the new measures with the old ought then to bring to light any possible changes in the plates. It is true that such a comparison will not furnish definitive information as to the permanence of the modern gelatine dry-plates, such as are now everywhere in use for astronomical photography. For the Rutherfurd photographs were made by the old wet-plate process, using albumenized plates. Yet it is not improbable that the modern dry-plates will equal in durability the ones used by Rutherfurd, so that the very favorable result obtained in the present paper is most encouraging to the hope that the measurement of the plates now being made will be possible at epochs quite remote from the present time.

The cluster of stars most convenient for the present research is, of course, the group of the Pleiades. This group was frequently photographed by Rutherfurd, and ten of his best plates were carefully measured under his direction by Miss Ida C. Martin. Each of these plates has two impressions. The results of all these measures by Miss Martin have been published.* It has seemed very appropriate that the first work to be undertaken with the Repsold photographic measuring machine presented to the Observatory of Columbia University by Mr. Rutherfurd Stuyvesant should be the remeasurement of these old Pleiades plates, for the purpose of deciding the question of their permanence. This question once settled, the measurement of the other clusters photographed by Rutherfurd can be commenced. Many of these clusters have never been micrometrically determined. The only ones that have been measured with the heliometer, so far as we know, are the Pleiades and the Praesepe.† The latter cluster has been very carefully measured with the heliometer of the Göttingen Observatory, and Dr. Schur has only very recently published his most exhaustive discussion of these observations. He has not failed to point out the great desirability of publishing the results of Rutherfurd's later work on this cluster. But he has not emphasized the fact that his own heliometer observations are of the greatest importance in the reduction of all the Rutherfurd work. Since the appearance of the Göttingen triangulation of the Praesepe it has become possible to get a very complete check upon the scale-value and other constants of reduction of the Rutherfurd plates. These constants have heretofore depended altogether on Dr. Elkin's work on the Pleiades. It is to be hoped that, after the Praesepe plates have been measured, a comparison with the Göttingen triangulation will throw much light upon several points which have not as yet been made quite clear. The measurement of the Praesepe plates will therefore be the next work undertaken in connection with the Rutherfurd photographs.

2. The Repsold machine for the measurement of astronomical photographs belonging to the observatory of Columbia University is almost exactly similar to the one constructed by the same

* Annals N. Y. Acad. Sci., Vol. VI, p. 239.

† While the present paper was being printed, the Observatory of Yale University published a heliometric triangulation of the cluster in Coma Berenices, by Dr. Chase. This cluster is also among those photographed by Rutherfurd.

makers for Prof. Bakhuyzen, and which has been fully described by him (Bulletin du Comité Permanent, Tome I., p. 169). A very brief description of the instrument may perhaps not be out of place here. It consists essentially of an arrangement for comparing distances on the plate with a carefully graduated metal scale. To accomplish this a micrometer microscope is mounted on trunnions in such a way that by revolving the microscope through a very small angle it is possible to direct it towards either the plate or the scale. In this way it is possible to make successive bisections of the star and scale with the same microscope. Thus the position of the star with respect to the scale is measured micrometrically. The trunnions are parallel to the scale. The plate itself is mounted on a very firm casting which slides upon ways that are at right angles to the scale. The microscope with its trunnions slides upon another pair of ways that are parallel to the scale. Thus it is possible to center any star on the plate under the microscope by moving the microscope along its slide parallel to the scale, and the plate on its casting along the ways at right angles to the scale. The star having been centered in this way, a comparison with the scale gives us one coördinate of the star on the plate. It is evident from this that the coördinate as measured will be influenced by any divergence from exact straightness that may exist in the ways carrying the plate and its holder. For this reason, the greatest care has been taken to make these ways straight. The guiding way is a cylinder, because a cylinder can be constructed more nearly exact than any other geometrical form. The other way is merely a plane, and acts only as a support, not at all as a guide. In order to measure the second coördinate, it is necessary to turn the plate through a right angle, and then to proceed as before. To accomplish this a graduated circle is provided, read by two micrometer microscopes to single seconds.

The microscope used throughout the present series of observations for bisecting the plate and scale is provided with two distinct sets of wires, moved by separate screws at right angles to each other. Both sets of wires are in focus at the same time, though, of course, the two sets are not exactly in the focal plane of the microscope. The object of having two sets of wires is to measure plates that have had a *réseau*, or network of straight lines, photographed on them. For such plates, this double

microscope allows both coördinates to be measured in one position of the microscope by referring the star to the nearest straight lines. In the present research, only the horizontal screw of the microscope has been used. For the Rutherfurd plates have not the photographed réseau, and therefore the measures were made by the method described above in which the two coördinates are separately obtained by means of a direct comparison with the scale.

The errors of the measuring machine which can have an influence upon the measured coördinates, and which were therefore investigated with considerable care, are as follows:

1. Errors of the micrometer screw.
2. Division errors of the scale.
3. Deviations from perfect straightness of the guiding cylinder of the machine.
4. So-called errors of projection. These errors are caused by the fact that the trunnions about which the microscope revolves do not maintain a perfectly constant direction when the microscope with its trunnions is moved to different positions on its slider. This is caused by a lack of perfect straightness in the slider. The consequence of any slight change in the direction of the line joining the trunnions is of course to produce a slight error when the microscope is revolved about the trunnions in the comparison of the star with the scale. The existence of small errors from this source was pointed out by Donner (Acta Soc. Fenn. XXI. No. 8). Prof. Donner gave a method for the investigation of these errors. I have, however, preferred to neglect them altogether in the present research for the following reasons. Their investigation is a somewhat laborious operation requiring a great deal of time. Moreover, it is almost impossible to obtain a determination of them which will have quite sufficient weight. For this reason, the Messrs. Repsold have devoted considerable attention to devising a form of machine which will not be subject to these errors at all. They have come upon a plan which promises complete success, and this plan will be carried out in the new machine which they are now constructing for the observatory of Columbia University. It follows that if the errors in question had been elaborately investigated for the purpose of the present research, the results would not have been useful any further, because the next series of measures undertaken will be made with

the improved machine. But in the case of the present research the omission of these errors is of minor importance, for it is not our object to obtain the coördinates of the stars with the very last degree of precision possible. It is only intended to get a comparison of the old and new measures, and it is evident that the omission of these tiny corrections will tend to diminish the agreement of the two sets of measures, if indeed it has any appreciable effect at all. Consequently the favorable conclusion which we shall obtain further on as to the durability of the Rutherfurd plates will not be impaired in the slightest by the circumstance that we have omitted these errors of projection.

We shall now consider the above different errors of the measuring machine, beginning with the errors of the micrometer screw. The periodic errors of the screw were not determined, because it has always been possible to eliminate them almost completely by repeating all measures with the position of the screw changed by half a revolution. The non-periodic, or progressive errors were determined by a modification of the method used by Gill for the determination of the errors of the scales of the Cape heliometer. I am not aware that this method has been used elsewhere for the investigation of micrometer screws, and as it gives a determination of the progressive errors with very high precision but comparatively little labor, a brief description of it will not be out of place here. The full description of the method in all its details is now in course of publication in the American Journal of Science. It can be applied directly to the screws of micrometer microscopes, such as are used for reading scales or circles.

The observations consist in a series of readings of the divisions of the scale, taken with the micrometer microscope. In the present case, the scale is divided into millimetres, and as two revolutions of the screw correspond to one millimetre on the scale, it has only been possible to determine the error of the screw for each second complete revolution. A special scale a few millimetres in length, and divided into quarter millimetres, has been made by the Messrs. Repsold. With this scale the non-periodic errors will now be determined for a larger number of points on the screws.

The microscope is provided with an apparatus for counting the whole revolutions of the screw, and the range is from

$$\overset{R}{5.0} \text{ to } \overset{R}{15.0}.$$

Consequently the progressive errors have been determined for the points:

$$5.0_R,\ 7.0_R,\ 9.0_R,\ 11.0_R,\ 13.0_R,\ 15.0_R.$$

The errors determined for each point are independent of any assumed law for the variation of the progressive errors of the screw. The portion of the scale used for the present purpose is numbered from 73 to 78 inclusive, the numbering on the scale decreasing with increasing readings of the micrometer screw. The observations were made in a series of operations in each of which the screw was read on all the divisions of the scale, between 73 and 78, possible in the position occupied by the microscope during that operation. And the position of the microscope was changed between the operations in such a way that the observations in the successive operations were obtained in accordance with the following scheme. This scheme shows the results of two separate series of observations made by Mrs. Herman S. Davis.

Operation 1.

First Series.

Scale.	Screw.	Diff.
mm.	R	R
78	13.0014	
77	15.0018	2.0004

Second Series.

Scale.	Screw.	Diff.
mm.	R	R
78	13.0100	
77	15.0109	2.0009

Operation 2.

First Series.

Scale.	Screw.	Diff.
mm.	R	R
78	11.0020	
77	13.0040	2.0020
76	15.0058	2.0018

Second Series.

Scale.	Screw.	Diff.
mm.	R	R
78	11.0156	
77	13.0220	2.0064
76	15.0200	1.9980

Operation 3.

First Series.

Scale.	Screw.	Diff.
mm	R	R
78	9.0025	
77	11.0070	2.0045
76	13.0100	2.0030
75	15.0119	2.0019

Second Series.

Scale.	Screw.	Diff.
mm.	R	R
78	9.0045	
77	11.0080	2.0035
76	13.0115	2.0035
75	15.0150	2.0035

Operation 4.

First Series.

Scale.	Screw.	Diff.
mm	R	R
78	7.0076	
77	9.0115	2.0039
76	11.0170	2.0055
75	13.0235	2.0065
74	15.0226	1.9991

Second Series.

Scale.	Screw.	Diff.
mm.	R	R
78	7.0088	
77	9.0125	2.0037
76	11.0175	2.0050
75	13.0230	2.0055
74	15.0225	1.9995

Operation 5.

First Series.

Scale.	Screw.	Diff.
mm.	R	R
78	5.0115	
77	7.0160	2.0045
76	9.0205	2.0045
75	11.0285	2.0080
74	13.0320	2.0035
73	15.0322	2.0002

Second Series.

Scale.	Screw.	Diff.
mm.	R	R
78	5.0131	
77	7.0170	2.0039
76	9.0210	2.0040
75	11.0275	2.0065
74	13.0315	2.0040
73	15.0320	2.0005

Operation 6.

First Series.

Scale.	Screw.	Diff.
mm.	R	R
77	5.0026	
76	7.0095	2.0069
75	9.0140	2.0045
74	11.0190	2.0050
73	13.0239	2.0049

Second Series.

Scale.	Screw.	Diff.
mm.	R	R
77	5.0115	
76	7.0155	2.0040
75	9.0235	2.0080
74	11.0280	2.0045
73	13.0314	2.0034

Operation 7.

First Series.

Scale.	Screw.	Diff.
mm.	R	R
76	5.0005	
75	7.0070	2.0065
74	9.0085	2.0015
73	11.0152	2.0067

Second Series.

Scale.	Screw.	Diff.
mm.	R	R
76	5.0161	
75	7.0215	2.0054
74	9.0250	2.0035
73	11.0308	2.0058

Operation 8.

First Series.

Scale.	Screw.	Diff.
mm	R	R
75	5.0020	
74	7.0020	2.0000
73	9.0101	2.0081

Second Series.

Scale.	Screw.	Diff.
mm.	R	R
75	5.0024	
74	7.0020	1.9996
73	9.0092	2.0072

OPERATION 9.

First Series.			Second Series.		
Scale.	Screw.	Diff.	Scale.	Screw.	Diff.
mm.	R	R	mm.	R	R
74	5.0040		74	5.0035	
73	7.0102	2.0062	73	7.0090	2.0055

The micrometer readings in the column headed "Screw" are the means of two separate settings in every case except the first and last in each column. The latter are the means of eight settings. It can be shown that the precision of the whole result is very greatly increased by giving an increased weight to the first and last readings in this way. The numbers in the column "Diff." are found by substraction of the successive numbers in the preceding column. They are, therefore, the distances on the screw corresponding to the various millimetre spaces on the scale. It will be found that every millimetre space on the scale has been compared with the following spaces on the screw:

5–7, 7–9, 9–11, 11–13, 13–15.

The results are collected in the following table, which gives the numbers from the column "Diff." above *minus* 2^R. These quantities are expressed in units of the fourth decimal place.

First Series. Screw Revolutions.						Second Series. Screw Revolutions.					
Scale.	5–7	7–9	9–11	11–13	13–15	Scale.	5–7	7–9	9–11	11–13	13–15
78–77	+45	+39	+45	+20	+ 4	78–77	+39	+37	+35	+64	+ 9
77–76	+69	+45	+55	+30	+18	77–76	+40	+40	+50	+35	—20
76–75	+65	+45	+80	+65	+19	76–75	+54	+80	+65	+55	+35
75–74	0	+15	+50	+35	— 9	75–74	— 4	+35	+45	+40	— 5
74–73	+62	+81	+67	+49	+ 2	74–73	+55	+72	+58	+34	+ 5
Means.	+48	+45	+59	+40	+ 7	Means.	+37	+53	+51	+46	+ 5

It is evident that the quantities in the above table are the amounts by which the several millimetre spaces of the scale exceed two revolutions of the screw at various parts of its length. Consequently, the means at the foot of the columns are the corresponding excesses of the *mean* millimetre space. In other words, if we take the mean millimetre space as our standard of length, these means are the amounts by which the various distances of two revolutions of the screw are in error. A summation

of these quantities will therefore give us the errors of the screw at the various points observed. The method of computation will be plain from the following table. We have:

First Series.

R	Error.	Sum.
5– 7	+48	+ 48
7– 9	+45	+ 93
9–11	+59	+152
11–13	+40	+192
13–15	+ 7	+199

Second Series.

R	Error.	Sum.
5– 7	+37	+ 37
7– 9	+53	+ 90
9–11	+51	+141
11–13	+46	+187
13–15	+ 5	+192

The numbers in the column "Sum" are evidently the errors of the screw at the successive points:

$$7^R,\ 9^R,\ 11^R,\ 13^R,\ 15^R.$$

We may therefore proceed as follows:

First Series.

Read. of screw. R	Error of screw.	Prog. corr.	Final error.
5	0	0	0
7	+ 48	— 40	+ 8
9	+ 93	— 80	+13
11	+152	—120	+32
13	+192	—160	+33
15	+199	—199	+ 0

Second Series.

Read. of screw. R	Error of screw.	Prog. corr.	Final error.
5	0	0	0
7	+ 37	— 38	— 1
9	+ 90	— 77	+13
11	+141	—115	+26
13	+187	—153	+34
15	+192	—192	0

The quantities in the column headed "Error of Screw" are the summed errors from the preceding table. The next column, headed "Progressive Correction," contains a correction which varies uniformly as we proceed along the screw. It is intended to make the errors of the screw zero at the ends, and amounts to no more than changing our standard of length. Up to this point we used as our standard of length the mean millimetre of the scale. The application of the progressive correction makes the total length of the screw the standard, and the quantities in the last column, headed "Final Error," will therefore serve to reduce readings taken with this screw to what they would have been if the screw had no progressive errors. The signs will have to be changed in order to get the corrections that must be added to observed readings of the screw. We thus get the following final table of corrections that must be added to observed readings of the screw, in order to reduce them to what they would have been if the screw were free from non-periodic errors.

FINAL TABLE OF NON-PERIODIC SCREW-CORRECTIONS.

Read. of Screw.	First Series.	Second Series.	Final Mean.
R	R	R	R
5	0.0000	0.0000	0.0000
7	— .0008	+ .0001	— .0004
9	— .0013	— .0013	— .0013
11	— .0032	— .0026	— .0029
13	— .0033	— .0034	— .0034
15	.0000	.0000	.0000

It can be shown mathematically that the corrections determined for the various points by the above method possess very nearly equal weight. That the method gives results of extremely high precision, is evident from the agreement of the two entirely independent series. In examining these, it should be remembered that unity in the fourth decimal place corresponds to one twentieth of a micron on the scale, or 0.00005 millimetre.

In the actual reduction of the observations, it was found convenient to combine the above errors of the screw with the ordinary correction for runs. The latter was always carefully determined by reading the divisions numbered 60 and 65 on the scale. The distance between these two divisions corresponds very nearly to ten revolutions of the screw, and as no more than two revolutions were ever used in the measurements, the error of runs may be regarded as determined with quite sufficient precision. As we shall see further on, the divisions numbered 60 and 65 on the scale have equal errors of division. The error of runs determined from them did not therefore require correction for errors of division of the scale itself. Runs were always observed at the beginning and end of a day's work, which lasted about three hours. As no appreciable variations of the run were ever obtained, the mean for the day was used for all the observations of that day. The run varied considerably from day to day, however.

The combined correction for run and errors of the screw was obtained in the following way. Bearing in mind that the readings of the screw increase as the numbering on the scale decreases, let us put:

R=Reading on 60 *minus* Reading on 65 *minus* $^{R}10.0000$,
k=The non-periodic screw-correction already determined,
S=Any reading of the screw, whether taken on the star or scale.

Then the complete correction for runs and screw-error, which must be added to the reading S is:

$$-S\frac{R}{10}+k$$

Inasmuch as this correction is added to the readings on both the scale and star, and as the coördinate of the star is obtained by subtracting one of these readings from the other, it is allowable to add any quantity not a function of S to the above expression. By so doing we can make the expression always positive. Finally, then, the total correction to be added to all readings of the screw has been taken as:

$$-S\frac{R}{10}+k+1.2\,R+0.0035.$$

The object of using the quantity:

$$+1.2\,R+0.0035,$$

instead of a simple numerical constant, was to obtain the desired result without making any of the corrections unduly large. A set of tables were computed and the above corrections were taken from them without interpolation. In computing these tables, the screw corrections already determined were interpolated between the limits 9^R and 12^R. The screw was not used outside these limits in the present research.

An example of one of these tables, computed for $R = +0.^R0195$ is given here.

	9^R	10^R	11^R
.0	+0.0080	+0.0053	+0.0026
.1	.0078	.0050	.0022
.2	.0076	.0047	.0020
.3	.0072	.0044	.0017
.4	.0070	.0042	.0015
.5	.0067	.0039	.0013
.6	.0063	.0036	.0010
.7	.0061	.0034	.0008
.8	.0059	.0031	.0006
.9	.0056	.0028	.0003

3. We take up next the consideration of the division errors of the scale. These were determined for the Observatory by the *Kaiserliche Normal Aichungs Kommission* at Berlin. The method employed for determining the errors of the centimetre lines was that which I have described as Gill's method in the American Journal of Science for May, 1896. This method

is, however, credited to Leman and Thiessen in the report of the Aichungs Kommission. The millimetre lines were determined by comparison with a standard centimetre whose subdivisions had been previously carefully examined. The details of the present scale investigation, as well as those of an independent investigation which has been undertaken at Columbia University, are reserved for a separate publication. The present determination was made in such a way that the mean millimetre of the scale is taken as the standard millimetre. Consequently, the division errors for the two end lines of the scale are zero. The following table contains the division errors, the positive sign indicating that the interval between the zero line and the line in question is greater than the number of millimetres indicated by the number attached to the line. Consequently, in measuring with this scale, we must add to distances obtained directly the correction given in the following table, in order to obtain what we would have got if all the spaces of the scale were equal to the mean millimetre space.

TABLE OF DIVISION ERRORS OF THE SCALE.

Line	Corr.	Line	Corr.	Line	Corr.	Line	Corr.	Line	Corr.
	mm.		mm.		mm.		mm.		mm.
0	.000	27	+.004	53	+.002	79	+.004	105	+.002
1	—.001	28	+.002	54	+.004	80	+.004	106	+.002
2	—.001	29	+.002	55	+.003	81	+.004	107	+.002
3	—.001	30	+.003	56	+.004	82	+.004	108	+.002
4	.000	31	+.003	57	+.005	83	+.004	109	+.002
5	.000	32	+.003	58	+.005	84	+.003	110	+.001
6	.000	33	+.002	59	+.005	85	+.003	111	.000
7	.000	34	+.002	60	+.004	86	+.001	112	.000
8	—.001	35	+.003	61	+.004	87	+.004	113	.000
9	—.001	36	+.003	62	+.004	88	+.002	114	+.002
10	+.001	37	+.003	63	+.006	89	+.003	115	+.001
11	+.002	38	+.002	64	+.005	90	+.003	116	+.001
12	+.001	39	+.003	65	+.004	91	+.004	117	+.003
13	+.001	40	+.002	66	+.006	92	+.002	118	+.001
14	.000	41	+.001	67	+.004	93	+.002	119	+.003
15	+.001	42	+.001	68	+.003	94	+.002	120	+.002
16	+.001	43	+.002	69	+.005	95	+.002	121	+.002
17	.000	44	+.002	70	+.005	96	+.002	122	+.002
18	.000	45	+.002	71	+.005	97	+.002	123	+.002
19	+.001	46	+.002	72	+.004	98	+.002	124	+.003
20	+.001	47	+.002	74	+.004	99	+.002	125	+.002
21	+.001	48	+.002	74	+.004	100	+.002	126	+.003
22	+.001	49	+.003	75	+.003	101	+.001	127	+.002
23	.000	50	+.003	76	+.005	102	+.001	128	+.001
24	+.001	51	+.003	77	+.005	103	+.001	129	+.003
25	+.001	52	+.003	78	+.004	104	+.001	130	.000
26	+.002								

4. We shall now consider the errors caused by a deviation from perfect straightness in the guiding cylinder of the machine. It was not at first intended to take these errors into account in the present research, for the reason that it was certain *a priori* that they would be extremely small. Moreover, there was some delay in securing the apparatus needed for the investigation of this matter. The computations were therefore carried out without the application of any corrections for lack of straightness of the cylinder. The cylinder was, however, very carefully investigated afterwards, and it was found that no appreciable errors could be observed. The method employed for the investigation of the cylinder was that used by Gill in the investigation of the Cape of Good Hope measuring machine. It consists in comparing the cylinder with a stretched spider thread. For this purpose a stretched spider thread was carefully mounted on an iron plate, which could be inserted in the machine in the same way that the ordinary photographic negatives are put in. The spider thread being then made very nearly parallel to the cylinder by means of the position circle, it was merely necessary to move the plate along the guiding cylinder, and bisect the spider thread at various positions with the micrometer microscope. We thus measure directly the departure of the cylinder from a straight line, provided we assume that the spider thread itself is exactly straight. But as the thread was stretched with considerable tension, it is not possible that it should deviate at all from a sensibly straight line. Its own weight would of course make it hang in a catenary curve, but it is the projection of this curve upon a horizontal plane that we bisect. And this projection would of course be perfectly straight. As a further precaution, all the measures were repeated with the thread-plate turned through an angle of 180°. In this way any error of the cylinder will be determined separately by two entirely different parts of the thread. If there be real errors of the cylinder, they should come out sensibly the same from the two positions of the thread-plate.

In order that it may be possible to fix the points of the cylinder for which the errors are determined, there is an auxiliary scale attached to the machine. This scale is parallel to the cylinder, and is attached to the casting that carries the plate. A rough auxiliary microscope serves to read this scale to the nearest tenth of a millimetre. The numbering on this scale runs from 200 to

330, and in the present series of observations the thread was bisected at intervals of five millimetres throughout its length. The following table contains the readings on the thread obtained by two independent observers, Mrs. Herman S. Davis and Mrs. Annie Maclear Jacoby. Each number is the mean of at least six observations, made in three independent series. In each such series the observations were always repeated in the reverse order, so as to eliminate the effects of any possible continuous changes of temperature.

TABLE OF SPIDER THREAD OBSERVATIONS.

	OBSERVER DAVIS.		OBSERVER JACOBY.	
	Spider Line.		Spider Line.	
Scale.	Dir't.	Rev'd.	Dir't.	Rev'd.
	R	R	R	R
325	9.4987	9.4977	9.5000	9.5000
320	.4985	.4970	.5007	.4988
315	.4993	.4977	.4997	.4998
310	.5000	.4970	.4998	.4990
305	.4999	.4967	.4997	.4978
300	.4996	.4968	.5017	.4990
295	.4997	.4968	.5002	.4997
290	.4987	.4950	.5000	.4985
285	.5004	.4965	.4983	.4997
280	.4980	.4953	.4988	.4985
275	.4993	.4965	.4993	.4985
270	.4996	.4947	.4980	.4983
265	.4995	.4953	.4987	.4982
260	.4997	.4955	.4982	.4987
255	.4987	.4952	.4977	.4978
250	.4991	.4955	.4982	.4985
245	.4987	.4947	.4987	.4985
240	.4985	.4957	.4968	.4988
235	.4966	.4943	.4972	.4983
230	.4971	.4932	.4958	.4977
225	.4967	.4937	.4962	.4980
220	.4962	.4928	.4957	.4988
215	.4972	.4937	.4958	.4962
210	.4962	.4930	.4940	.4970
205	.4964	.4933	.4932	.4968

If there be appreciable errors of the cylinder, they should appear from the variation of the numbers in the above table. But first these numbers must be corrected for a possible lack of parallelism of the spider thread and the cylinder. It is also evidently allowable to add a constant to all the numbers. The following method of reduction has been used. Let:

N be one of the observed numbers in the table.
S be the corresponding reading of the scale.
x, y be two constants to be determined.

From each observed number in the table an equation of the following form was written down:

$$\tfrac{1}{5}(S - 265)\, x + y + N = 0$$

From a solution of these equations by least squares the values of x and y were determined. A separate solution was made for each column of observed numbers in the preceding table. If we then let:

N' be the corrected value of the error of the cylinder, we can compute N' by the equation:

$$N' = N + \tfrac{1}{5}(S - 265)\, x + y.$$

It is evident that this method of reduction amounts to nothing more than the application to the observed numbers of a correction that varies uniformly as we move along the cylinder. Such a correction evidently removes the effect of any want of parallelism of the cylinder and spider thread. The constant correction y is added for convenience merely.

The solutions of the equations by least squares give the following results:

	x	y
Observer Davis, Spider line direct,	—0.000135	—9.4985
Observer Davis, Spider line rever'd.,	— .000188	— .4953
Observer Jacoby, Spider line direct,	— .000260	— .4981
Observer Jacoby, Spider line rever'd.,	— .000089	— .4984

Applying these numbers to the calculation of the corrected errors of the cylinder, which we have called N', we get the final results contained in the following table:

TABLE OF ERRORS OF THE CYLINDER.

	Observer Davis.		Observer Jacoby.		
	Spider Line.		Spider Line.		
Scale.	Dir't.	Rev'd.	Dir't.	Rev'd.	Final Mean.
	R	R	R	R	R
325	—0.0014	+0.0002	—0.0012	+0.0005	—0.0005
320	— .0015	— .0004	— .0003	— .0006	— .0007
315	— .0005	+ .0005	— .0010	+ .0005	— .0001
310	+ .0003	.0000	— .0006	— .0002	— .0001
305	+ .0003	— .0001	— .0005	— .0013	— .0004
300	+ .0002	+ .0002	+ .0018	.0000	+ .0006
295	+ .0004	+ .0004	+ .0005	+ .0008	+ .0005
290	— .0005	— .0012	+ .0006	— .0003	— .0004
285	+ .0014	+ .0004	— .0008	+ .0009	+ .0005
280	— .0009	— .0006	— .0001	— .0002	— .0004
275	+ .0005	+ .0008	+ .0007	— .0001	+ .0005
270	+ .0010	— .0008	— .0004	— .0002	— .0001
265	+ .0010	.0000	+ .0006	— .0002	+ .0004
260	+ .0013	+ .0004	+ .0004	+ .0004	+ .0006
255	+ .0005	+ .0003	+ .0001	— .0004	+ .0001
250	+ .0010	+ .0008	+ .0009	+ .0004	+ .0008
245	+ .0007	+ .0002	+ .0016	+ .0005	+ .0008
240	+ .0007	+ .0013	.0000	+ .0008	+ .0007
235	— .0011	+ .0001	+ .0007	+ .0004	.0000
230	— .0005	— .0008	— .0005	— .0001	— .0005
225	— .0007	— .0001	+ .0002	+ .0003	— .0001
220	— .0011	— .0008	— .0001	+ .0012	— .0002
215	.0000	+ .0003	+ .0003	— .0013	— .0002
210	— .0008	— .0002	— .0012	— .0004	— .0006
205	— .0005	+ .0002	— .0018	— .0005	— .0006

The above results bear eloquent testimony to the precision with which the measuring machine has been constructed. It must be borne in mind that the above errors are not strictly errors of the cylinder. They include the errors caused by any defect in the way the casting that carries the plate follows the cylinder. Remembering that unity in the fourth decimal place corresponds to 0.00005 millimetre, we see that in no case does the cylinder error amount to half a micron. We can, therefore, conclude that no harm has been done by the omission of the cylinder errors in the present research. Still the numbers in the last column above show a prevalence of the negative sign at the beginning and end of the column. This seems to indicate that a very slight curve exists in the cylinder. If it were desired to apply the corrections here determined, it would be necessary to apply the above numbers with reversed sign to the observed screw reading obtained in the bisection of the star.

5. Having finished the description of the investigation of the

various errors of the machine, we come now to the measures of the plates. As we have already pointed out, the arrangements are such that the stars on the plate are compared successively with the divisions on a metal scale. Evidently it is merely necessary to subtract the reading of the scale belonging to the central star from that belonging to any other star, in order to get the coördinate of the latter, referred to the central star as the origin. It will be most convenient to use the central star as the origin, because the old measures were made in polar coördinates, *i. e.*, position angle and distance from the central star.

The first difficulty that presents itself arises from the fact that we are measuring glass plates with a scale made of German silver. As the coefficients of expansion of glass and German silver are very different, errors of appreciable magnitude might easily be caused by variations of temperature during the observations. For this reason, we have always repeated all our observations in the reverse order, immediately after finishing a series of any kind. The manner of doing this will be explained below. We have also taken the greatest care in securing readings of the position circle microscopes and the runs of the micrometer. Both were taken at the beginning and end of each series of observations, experience having shown that it was unnecessary to take them more frequently.

All the observations were made by Mrs. Herman S. Davis, and Mrs. Annie Maclear Jacoby. The following are the instructions that were written out by me for the guidance of the observers. I give first the instructions for making a complete comparison of a star with the scale:

"1. See that the eye-piece is central over the wires, and the reading of the micrometer about 9.000^{R}.

2. Read on the eastern impression of the star.

3. Read on the next smaller number of the scale.

4. Repeat 3.

5. Repeat 2.

6. Change the reading of the micrometer to about 9.500^{R}.

7. Repeat 2, 3, 4, and 5, using the western impression of the star."

These seven operations constitute a *complete* comparison of the star with the scale, and when speaking of such comparisons, complete comparisons are always meant.

In order to understand the above, it is necessary to bear in mind that it was Mr. Rutherfurd's invariable custom to make two impressions on his plates. They differ a little in right ascension, but not at all in declination. It is, therefore, clear that by reading the western impression with the micrometer changed by half a revolution, as explained in the above instructions, the mean result from the two impressions will be almost entirely free from periodic errors of the micrometer screw. Moreover, it will be noticed that the principle of repeating all observations in the reverse order is rigidly adhered to in the above instructions.

While this careful use of the above principle may reasonably be expected to remove the effects of any changes of temperature that may take place during a single set of observations, it is otherwise with changes that may take place at longer intervals of time. Measures made on one day are not immediately comparable with those made on another day. For the scale may have a different temperature on the second day, so that we shall really be measuring with a different standard of length on the two days. It has therefore been necessary to standardize the scale every day. This was done in the following way.

A pair of stars were selected differing very greatly in both coördinates, and therefore situated near opposite corners of the plate. These were carefully compared with the scale each day, and all the measures of that day were multiplied by a constant factor of such magnitude as would make the distance between the standards an absolute constant. Moreover, a special series of inter-comparisons of the distance between the standards in the x-coördinate and the y-coördinate was made, so as to be sure that the unit of measurement should be the same for both coördinates. we shall return to this matter later, as it is desirable first to give the further instructions furnished to the observers. These were as follows :

" To standardize the measures it is necessary to select a pair of standard stars having a very wide difference of both coördinates. These stars we will call A and B. The successive operations will now be as follows :

" (a) Compare the standard stars with the scale in the order A, B, B, A.

" (b) Compare the central star twice.

" (c) Compare a number of other stars with the scale, and then

repeat all the comparisons, taking the stars in the inverse order.

"(d) Repeat (b) and (a).

"The series of measures (a), (b), (c), and (d) will constitute a morning's work; and this can be carried on till all the stars have been measured in one coördinate. The microscopes connected with the position circle should be read each day, before beginning and after ending work. The same should be done with the thermometer.

"To measure the other coördinate, the position circle must be turned through a right angle, as nearly as may be, and all the stars must be measured in the same way."

It will be seen that throughout the above instructions the principle of repetition in the reverse order has been as closely adhered to as before. We have not been content with measurement made according to the above plan, however, but have again repeated all the measures in exactly the same way with the position circle turned through an angle of 180° from each of its former positions. This doubled the labor, but it has the advantage of eliminating any personality in bisecting the images. For if the observer has a habit of always putting the thread of the microscope too far to the right in making a bisection, then when the star-image is reversed 180° the same personality will affect the resulting coördinate with the opposite sign. Consequently the mean of the two measures will be free from any such personality, if it remain constant. Needless to say, as every star was measured twice at least each day, it has been possible to have the measure of each star on each day divided equally between the two observers. Consequently, the final position for each day is made to depend on two observers instead of one. In making the measures with the plate reversed 180°, operations 1 and 6 in the observer's instructions were interchanged for the more complete elimination of the periodic screw-errors.

We shall give an example of the method employed for recording and computing the comparisons of the star and scale. The star measured is Anon. 34, which was one of the standards. Of course the blank forms for recording these measures were arranged so as to bring all the measures of any given star so far as possible together on one sheet of paper. But all the measures of the present research were made in the manner shown below, so that the series of operations, of which this is a specimen, is to be re-

garded as the elementary one from a repetition of which all the final results were obtained.

Date, Dec. 31, 1895.

X

	STAR.		SCALE.			Difference of Means.	
	Microm.	Screw Corr. and Run.	Div.	Microm.	Screw Corr. and Run.		
EAST	9.517		34	9.709			
	.516			.710			
Means	9.5165	+67		9.7095	+61	0.1930	—6
WEST	9.009		34	9.218			
	.011			.219			
Means	9.0100	+80		9.2185	+76	0.2085	—4
				Mean of Differences $= m$		0.2008	—5
Measured by Davis.				$\frac{1}{2}\, m$		0.1004	—2
				Division Error Corr.		+.0020	
				Star		34.1022	

The above is a measure of the x-coördinate, corresponding to the direction of right ascension on the plate. It is one of the measures for which the position circle had been reversed through an angle of 180°, so that operations 1 and 6 have been interchanged. This is the reason why the first reading on the star was made with the microscope screw set near $\overset{R}{9.500}$. This particular measure was selected as an example because the run of the microscope was:

$$\overset{R}{R} = +0.0195,$$

so that we can use the specimen table of run and screw-error corrections given on p. 205. From that table are taken the numbers given here in the columns headed "Screw Corr." The rest of the above example requires little explanation. The column headed "Div." gives the number attached to the line of the scale upon which a reading was made. The screw corrections were not applied directly to the observations, but were carried along on the narrow column on the extreme right, expressed in units of the fourth decimal place. This column contains the difference of the

two screw corrections belonging to the two numbers whose difference is set down in the column headed " Difference of Means."

This method of reduction has the advantage of showing very clearly how much the results have been affected in each individual case by the application of the screw corrections. The line beginning " Mean of Differences " gives the mean of the measures of the east and west impressions, together with the mean of the two corresponding screw corrections. This number being expressed in revolutions of the screw needs to be divided by 2 in order to turn it into divisions of the scale. The next line, therefore, contains the half of the number in the preceding line, together with the corresponding half of the screw correction. This last has now become only 2 units of the fourth decimal place. The next line contains the division error of the line numbered 34 on the scale. This was the line read in the present measure, and the division error for it was taken from the table on p. 206. The last line then contains the point on the scale that is exactly opposite this star, according to the present measure. The number is obtained by applying the division-error correction and the tiny screw correction to the number marked " ½m." The whole number, 34, is simply the number attached to the line read on the scale.

It sometimes happens that the same line is not read on the scale for both the East and West impressions. For we always read on the next smaller division line of the scale, and if a line of the scale happened to be between the East and West images, the lines read for the two images would not be the same. In such cases it is evidently necessary to take the mean of the lines as well as the mean of the microscope readings. Thus if the line read for the West impression in the above example had been 35 instead of 34, the final line at the end should be 34½ instead of 34. This would be expressed by writing the final number 34.6022 instead of 34.1022.

6. The table given below contains the results of all the measures, set down in chronological order, according to the date of measurement. Two lines are devoted to each set of measures like the one just described. All the measures of each star taken on the same day are placed side by side, as it was thought this arrangement would make reference to the table more convenient. Of course the measures were not taken in the order as set down, but were made in strict accordance with the principle of repetition

in the reverse order, exactly as described above in the instructions given the observers.

At the head of each day's work are given the readings of the thermometer and position circle microscopes, together with the observations made for the determination of the runs. These quantities were always observed both before and after the day's work, and both results are given here. The mean was always used in the further reductions. The thermometer readings are in Fahrenheit degrees.

For convenience of reference, a rotation number has been assigned to each star in this table.

The initials in the last column are those of the two observers, Mrs. Herman S. Davis and Mrs. Annie Maclear Jacoby.

RESULTS OF THE MEASURES, PLATE 18, X-COÖRDINATE.

Date of Measures, 1895 Nov. 30.

Temperature, 57.0, 60.5. Circle right 181° 43′ 28″, 43′ 28″.

Runs, +.0200, +.0200. Circle left 43 52, 43 50.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	9.0045	28	10.3090	+1.3045	0.7019	.0000	29.2019	D.
W	9.5025	29	11.0055	+1.5030				
E	9.0310	28	10.3405	+1.3095	0.7019	.0000	29.2019	D.
W	9.5150	29	11.0130	+1.4980				
1 E	8.9990	28	10.3290	+1.3300	0.7106	.0000	29.2106	J.
W	9.4785	29	10.9910	+1.5125				
E	9.0150	28	10.3400	+1.3250	0.7072	.0000	29.2072	J.
W	9.4975	29	11.0015	+1.5040				
18 *m*, E	9.0310	100	9.8170	+0.7860	0.4325	+.0003	100.9328	D.
W	9.5140	101	10.4580	+0.9440				
E	9.0000	100	9.7840	+0.7840	0.4358	+.0003	100.9361	D.
W	9.5190	101	10.4780	+0.9590				
2 E	8.9950	100	9.7855	+0.7905	0.4401	+.0003	100.9404	J.
W	9 5025	101	10.4725	+0.9700				
E	8.9680	100	9.7675	+0.7995	0.4426	+.0003	100.9429	J.
W	9.4905	101	10.4615	+0.9710				
24 *p*, E	9.0010	65	10.9950	+1.9940	0.5411	+.0025	66.5436	J.
W	9.5005	67	9.6710	+0.1705				
E	9.0225	66	8.9905	−0.0320	0.0350	+.0049	66.5399	J.
W	9.4990	67	9.6710	+0.1720				
3 E	9.0320	65	11.0090	+1.9770	0.5355	+.0025	66.5380	D.
W	9.5195	67	9.6845	+0.1650				
E	9.0190	65	10.9985	+1.9795	0.5349	+.0025	66.5374	D.
W	9.5165	67	9.6765	+0.1600				
A 12, E	8.9990	71	10.8450	+1.8460	0.4679	+.0032	72.4711	J.
W	9.4850	73	9.5105	+0.0255				
4 E	9.0190	71	10.8585	+1.8395	0.4639	+.0032	72.4671	D.
W	9.5215	73	9 5375	+0.0160				
A 22, E	8.9850	64	10.8885	+1.9035	0.4924	+.0041	65.4965	J.
W	9.5005	66	9.5665	+0.0660				
5 E	9.0115	64	10.9165	+1.9050	0.4946	+.0041	65.4987	D.
W	9.5265	66	9.6000	+0.0735				
A 24, E	9.0470	63	10.9510	+1.9040	0.4989	+.0036	64.5025	D.
W	9.5050	65	9.5965	+0.0915				
6 E	9.0450	63	10.9480	+1.9030	0.4979	+.0036	64.5015	D.
W	9.4975	65	9.5860	+0.0885				

RESULTS OF THE MEASURES, PLATE 18, X-COÖRDINATE (*Continued*).

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 28, E	9.0105	49	10.7020	+1.6915	0.8970	+.0005	50.3975	D.
W	9.5070	50	11.4035	+1.8965				
7 E	8.9955	49	10.6910	+1.6955	0.9009	+.0005	50.4014	J.
W	9.5070	50	11.4150	+1.9080				
A 30, E	9.0150	36	10.9900	+1.9750	0.5346	+.0010	37.5356	D.
W	9.5205	38	9.6840	+0.1635				
8 E	8.9825	36	10.9650	+1.9825	0.5362	+.0010	37.5372	J.
W	9.4875	38	9.6500	+0.1625				
A 39, E	9.0260	18	9.1645	+0.1385	0.1112	+.0002	18.6114	D.
W	9.5150	19	9.8215	+0.3065				
9 E	8.9955	18	9.1505	+0.1550	0.1209	+.0002	18.6211	J.
W	9.4810	19	9.8095	+0.3285				

RESULTS OF THE MEASURES, PLATE 18, Y-COÖRDINATE.

Date of Measures, 1895, Dec. 2.

Temperature, 58.8, 63.5. Circle right 91° 43′ 31″, 43′ 38″.

Runs +.0180, +.0180. Circle left 43 52, 43 50.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	9.0160	94	11.0055	+1.9895	0.9900	—.0006	94.9894	D.
W	9.5030	94	11.4735	+1.9705				
E	9.0205	94	10.9895	+1.9690	0.9856	—.0006	94.9850	D.
W	9.4895	94	11.4630	+1.9735				
10 E	9.0165	94	11.0070	+1.9905	0.9912	—.0006	94.9906	J.
W	9.4320	94	11.4065	+1.9745				
E	9.0050	94	10.9940	+1.9890	0.9922	—.0006	94.9916	J.
W	9.5180	94	11.4980	+1.9800				
18 *m*, E	9.0300	19	9.3730	+0.3430	0.1641	+.0006	19.1647	D.
W	9.5230	19	9.8365	+0.3135				
E	9.0115	19	9.3615	+0.3500	0.1650	+.0006	19.1656	D.
W	9.5100	19	9.8200	+0.3100				
11 E	8.9605	19	9.3010	+0.3405	0.1629	+.0006	19.1635	J.
W	9.4930	19	9.8040	+0.3110				
E	9.0245	19	9.3610	+0.3365	0.1639	+.0006	19.1645	J.
W	9.4910	19	9.8100	+0.3190				
24 *p*, E	8.9815	68	8.9545	—0.0270	—0.0072	+.0030	67.9958	J.
W	9.5070	68	9.5050	—0.0020				
E	9.0020	68	9.0345	+0.0325	+0.0099	+.0030	68.0129	J.
W	9.4895	68	9.4965	+0.0070				
12 E	9.0005	68	9.0165	+0.0160	+0.0015	+.0030	68.0045	D.
W	9.5220	68	9.5120	—0.0100				
E	9.0230	68	9.0415	+0.0185	+0.0018	+.0030	68.0048	D.
	9.5290	68	9.5175	—0.0115				
A 12, E	9.0015	40	10.2110	+1.2095	0.5972	+.0005	40.5977	J.
W	9.5000	40	10.6795	+1.1795				
13 E	9.0400	40	10.2385	+1.1985	0.5918	+.0004	40.5922	D.
W	9.5135	40	10.6820	+1.1685				
A 22, E	8.9700	81	10.4320	+1.4620	0.7225	+.0022	81.7247	J.
W	9.4915	81	10.9195	+1.4280				
14 E	9.0255	81	10.4785	+1.4530	0.7166	+.0021	81.7187	D.
W	9.5155	81	10.9290	+1.4135				
A 24, E	9.0255	56	9.5545	+0.5290	0.2608	+.0033	56.2641	D.
W	9.5240	56	10.0380	+0.5140				
15 E	8.9875	56	9.5295	+0.5420	0.2666	+.0034	56.2700	J.
W	9.5020	56	10.0265	+0.5245				

RESULTS OF THE MEASURES, PLATE 18, Y-COÖRDINATE (*Continued*).

Desig. of Star.	Microm. Readings. On Star.	On scale. Line	On scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 28, E	9.0440	115	9.2225	+0.1785	0.0836	+.0008	115.0844	D.
W	9.5310	115	9.6870	+0.1560				
16 E	8.9845	115	9.1745	+0.1900	0.0866	+.0008	115.0874	J.
W	9.5035	115	9.6600	+0.1565				
A 30, E	9.0245	83	9.4595	+0.4350	0.2112	+.0035	83.2147	D.
W	9.5115	83	9.9215	+0.4100				
17 E	8.9715	83	9 4080	+0.4365	0.2151	+.0035	83.2186	J.
W	9.5115	83	9.9355	+0.4240				
A 39, E	9.0295	41	10.0925	+1.0630	0.5249	—.0004	41.5245	D.
W	9.5160	41	10.5525	+1.0365				
18 E	9.0205	41	10.0905	+1.0700	0.5315	—.0004	41.5311	J.
W	9.4955	41	10.5515	+1.0560				

RESULTS OF THE MEASURES, PLATE 18, STANDARDS.

Date of Measures, 1895, Dec. 3.

Temperature, 57.5, 64.0.

Runs,*

Y-COÖRDINATE.

Circle right 91° 43′ 38″, 43′ 36″.

Circle left 43 46, 43 54.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	9.0145	94	10.9805	1.9660	0.9828	—0.0007	94.9821	D.
W	9.5265	94	11.4915	1.9650				
19 E	9.0345	94	10.9910	1.9565	0.9789	—0.0007	94.9782	D.
W	9.5205	94	11.4795	1.9590				
18 *m*, E	9.0125	19	9.3475	0.3350	0.1606	+0.0006	19.1612	D.
W	9.5190	19	9.8265	0.3075				
20 E	9.0250	19	9.3580	0.3330	0.1611	+0.0006	19.1617	D.
W	9.5330	19	9.8445	0.3115				

X-COÖRDINATE.

Circle right 181° 43′ 44″, 43′ 49″.

Circle left 43 49, 43 35.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	9.0080	28	10.3225	1.3145	0.7044	+0.0001	29.2045	D.
W	9.5270	29	11.0300	1.5030				
21 E	9.0420	28	10.3645	1.3225	0.7062	0.0000	29.2062	D.
W	9.5195	29	11.0220	1.5025				
18 *m*, E	9.0325	100	9.8305	0.7980	0.4414	+0.0003	100.9417	D.
W	9.5085	101	10.4760	0.9675				
22 E	9.0165	100	9.8095	0.7930	0.4398	+0.0003	100.9401	D.
W	9.5110	101	10.4770	0.9660				

* The runs were not observed, and the observations were reduced with the assumed value R = + 0ᵉ.0195.

RESULTS OF THE MEASURES, PLATE 18, STANDARDS (*Continued*).

X-COÖRDINATE (Rev'd).

Circle right 1° 43′ 37″, 43′ 38″.

Circle left 43 49, 43 48.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	9.5255	101	10.9340	1.4085	0.6556	—0.0003	101.1553	D.
W	9.0185	100	10.2325	1.2140				
23 E	9.5440	101	10.9520	1.4080	0.6558	—0.0003	101.1555	D.
W	9.0000	100	10.2150	1.2150				
18 *m*, E	9.5325	29	11.4720	1.9395	0.9282	—0.0006	29.4276	D.
W	9.0445	28	10.8180	1.7735				
24 E	9.5285	29	11.4615	1.9330	0.9249	—0.0006	29.4243	D.
W	9.0365	28	10.8030	1.7665				

Y-COÖRDINATE (Rev'd).

Circle right 271° 43′ 54″, 43′ 51″.

Circle left 43 28, 43 28.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	9.5095	35	10.2660	0.7565	0.3786	+0.0019	35.3805	D.
W	9.0385	35	9.7965	0.7580				
25 E	9.5225	35	10.2840	0.7615	0.3808	+0.0019	35.3827	D.
W	9.0475	35	9.8090	0.7615				
18 *m*, E	9.5390	111	9.9335	0.3945	0.2044	—0.0006	111.2038	D.
W	9.0270	111	9.4500	0.4230				
26 E	9.5205	111	9.9100	0.3895	0.2031	—0.0006	111.2025	D.
W	9.0170	111	9.4400	0.4230				

RESULTS OF THE MEASURES, PLATE 18, X-COÖRDINATE (Rev'd).

Date of Measures, 1895, Dec. 5.

Temperature, 61.0, 68.5. Circle right 1° 43′ 38″, 43′ 40″.

Runs +.0210, +.0190. Circle left 43 32, 43 25.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	9.5160	101	10.9235	1.4075	0.6580	—0.0003	101.1577	D.
W	9.0045	100	10.2290	1.2245				
E	9.5240	101	10.9315	1.4075	0.6576	—0.0003	101.1573	D.
W	9.0020	100	10.2250	1.2230				
27 E	9.4815	101	10.8985	1.4170	0.6592	—0.0004	101.1588	J.
W	9.0045	100	10.2245	1.2200				
E	9.5040	101	10.9190	1.4150	0.6566	—0.0003	101.1563	J.
W	8.9905	100	10.2020	1.2115				
18 *m*, E	9.5485	29	11.4925	1.9440	0.9294	—0.0006	29.4288	D.
W	9.0315	28	10.8050	1.7735				
E	9.5160	29	11.4550	1.9390	0.9261	—0.0006	29.4255	D.
W	9.0350	28	10.8005	1.7655				
28 E	9.5045	29	11.4540	1.9495	0.9339	—0.0006	29.4333	J.
W	9.0045	28	10.7905	1.7860				
E	9.4885	29	11.4345	1.9460	0.9308	—0.0006	29.4302	J.
W	8.9735	28	10.7505	1.7770				
24 *p*, E	9.5205	64	10.2655	0.7450	0.3268	+0.0046	63.8314	J.
W	9.0000	63	9.5620	0.5620				
E	9.4875	64	10.2100	0.7225	0.3170	+0.0046	63.8216	J.
W	8.9940	63	9.5395	0.5455				
29 E	9.5200	64	10.2515	0.7315	0.3194	+0.0046	63.8240	D.
W	9.0350	63	9.5810	0.5460				
E	9.5160	64	10.2475	0.7315	0.3185	+0.0046	63.8231	D.
W	9.0295	63	9.5720	0.5425				
A 12, E	9.4885	58	10.3695	0.8810	0.3960	+0.0038	57.8998	J.
W	8.9960	57	9.6990	0.7030				
30 E	9.5355	58	10.4080	0.8725	0.3951	+0.0038	57.8989	D.
W	9.0365	57	9.7445	0.7080				
A 22, E	9.4930	65	10.3180	0.8250	0.3686	+0.0035	64.8721	J.
W	8.9605	64	9.6100	0.6495				
31 E	9.5190	65	10.3370	0.8180	0.3666	+0.0035	64.8701	D.
W	9.0230	64	9.6715	0.6485				
A 24, E	9.5210	66	10.3195	0.7985	0.3529	+0.0040	65.8569	D.
W	9.0290	65	9.6420	0.6130				
32 E	9.4955	66	10.3055	0.8100	0.3589	+0.0040	65.8629	J.
W	9.0060	65	9.6315	0.6255				

RESULTS OF THE MEASURES, PLATE 18, X-COÖRDINATE (Rev'd).
(*Continued.*)

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 28, E	9.4960	80	10.5165	1.0205	0.4601	+0.0028	79.9629	D.
W	9.0110	79	9.8310	0.8200				
33 E	9.5040	80	10.5385	1.0345	0.4639	+0.0028	79.9667	J.
W	8.9990	79	9.8200	0.8210				
A 30, E	9.5190	93	10.2655	0.7465	0.3252	+0.0010	92.8262	D.
W	9.0400	92	9.5945	0.5545				
34 E	9.4925	93	10.2485	0.7560	0.3300	+0.0011	92.8311	J.
W	8.9965	92	9.5605	0.5640				
A 39, E	9.5395	112	10.1220	0.5825	0.2488	—0.0007	111.7481	D.
W	9.0170	111	9.4295	0.4125				
35 E	9.5120	112	10.1075	0.5955	0.2540	—0.0007	111.7533	J.
W	9.0075	111	9.4280	0.4205				

RESULTS OF THE MEASURES, PLATE 18, Y-COÖRDINATE (Rev'd).

Date of Measures, 1895, Dec. 6.

Temperature, 63.0, 64.5. Circle right 271° 43′ 55″, 43′ 55″.

Runs, +.0210, +.0190. Circle left 43 20, 43 15.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	9.5130	35	10.2610	0.7480	0.3758	+0.0019	35.3777	D.
W	9.0315	35	9.7865	0.7550				
E	9.5390	35	10.2890	0.7500	0.3770	+0.0019	35.3789	D.
W	9.0435	35	9.8015	0.7580				
36 E	9.5075	35	10.2620	0.7545	0.3819	+0.0020	35.3839	J.
W	8.9860	35	9.7590	0.7730				
E	9.4955	35	10.2495	0.7540	0.3800	+0.0020	35.3820	J.
W	9.0035	35	9.7695	0.7660				
18 *m*, E	9.5440	111	9.9330	0.3890	0.1999	—0.0006	111.1993	D.
W	9.0300	111	9.4405	0.4105				
E	9.4935	111	9.8860	0.3925	0.2031	—0.0006	111.2025	D.
W	9.0390	111	9.4590	0.4200				
37 E	9.4905	111	9.8800	0.3895	0.2045	—0.0005	111.2040	J.
W	8.9810	111	9.4095	0.4285				
E	9.4920	111	9.8820	0.3900	0.2028	—0.0005	111.2023	J.
W	9.0130	111	9.4340	0.4210				
24 *p*, E	9.5045	62	10.2110	0.7065	0.3588	+0.0030	62.3638	J.
W	8.9980	62	9.7265	0.7285				
E	9.5015	62	10.2085	0.7070	0.3595	+0.0030	62.3625	J.
W	8.9975	62	9.7285	0.7310				
38 E	9.5275	62	10.2260	0.6985	0.3558	+0.0030	62.3588	D.
W	9.0225	62	9.7470	0.7245				
E	9.5015	62	10.2080	0.7065	0.3582	+0.0030	62.3612	D.
W	9.0355	62	9.7620	0.7265				
A 12, E	9.4995	89	11.0400	1.5405	0.7791	+0.0008	89.7799	J.
W	9.0005	89	10.5760	1.5760				
39 E	9.5230	89	11.0560	1.5330	0.7734	+0.0008	89.7742	D.
W	9.0520	89	10.6125	1.5605				
A 22, E	9.4870	48	10.7705	1.2835	0.6498	+0.0002	48.6500	J.
W	9.0055	48	10.3210	1.3155				
40 E	9.5010	48	10.7795	1.2785	0.6494	+0.0002	48.6496	D.
W	9.0470	48	10.3660	1.3190				
A 24, E	9.5120	74	9.6950	0.1830	0.0958	+0.0037	74.0995	D.
W	9.0220	74	9.2220	0.2000				
41 E	9.4970	74	9.6995	0.2025	0.1042	+0.0037	74.1079	J.
W	9.0000	74	9.2145	0.2145				

RESULTS OF THE MEASURES, PLATE 18, Y-COÖRDINATE (Rev'd).—(*Continued.*)

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 28, E	9.5405	15	10.0715	0.5310	0.2742	+0.0002	15.2744	D.
W	9.0180	15	9.5840	0.5660				
42 E	9.4940	15	10.0440	0.5500	0.2804	+0.0002	15.2806	J.
W	8.9945	15	9.5660	0.5715				
A 30, E	9.5490	47	9.8385	0.2895	0.1485	+0.0016	47.1501	D.
W	9.0480	47	9.3525	0.3045				
43 E	9.5190	47	9.8125	0.2935	0.1524	+0.0016	47.1540	J.
W	8.9840	47	9.3000	0.3160				
A 39, E	9.5260	88	11.1995	1.6735	0.8385	—0.0004	88.8381	D.
W	9.0240	88	10.7045	1.6805				
44 E	9.5055	88	11.1845	1.6790	0.8418	—0.0004	88.8414	J.
W	9.0010	88	10.6890	1.6880				

RESULTS OF THE MEASURES, PLATE 22, X-COÖRDINATE.

Date of Measures, 1895, Dec. 7.

Temperature, 64.5, 64.8. Circle right 181° 27′ 55″, 27′ 55″.

Runs, .0210, 0200. Circle left 27 52, 27 54.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	9.0210	31	10.6980	1.6770	0.7869	+0.0002	32.7871	D.
W	9.5110	33	10.9815	1.4705				
E	9.0565	31	10.7245	1.6680	0.7861	+0.0003	32.7864	D.
W	9.5050	33	10.9815	1.4765				
45 E	8.9935	31	10.6715	1.6780	0.7881	+0.0003	32.7884	J.
W	9.5055	33	10.9800	1.4745				
E	9.0320	31	10.7050	1.6730	0.7879	+0.0002	32.7881	J.
W	9.4880	33	10.9665	1.4785				
18 *m*, E	9.0395	103	10.2480	1.2085	0.5449	—0.0001	104.5448	D.
W	9.5210	105	10.4920	0.9710				
E	9.0440	103	10.2485	1.2045	0.5426	—0.0001	104.5425	D.
W	9.5430	105	10.5090	0.9660				
46 E	8.9860	103	10.1940	1.2080	0.5470	—0.0001	104.5469	J.
W	9.4925	105	10.4725	0.9800				
E	8.9890	103	10.2005	1.2115	0.5465	—0.0001	104.5464	J.
W	9.4990	105	10.4735	0.9745				
24 *p*, E	8.9960	69	9.3580	0.3620	0.1258	+0.0046	70.1304	J.
W	9.4935	71	9.6345	0.1410				
E	8.9810	69	9.3435	0.3625	0.1240	+0.0047	70.1287	J.
W	9.4970	71	9.6305	0.1335				
47 E	9.0625	69	9.4115	0.3490	0.1198	+0.0047	70.1245	D.
W	9.5000	71	9.6300	0.1300				
E	9.0355	69	9.3790	0.3435	0.1189	+0.0046	70.1235	D.
W	9.5080	71	9.6400	0.1320				
A 12, E	8.9850	75	9.2305	0.2455	0.0658	+0.0038	76.0696	J.
W	9.4815	77	9.4990	0.0175				
48 E	9.0175	75	9.2575	0.2400	0.0635	+0.0038	76.0673	D.
W	9.5030	77	9.5170	0.0140				
A 22, E	9.0005	68	9.2645	0.2640	0.0746	+0.0038	69.0784	J.
W	9.5160	70	9.5505	0.0345				
49 E	9.0425	68	9.2950	0.2525	0.0711	+0.0038	69.0749	D.
W	9.5170	70	9.5490	0.0320				
A 24, E	9.0330	67	9.3445	0.3115	0.0992	+0.0042	68.1034	D.
W	9.4945	69	9.5800	0.0855				
50 E	8.9960	67	9.3005	0.3045	0.0984	+0.0042	68.1026	J.
W	9.4950	69	9.5840	0.0890				

RESULTS OF THE MEASURES, PLATE 22, X-COÖRDINATE (*Continued*).

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 28, E	9.0300	53	9.0445	0.0145	0.4610	+0.0017	53.9627	D.
W	9.4980	54	11.3275	1.8295				
51 E	8.9895	53	9.0120	0.0225	0.4666	+0.0017	53.9683	J.
W	9.4905	54	11.3345	1.8440				
A 30, E	9.0560	40	9.3950	0.3390	0.1136	+0.0012	41.1148	D.
W	9.4965	42	9.6120	0.1155				
52 E	9.0075	40	9.3525	0.3450	0.1160	+0.0012	41.1172	J.
W	9.5045	42	9.6235	0.1190				
A 39, E	9.0385	21	9.6080	0.5695	0.2269	−0.0002	22.2267	D.
W	9.5070	23	9.8450	0.3380				
53 E	8.9840	21	9.5535	0.5695	0.2305	−0.0001	22.2304	J.
W	9.5100	23	9.8625	0.3525				

RESULTS OF THE MEASURES, PLATE 22, Y-COÖRDINATE.

Date of Measures, 1895, Dec. 9.

Temperature, 59.0, 63.5. Circle right 91° 27′ 56″, 27′ 55″.

Runs, +.0180, +.0200. Circle left 27 56, 27 55.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	9.0320	93	9.0705	0.0385	0.0222	+0.0019	93.0241	D.
W	9.5220	93	9.5725	0.0505				
E	9.0340	93	9.0740	0.0400	0.0229	+0.0019	93.0248	D.
W	9.5225	93	9.5740	0.0515				
54 E	8.9920	93	9.0350	0.0430	0.0254	+0.0020	93.0274	J.
W	9.4955	93	9.5540	0.0585				
E	9.0010	93	9.0475	0.0465	0.0258	+0.0019	93.0277	J.
W	9.5030	93	9.5595	0.0565				
18 *m*, E	9.0615	17	9.5885	0.5270	0.2600	—0.0008	17.2592	D.
W	9.5305	17	10.0435	0.5130				
E	9.0445	17	9.5705	0.5260	0.2596	—0.0007	17.2589	D.
W	9.5075	17	10.0200	0.5125				
55 E	8.9685	17	9.5070	0.5385	0.2646	—0.0007	17.2639	J.
W	9.4835	17	10.0035	0.5200				
E	8.9725	17	9.5185	0.5460	0.2682	—0.0007	17.2675	J.
W	9.4810	17	10.0080	0.5270				
24 *p*, E	8.9780	66	9.1230	0.1450	0.0745	+0.0058	66.0803	J.
W	9.4790	66	9.6320	0.1530				
E	8.9855	66	9.1310	0.1455	0.0732	+0.0058	66.0790	J.
W	9.4975	66	9.6450	0.1475				
56 E	9.0160	66	9.1545	0.1385	0.0709	+0.0058	66.0767	D.
W	9.5130	66	9.6580	0.1450				
E	9.0340	66	9.1710	0.1370	0.0702	+0.0058	66.0760	D.
W	9.5080	66	9.6520	0.1440				
A 12, E	9.0060	38	10.3475	1.3415	0.6685	+0.0002	38.6687	J.
W	9.4980	38	10.8305	1.3325				
57 E	9.0315	38	10.3695	1.3380	0.6675	+0.0002	38.6677	D.
W	9.5320	38	10.8640	1.3320				
A 22, E	8.9995	79	10.5745	1.5750	0.7872	+0.0018	79.7890	J.
W	9.5075	79	11.0815	1.5740				
58 E	9.0360	79	10.5975	1.5615	0.7820	+0.0018	79.7838	D.
W	9.5305	79	11.0970	1.5665				
A 24, E	9.0425	54	9.7025	0.6600	0.3309	+0.0031	54.3340	D.
W	9.5160	54	10.1795	0.6635				
59 E	9.0130	54	9.6855	0.6725	0.3374	+0.0030	54.3404	J.
W	9.4825	54	10.1595	0.6770				

RESULTS OF THE MEASURES, PLATE 22, Y-COÖRDINATE (*Continued*).

Desig. of Star.	Microm. Readings.			Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
	On Star.	On Scale.						
		Line	Reading.					
A 28, E	9.0165	113	9.2980	0.2815	0.1415	—0.0004	113.1411	D.
W	9 5250	113	9.8095	0.2845				
60 E	9.0060	113	9.2860	0.2800	0.1424	—0.0004	113.1420	J.
W	9.4745	113	9.7640	0.2895				
A 30, E	9.0225	81	9.5405	0.5180	0.2604	+0.0032	81.2636	D.
W	9.5255	81	10.0490	0.5235				
61 E	9.0215	81	9.5455	0.5240	0.2622	+0.0033	81.2655	J.
W	9.5025	81	10.0275	0.5250				
A 39, E	9.0380	39	10.1435	1.1055	0.5591	+0.0014	39.5605	D.
W	9.5335	39	10.6645	1.1310				
62 E	8.9990	39	10.1145	1.1155	0.5640	+0.0015	39.5655	J.
W	9.4960	39	10.6365	1.1405				

RESULTS OF THE MEASURES, PLATE 22, X-COÖRDINATE (Rev'd).
Date of Measures, 1895, Dec. 10.

Temperature, 61.0, 67.5.
Runs, +.0190, +.0180.

Circle right 1° 27′ 55″, 27′ 56″.
Circle left 27 52, 27 49.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	9.5525	98	10.6180	1.0655	0.5828	+.0004	97.5832	D.
W	9.0320	96	10.2975	1.2655				
E	9.5240	98	10.5910	1.0670	0.5849	+.0004	97.5853	D.
W	9.0375	96	10.3100	1.2725				
63 E	9.4900	98	10.5690	1.0790	0.5890	+.0005	97.5895	J.
W	9.0010	96	10.2780	1.2770				
E	9.5095	98	10.5815	1.0720	0.5859	+.0004	97.5863	J.
W	9.0095	96	10.2810	1.2715				
18 *m*, E	9.5220	26	11.0520	1.5300	0.8221	—.0007	25.8214	D.
W	9.0285	24	10.7870	1.7585				
E	9.5345	26	11.0670	1.5325	0.8240	—.0007	25.8233	D.
W	9.0385	24	10.8020	1.7635				
64 E	9.4955	26	11.0390	1.5435	0.8295	—.0007	25.8288	J.
W	9.0155	24	10.7900	1.7745				
E	9.4940	26	11.0380	1.5440	0.8281	—.0007	25.8274	J.
W	9.0005	24	10.7690	1.7685				
24 *p*, E	9.5035	61	9.8805	0.3770	0.2421	+.0038	60.2459	J.
W	9.0200	59	9.6115	0.5915				
E	9.4865	61	9.8600	0.3735	0.2448	+.0038	60.2486	J.
W	9.0000	59	9.6055	0.6055				
65 E	9.5200	61	9.8840	0.3640	0.2384	+.0038	60.2422	D.
W	9.0185	59	9.6080	0.5895				
E	9.5185	61	9.8885	0.3700	0.2380	+.0038	60.2418	D.
W	9.0215	59	9.6035	0.5820				
A 12, E	9.4970	55	9.9905	0.4935	0.3038	+.0017	54.3055	J.
W	9.0005	53	9.7220	0.7215				
66 E	9.5595	55	10.0420	0 4825	0.2986	+.0017	54.3003	D.
W	9.0225	53	9.7345	0.7120				
A 22, E	9.5285	62	9.9985	0.4700	0.2904	+.0032	61.2936	J.
W	8.9935	60	9.6850	0.6915				
67 E	9.5205	62	9.9905	0.4700	0.2901	+.0032	61.2933	D.
W	9.0515	60	9.7420	0.6905				
A 24, E	9.5400	63	9.9420	0.4020	0.2598	+.0043	62.2641	D.
W	9.0330	61	9.6700	0.6370				
68 E	9.5120	63	9.9310	0.4190	0.2674	+.0043	62.2717	J.
W	9.0020	61	9.6525	0.6505				

RESULTS OF THE MEASURES, PLATE 22, X-COÖRDINATE (Rev'd).

(*Continued.*)

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 28, E	9.5450	77	10.2495	0.7045	0.4014	+.0029	76.4043	D.
W	9.0135	75	9.9145	0.9010				
69 E	9.4930	77	10.2125	0.7195	0.4089	+.0030	76.4119	J.
W	9.0100	75	9.9260	0.9160				
A 30, E	9.5455	90	9.9360	0.3905	0.2489	+.0018	89.2507	D.
W	9.0365	88	9.6415	0.6050				
70 E	9.4725	90	9.8740	0.4015	0.2538	+.0018	89.2556	J.
W	9.0155	88	9.6290	0.6135				
A 39, E	9.5365	109	9.7065	0.1700	0.1414	+.0016	108.1430	D.
W	9.0215	107	9.4170	0.3955				
71 E	9.4730	109	9.6500	0.1770	0.1450	+.0016	108.1466	J.
W	8.9700	107	9.3730	0.4030				

RESULTS OF THE MEASURES, PLATE 22, Y-COÖRDINATE (Rev'd).

Date of Measures, 1895, Dec. 11.

Temperature, 62.4, 64.0. Circle right 271° 27′ 50″, 27′ 50″.

Runs, +.0180, +.0200. Circle left 27 48, 27 47.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	9.5080	37	10.1855	0.6775	0.3380	+0.0021	37.3401	D.
W	9.0635	37	9.7380	0.6745				
E	9.5415	37	10.2225	0.6810	0.3375	+0.0021	37.3396	D.
W	9.0525	37	9.7215	0.6690				
72 E	9.4915	37	10.1790	0.6875	0.3401	+0 0020	37.3421	J.
W	9.0125	37	9.6855	0.6730				
E	9.5305	37	10.2200	0.6895	0.3408	+0.0020	37.3428	J.
W	8.9865	37	9.6600	0.6735				
18 *m*, E	9.5310	113	9.7390	0.2080	0.1045	—0.0003	113.1042	D.
W	9.0550	113	9.2650	0.2100				
E	9.5485	113	9.7500	0.2015	0.1048	—0.0003	113.1045	D.
W	9.0365	113	9.2540	0.2175				
73 E	9.4835	113	9.7115	0.2280	0.1156	—0.0003	113.1153	J.
W	8.9845	113	9.2190	0.2345				
E	9.4915	113	9.7045	0.2130	0.1074	—0.0003	113.1071	J.
W	9.0010	113	9.2175	0.2165				
24 *p*, E	9.5160	64	10.1050	0.5890	0.2928	+0.0042	64.2970	J.
W	9.0195	64	9.6015	0.5820				
E	9.4955	64	10.0790	0.5835	0.2899	+0.0042	64.2941	J.
W	8.9990	64	9.5750	0.5760				
74 E	9.5720	64	10.1480	0.5760	0.2869	+0.0042	64.2911	D.
W	9.0195	64	9.5910	0.5715				
E	9.5315	64	10.1130	0.5815	0.2894	+0.0042	64.2936	D.
W	9.0415	64	9.6175	0.5760				
A 12, E	9.4805	91	10.8780	1.3975	0.6991	+0.0021	91.7012	J.
W	8.9885	91	10.3875	1.3990				
75 E	9.5180	91	10.9105	1.3925	0.6960	+0.0021	91.6981	D.
W	9.0190	91	10.4105	1.3915				
A 22, E	9.4820	50	10.6575	1.1755	0.5861	+0.0014	50.5875	J.
W	8.9955	50	10.1645	1.1690				
76 E	9.5215	50	10.6915	1.1700	0.5851	+0.0014	50.5865	D.
W	9.0375	50	10.2080	1.1705				
A 24, E	9.5345	76	9.5915	0.0570	0.0278	+0.0049	76.0327	D.
W	9.0140	76	9.0680	0.0540				
77 E	9.5150	76	9.5630	0.0480	0.0249	+0.0049	76.0298	J.
W	9.0060	76	9 0575	0.0515				

RESULTS OF THE MEASURES, PLATE 22, Y-COÖRDINATE (Rev'd).—(*Continued.*)

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 28, E	9.5440	17	9.9930	0.4490	0.2249	—0.0006	17.2243	D.
W	9.0190	17	9.4695	0.4505				
78 E	9.5075	17	9.9615	0.4540	0.2269	—0.0006	17.2263	J.
W	8.9955	17	9.4490	0.4535				
A 30, E	9.5335	49	9.7430	0.2095	0.1030	+0.0027	49.1057	D.
W	9.0405	49	9.2430	0.2025				
79 E	9.5025	49	9.7130	0.2105	0.1044	+0.0027	49.1071	J.
W	9.0015	49	9.2085	0.2070				
A 39, E	9.5545	90	11.1710	1.6165	0.8000	+0.0008	90.8008	D.
W	9.0425	90	10.6260	1.5835				
80 E	9.5055	90	11.1265	1.6210	0.8025	+0.0008	90.8033	J.
W	9.0110	90	10.6000	1.5890				

RESULTS OF THE MEASURES, PLATE 22, STANDARDS.

Date of Measures, 1895. Dec. 12. Y-COÖRDINATE (Rev'd).

Temperature, 61.8, 58.8. Circle right 271° 27′ 49″, 27′ 47″.

Runs, +.0200, +.0180. Circle left 27 47, 27 47.

Desig. of Star.	Microm. Readings. On Star.	on Scale. Line	on Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	9.0295	37	9.7105	0.6810	0.3370	+.0020	37.3390	D.
W	9.5195	37	10.1865	0.6670				
81 E	9.0655	37	9.7380	0.6725	0.3354	+.0021	37.3375	D.
W	9.5490	37	10.2180	0.6690				
18 *m*, E	9.0450	113	9.2565	0.2115	0.1102	—.0003	113.1099	D.
W	9.5265	113	9.7560	0.2295				
82 E	9.0055	113	9.2160	0.2105	0.1106	—.0003	113.1103	D.
W	9.5055	113	9.7375	0.2320				

X-COÖRDINATE (Rev'd).

Circle right 1° 27′ 54″, 27′ 50″.

Circle left 27 50, 27 52.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	8.9960	98	10.1045	1.1085	0.6072	+.0004	97.6076	J.
W	9.4955	96	10.8160	1.3205				
83 E	9.0010	98	10.1105	1.1095	0.6072	+.0004	97.6076	J.
W	9.4825	96	10.8020	1.3195				
18 *m*, E	8.9765	26	10.5480	1.5715	0.8479	—.0008	25.8471	J.
W	9.4980	24	11.3180	1.8200				
84 E	9.0025	26	10.5715	1.5690	0.8465	—.0008	25.8457	J.
W	9.5090	24	11.3260	1.8170				

RESULTS OF THE MEASURES, PLATE 22, STANDARDS (*Continued*).

X-COÖRDINATE

Circle right 181° 27′ 49″, 27′ 49″.

Circle left 27 51, 27 50.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	9.0320	31	10.6635	1.6315	0.7656	+.0004	32.7660	D.
W	9.5165	33	10.9475	1.4310				
85 E	9.5320	31	11.1645	1.6325	0.7641	+.0004	32.7645	D.
W	9.0140	33	10.4380	1.4240				
18 *m*, E	9.5445	103	10.6930	1.1485	0.5162	+.0001	104.5163	D.
W	9.0120	105	9.9285	0.9165				
86 E	9.5310	103	10.6880	1.1570	0.5188	+.0001	104.5189	D.
W	9.0165	105	9.9345	0.9180				

Y-COÖRDINATE.

Circle right 91° 27′ 50″, 27′ 50″.

Circle left 27 48, 27 48.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	9.4685	93	9.5240	0.0555	0.0309	+0.0019	93.0328	J.
W	9.0140	93	9.0820	0.0680				
87 E	9.4845	93	9.5445	0.0600	0.0315	+0.0019	93.0334	J.
W	9.0145	93	9.0805	0.0660				
18 *m*, E	9.5195	17	10.0600	0.5405	0.2654	—0.0007	17.2647	J.
W	9.0150	17	9.5360	0.5210				
88 E	9.4805	17	10.0245	0.5440	0.2644	—0.0007	17.2637	J.
W	9.0015	17	9.5150	0.5135				

RESULTS OF THE MEASURES, PLATE 24, X-COÖRDINATE.

Date of Measures, 1895, Dec. 13.

Temperature, 60.5, 66.0. Circle right 182° 20′ 27″, 20′ 27″.

Runs, +.0190, +.0190. Circle left 20 20, 20 18.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	9.0175	27	9.3595	0.3420	0.3978	+.0019	27.8997	D.
W	9.5110	28	10.7600	1.2490				
E	9.0180	27	9.3690	0.3510	0.3998	+.0019	27.9017	D.
W	9.5120	28	10.7600	1.2480				
89 E	9.0190	27	9.3750	0.3560	0.4024	+.0019	27.9043	J.
W	9.4925	28	10.7460	1.2535				
E	8.9780	27	9.3380	0.3600	0.4034	+.0019	27.9053	J.
W	9.5050	28	10.7585	1.2535				
18 *m*, E	9.0155	98	10.8430	1.8275	0.6256	+.0002	99.6258	D.
W	9.5150	100	10.1900	0.6750				
E	9.0160	98	10.8445	1.8285	0.6238	+.0003	99.6241	D.
W	9.5175	100	10.1840	0.6665				
90 E	8.9700	98	10.7930	1.8230	0.6261	+.0003	99.6264	J.
W	9.5000	100	10.1815	0.6815				
E	9.0020	98	10.8265	1.8245	0.6255	+.0003	99.6258	J.
W	9.4905	100	10.1680	0.6775				
24 *p*, E	8.9925	64	10.0240	1.0315	0.7336	+.0025	65.2361	J.
W	9.5060	65	11.4090	1.9030				
E	9.0020	64	10.0280	1.0260	0.7310	+.0025	65.2335	J.
W	9.4955	65	11.3935	1.8980				
91 E	9.0200	64	10.0360	1.0160	0.7270	+.0025	65.2295	D.
W	9.5170	65	11.4090	1.8920				
E	9.0155	64	10.0315	1.0160	0.7275	+.0025	65.2300	D.
W	9.5275	65	11.4215	1.8940				
A 12, E	8.9800	70	9.8565	0.8765	0.6558	+.0032	71.1590	J.
W	9.4940	71	11.2405	1.7465				
92 E	9.0250	70	9.8910	0.8660	0.6514	+.0032	71.1546	D.
W	9.5315	71	11.2710	1.7395				
A 22, E	8.9720	63	9.8985	0.9265	0.6872	+.0036	64.1908	J.
W	9.4880	64	11.3105	1.8225				
93 E	9.0140	63	9.9305	0.9165	0.6815	+.0037	64.1852	D.
W	9.5150	64	11.3245	1.8095				
A 24, E	9.0150	62	9.9715	0.9565	0.6959	+.0031	63.1990	D.
W	9.5160	63	11.3430	1.8270				
94 E	9.0030	62	9.9710	0.9680	0.7012	+.0031	63.2043	J.
W	9.5195	63	11.3565	1.8370				

RESULTS OF THE MEASURES, PLATE 24, X-COÖRDINATE (*Continued*).

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 28, E	9.0035	48	9.7320	0.7285	0.5876	+.0009	49.0885	D.
W	9.5045	49	11.1265	1.6220				
95 E	9.0100	48	9.7395	0.7295	0.5894	+.0009	49.0903	J.
W	9.5010	49	11.1290	1.6280				
A 30, E	9.0305	35	10.0630	1.0325	0.7382	+.0010	36.2392	D.
W	9.5045	36	11.4250	1.9205				
96 E	8.9705	35	10.0045	1.0340	0.7400	+.0010	36.2410	J.
W	9.5225	36	11.4485	1.9260				
A 39, E	9.0035	16	10.1995	1.1960	0.3194	—.0004	17.3190	D.
W	9.5205	18	9.6020	0.0815				
97 E	8.9900	16	10.1840	1.1940	0.3180	—.0004	17.3176	J.
W	9.5205	18	9.5985	0.0780				

RESULTS OF THE MEASURES, PLATE 24, Y-COÖRDINATE.

Date of Measures, 1895, Dec. 14.

Temperature, 67.0, 67.0. Circle right 92° 20′ 31″, 20′ 30″.

Runs, +.0180, +.0200. Circle left 20 30, 20 32.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	9.0330	93	10.9875	1.9545	0.9586	—.0006	93.9580	D.
W	9.5225	93	11.4025	1.8800				
E	9.0140	93	10.9680	1.9540	0.9592	—.0006	93.9586	D.
W	9.5280	93	11.4110	1.8830				
98 E	8.9865	93	10.9610	1.9745	0.9660	—.0006	93.9654	J.
W	9.4820	93	11.3715	1.8895				
E	8.9960	93	10.9660	1.9700	0.9651	—.0006	93.9645	J.
W	9.5010	93	11.3915	1.8905				
18 *m*, E	9.0265	18	9.3995	0.3730	0.1692	—.0004	18.1688	D.
W	9.5180	18	9.8220	0.3040				
E	9.0325	18	9.4185	0.3860	0.1698	—.0004	18.1694	D.
W	9.5170	18	9.8100	0.2930				
99 E	8.9790	18	9.3945	0.4155	0.1816	—.0005	18.1811	J.
W	9.4845	18	9.7955	0.3110				
E	9.0140	18	9.4075	0.3935	0.1768	—.0004	18.1764	J.
W	9.5010	18	9.8145	0.3135				
24 *p*, E	9.0035	67	9.0335	0.0300	0.4961	+.0037	66.9998	J.
W	9.5105	66	11.4650	1.9545				
E	8.9955	67	9.0340	0.0385	0.4988	+.0037	67.0025	J.
W	9.4835	66	11.4400	1.9565				
100 E	9.0205	67	9.0470	0.0265	0.4926	+.0037	66.9963	D.
W	9.5380	66	11.4820	1.9440				
E	9.0255	67	9.0480	0.0225	0.4919	+.0036	66.9955	D.
W	9.5240	66	11.4690	1.9450				
A 12, E	8.9845	39	10.2030	1.2185	0.5900	+.0014	39.5914	J.
W	9.5010	39	10.6425	1.1415				
101 E	9.0120	39	10.2190	1.2070	0.5836	+.0014	39.5850	D.
W	9.5235	39	10.6510	1.1275				
A 22, E	8.9980	80	10.4615	1.4635	0.7110	+.0020	80.7130	J.
W	9.4810	80	10.8615	1.3805				
102 E	9.0250	80	10.4810	1.4560	0.7059	+.0020	80.7079	D.
W	9.5285	80	10.8960	1.3675				
A 24, E	9.0270	55	9.5780	0.5510	0.2574	+.0023	55.2597	D.
W	9.5095	55	9.9880	0.4785				
103 E	8.9670	55	9.5230	0.5560	0.2619	+.0023	55.2642	J.
W	9.4895	55	9.9810	0.4915				

RESULTS OF THE MEASURES, PLATE 24, Y-COÖRDINATE (*Continued*).

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 28, E	9.0450	114	9.2280	0.1830	0.0715	+.0018	114.0733	D.
W	9.5045	114	9.6075	0.1030				
104 E	9.0225	114	9.2180	0.1955	0.0749	+.0018	114.0767	J.
W	9.4890	114	9.5930	0.1040				
A 30, E	9.0245	82	9.4430	0.4185	0.1885	+.0035	82.1920	D.
W	9.5090	82	9.8445	0.3355				
105 E	9.0185	82	9.4395	0.4210	0.1915	+.0035	82.1950	J.
W	9.4725	82	9.8175	0.3450				
A 39, E	9.0200	40	10.0360	1.0160	0.4880	+.0007	40.4887	D.
W	9.5140	40	10.4500	0.9360				
106 E	8.9760	40	9.9890	1.0130	0.4912	+.0006	40.4918	J.
W	9.4985	40	10.4505	0.9520				

RESULTS OF THE MEASURES, PLATE 24, X-COÖRDINATE (Rev'd).

Date of Measures, 1895, Dec. 16.

Temperature, 58.5, 64.0. Circle right 2° 20′ 30″, 20′ 30″.

Runs, +.0180, +.0210. Circle left 20 28, 20 32.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r
A 34, E	9.5185	103	9.9000	0.3815	0.4660	—.0003	102.4657	D.
W	9.0220	101	10.5045	1.4825				
E	9.5285	103	9.9155	0.3870	0.4704	—.0003	102.4701	D.
W	9.0205	101	10.5150	1.4945				
107 E	9.4830	103	9.8780	0.3950	0.4618	—.0002	102.4616	J.
W	8.9785	101	10.4305	1.4520				
E	9.5185	103	9.9080	0.3895	0.4719	—.0003	102.4716	J.
W	9.0345	101	10.5325	1.4980				
18 *m*, E	9.5275	31	10.4370	0.9095	0.2374	+.0024	30.7398	D.
W	9.0300	30	9.0700	0.0400				
E	9.5300	31	10.4300	0.9000	0.2345	+.0024	30.7369	D.
W	9.0540	30	9.0920	0.0380				
108 E	9.5020	31	10.4285	0.9265	0.2468	+.0024	30.7492	J.
W	9.0110	30	9.0715	0.0605				
E	9.4905	31	10.4055	0.9150	0.2412	+.0024	30.7436	J.
W	9.0000	30	9.0500	0.0500				
24 *p*, E	9.4965	65	11.2065	1.7100	0.6350	+.0028	65.1378	J.
W	8.9805	64	9.8105	0.8300				
E	9.5050	65	11.2120	1.7070	0.6346	+.0028	65.1374	J.
W	8.9890	64	9.8205	0.8315				
109 E	9.5175	65	11.2205	1.7030	0.6324	+.0028	65.1352	D.
W	9.0035	64	9.8300	0.8265				
E	9.5190	65	11.2180	1.6990	0.6304	+.0028	65.1332	D.
W	9.0190	64	9.8415	0.8225				
A 12, E	9.4950	59	11.3575	1.8625	0.7095	+.0031	59.2126	J.
W	9.0005	58	9.9760	0.9755				
110 E	9.5365	59	11.3865	1.8500	0.7066	+.0030	59.2096	D.
W	9.0300	58	10.0065	0.9765				
A 22, E	9.4665	66	11.2780	1.8115	0.6846	+.0031	66.1877	J.
W	8.9695	65	9.8965	0.9270				
111 E	9.5130	66	11.3045	1.7915	0.6736	+.0031	66.1767	D.
W	9.0370	65	9.9400	0.9030				
A 24, E	9.5285	67	11.2875	1.7590	0.6616	+.0032	67.1648	D.
W	9.0270	66	9.9145	0.8875				
112 E	9.4870	67	11.2545	1.7675	0.6662	+.0032	67.1694	J.
W	8.9830	66	9.8805	0.8975				

RESULTS OF THE MEASURES, PLATE 24, X-COÖRDINATE (Rev'd). (*Continued*).

Desig. of Star.	Microm. Readings.			Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
	On Star.	On Scale.						
		Line	Reading.					
A 28, E	9.5195	81	11.5170	1.9975	0.7740	+.0019	81.2751	D.
W	9.0370	80	10.1355	1.0985				
113 E	9.4965	81	11.5020	2.0055	0.7784	+.0019	81.2803	J.
W	9.0110	80	10.1190	1.1080				
A 30, E	9.5270	94	11.2380	1.7110	0.6300	+.0003	94.1303	D.
W	9.0500	93	9.8590	0.8090				
114 E	9.4870	94	11.2005	1.7135	0.6340	+.0003	94.1343	J.
W	8.9990	93	9.8215	0.8225				
A 39, E	9.5310	113	11.0660	1.5350	0.5461	—.0015	113.0446	D.
W	9.0190	112	9.6685	0.6495				
115 E	9.5085	113	11.0600	1.5515	0.5532	—.0015	113.0517	J.
W	8.9990	112	9.6605	0.6615				

RESULTS OF THE MEASURES, PLATE 24, Y-COÖRDINATE (Rev'd).

Date of Measures, 1895, Dec. 17.

Temperature, 67.0, 70.2. Circle right 272° 20′ 33″, 20′ 32″.

Runs, +.0190, +.0200. Circle left 20 32, 20 32.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	9.5245	36	10.2925	0.7680	0.4015	+.0018	36.4033	D.
W	9.0195	36	9.8575	0.8380				
E	9.5300	36	10.2925	0.7625	0.3999	+.0018	36.4017	D.
W	9.0150	36	9.8520	0.8370				
116 E	9.4955	36	10.2800	0.7845	0.4084	+.0019	36.4103	J.
W	8.9810	36	9.8300	0.8490				
E	9.4690	36	10.2505	0.7815	0.4078	+.0018	36.4096	J.
W	9.0075	36	9.8570	0.8495				
18 *m*, E	9.5125	112	9.8575	0.3450	0.1949	—.0006	112.1943	D.
W	9.0165	112	9.4510	0.4345				
E	9.5235	112	9.8745	0.3510	0.1964	—.0006	112.1958	D.
W	9.0270	112	9.4615	0.4345				
117 E	9.5020	112	9.8585	0.3565	0.2000	—.0006	112.1994	J.
W	9.0145	112	9.4580	0.4435				
E	9.4750	112	9.8335	0.3585	0.1972	—.0005	112.1967	J.
W	9.0085	112	9.4390	0.4305				
24 *p*, E	9.4820	63	10.1790	0.6970	0.3671	+.0050	63.3721	J.
W	8.9960	63	9.7675	0.7715				
E	9.4815	63	10.1715	0.6900	0.3641	+.0050	63.3691	J.
W	9.0245	63	9.7910	0.7665				
118 E	9.5305	63	10.2080	0.6775	0.3605	+.0050	63.3655	D.
W	9.0250	63	9.7895	0.7645				
E	9.5210	63	10.2050	0.6840	0.3619	+.0050	63.3669	D.
W	9.0400	63	9.8035	0.7635				
A 12, E	9.4830	90	11.0105	1.5275	0.7825	+.0008	90.7833	J.
W	9.0215	90	10.6240	1.6025				
119 E	9.5305	90	11.0400	1.5095	0.7752	+.0008	90.7760	D.
W	9.0320	90	10.6235	1.5915				
A 22, E	9.5150	49	10.7925	1.2775	0.6614	+.0012	49.6626	J.
W	9.0085	49	10.3765	1.3680				
120 E	9.5255	49	10.7935	1.2680	0.6576	+.0012	49.6588	D.
W	9.0415	49	10.4040	1.3625				
A 24, E	9.5305	75	9.6910	0.1605	0.1012	+.0027	75.1039	D.
W	9.0135	75	9.2580	0.2445				
121 E	9.5110	75	9.6850	0.1740	0.1072	+.0027	75.1099	J.
W	9.0035	75	9.2585	0.2550				

RESULTS OF THE MEASURES, PLATE 24, Y-COÖRDINATE (Rev'd).

(*Continued*).

Desig. of Star.	Microm. Readings. On Star.	On scale. Line	On scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 28, E	9.5225	16	10.0600	0.5375	0.2895	+.0002	16.2897	D.
W	9.0430	16	9.6635	0.6205				
122 E	9.4840	16	10.0425	0.5585	0.2954	+.0002	16.2956	J.
W	9.0195	16	9.6425	0.6230				
A 30, E	9.5155	48	9.8310	0.3155	0.1760	+.0016	48.1776	D.
W	9.0195	48	9.4080	0.3885				
123 E	9.4990	48	9.8105	0.3115	0.1749	+.0016	48.1765	J.
W	9.0135	48	9.4015	0.3880				
A 39, E	9.5405	89	11.2545	1.7140	0.8736	+.0006	89.8742	D.
W	9.0205	89	10.8010	1.7805				
124 E	9.5270	89	11.2490	1.7220	0.8810	+.0006	89.8816	J.
W	9.0240	89	10.8260	1.8020				

RESULTS OF THE MEASURES, PLATE 24, STANDARDS.

Date of Measures, 1895, Dec. 18. Y-COÖRDINATE (Rev'd).

Temperature, 66.2, 64.9. Circle right 272° 20′ 30″, 20′ 32″.

Runs, +.0210, +.0210. Circle left 20 30, 20 32.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	9.0395	36	9.8085	0.7690	0.4036	+.0018	36.4054	D.
W	9.5235	36	10.3690	0.8455				
125 E	9.0360	36	9.8000	0.7640	0.4022	+.0018	36.4040	D.
W	9.5350	36	10.3800	0.8450				
18 *m*, E	9.0185	112	9.3705	0.3520	0.1966	—.0006	112.1960	D.
W	9.5280	112	9.9625	0.4345				
126 E	9.0405	112	9.3945	0.3540	0.1978	—.0006	112.1972	D.
W	9.5035	112	9.9405	0.4370				

X-COÖRDINATE (Rev'd).

Circle right 2° 20′ 30″, 20′ 32″.

Circle left 20 31, 20 33.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	8.9745	103	9.3690	0.3945	0.4741	—.0004	102.4737	J.
W	9.4805	101	10.9825	1.5020				
127 E	9.0310	103	9.4310	0.4000	0.4746	—.0004	102.4742	J.
W	9.5000	101	10.9985	1.4985				
18 *m*, E	8.9790	31	9.8995	0.9205	0.2458	+.0023	30.7481	J.
W	9.4940	30	9.5565	0.0625				
128 E	8.9995	31	9.9205	0.9210	0.2464	+.0023	30.7487	J.
W	9.4695	30	9.5340	0.0645				

RESULTS OF THE MEASURES, PLATE 24, STANDARDS (*Continued*).

X-COÖRDINATE.

Circle right 182° 20′ 31″, 20′ 32″.

Circle left 20 29, 20 24.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	9.5170	27	9.8625	0.3455	0.3968	+.0018	27.8986	D.
W	9.0200	28	10.2615	1.2415				
129 E	9.5125	27	9.8615	0.3490	0.4004	+.0018	27.9022	D.
W	9.0195	28	10.2720	1.2525				
18 *m*, E	9.5205	98	11.3490	1.8285	0.6252	+.0002	99.6254	D.
W	9.0030	100	9.6755	0.6725				
130 E	9.5205	98	11.3500	1.8295	0.6270	+.0002	99.6272	D.
W	9.0060	100	9.6845	0.6785				

Y-COÖRDINATE.

Circle right 92° 20′ 31″, 20′ 32″.

Circle left 20 30, 20 30.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	9.4835	93	11.4685	1.9850	0.9701	—.0008	93.9693	J.
W	8.9800	93	10.8755	1.8955				
131 E	9.4705	93	11.4415	1.9710	0.9668	—.0008	93.9660	J.
W	8.9830	93	10.8790	1.8960				
18 *m*, E	9.4775	18	9.8795	0.4020	0.1804	—.0005	18.1799	J.
W	9.0120	18	9.3315	0.3195				
132 E	9.5115	18	9.9065	0.3950	0.1772	—.0005	18.1767	J.
W	9.0145	18	9.3285	0.3140				

RESULTS OF THE MEASURES, PLATE 16, X-COÖRDINATE.

Date of Measures, 1895, Dec. 19.

Temperature, 68.0, 70.5. Circle right 182° 26′ 21″, 26′ 21″.

Runs, +.0210, +.0190. Circle left 26′ 21″, 26′ 21″.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	9.0420	28	10.2480	1.2060	0.4644	+.0007	28.9651	D.
W	9.5220	29	10.1735	0.6515				
E	9.0500	28	10.2580	1.2080	0.4654	+.0006	28.9660	D.
W	9.5390	29	10.1925	0.6535				
133 E	9.0170	28	10.2360	1.2190	0.4722	+.0007	28.9729	J.
W	9.4915	29	10.1615	0.6700				
E	8.9905	28	10.2155	1.2250	0.4732	+.0007	28.9739	J.
W	9.4900	29	10.1580	0.6680				
18 *m*, E	9.0250	100	9.9160	0.8910	0.3059	+.0006	100.8065	D.
W	9.5260	101	9.8585	0.3325				
E	9.0185	100	9.9180	0.8995	0.3076	+.0007	100.8083	D.
W	9.5125	101	9.8435	0.3310				
134 E	9.0525	100	9.9500	0.8975	0.3110	+.0007	100.8117	J.
W	9.4700	101	9.8165	0.3465				
E	9.0490	100	9.9605	0.9115	0.3119	+.0007	100.8126	J.
W	9.5030	101	9.8390	0.3360				
24 *p*, E	8.9675	65	10.9595	1.9920	0.8514	+.0026	66.3540	J.
W	9.4815	66	10.8950	1.4135				
E	8.9920	65	10.9845	1.9925	0.8514	+.0026	66.3540	J.
W	9.4955	66	10.9085	1.4130				
135 E	9.0245	65	10.9785	1.9540	0.8361	+.0026	66.3387	D.
W	9.5055	66	10.8960	1.3905				
E	9.0320	65	10.9820	1.9500	0.8355	+.0026	66.3381	D.
W	9.4990	66	10.8910	1.3920				
A 12. E	8.9975	71	10.8875	1.8900	0.8079	+.0023	72.3102	J.
W	9.4800	72	10.8215	1.3415				
136 E	9.0235	71	10.9125	1.8890	0.8024	+.0022	72.3046	D.
W	9.5285	72	10.8490	1.3205				
A 22, E	8.9510	64	10.7980	1.8470	0.7800	+.0024	65.2824	J.
W	9.4950	65	10.7680	1.2730				
137 E	9.0305	64	10.8710	1.8405	0.7755	+.0023	65.2778	D.
W	9.5310	65	10.7925	1.2615				
A 24, E	9.0405	63	10.9620	1.9215	0.8242	+.0031	64.3273	D.
W	9.5150	64	10.8905	1.3755				
138 E	9.0005	63	10.9335	1.9330	0.8250	+.0032	64.3282	J.
W	9.5060	64	10.8730	1.3670				

RESULTS OF THE MEASURES, PLATE 16, X-COÖRDINATE (*Continued*).

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 28, E	9.0290	49	10.5560	1.5270	0.6286	+.0012	50.1298	D.
W	9.5205	50	10.5080	0.9875				
139 E	9.0030	49	10.5345	1.5315	0.6322	+.0012	50.1334	J.
W	9.5065	50	10.5040	0.9975				
A 30, E	9.0455	36	10.9600	1.9145	0.8156	+.0007	37.3163	D.
W	9.5340	37	10.8820	1.3480				
140 E	9.0175	36	10.9320	1.9145	0.8186	+.0007	37.3193	J.
W	9.4900	37	10.8500	1.3600				
A 39, E	9.0195	18	9.2245	0.2050	0.4638	—.0013	18.4625	D.
W	9.5090	18	11.1590	1.6500				
141 E	9.0090	18	9.2340	0.2250	0.4722	—.0013	18.4709	J.
W	9.4885	18	11.1525	1.6640				

RESULTS OF THE MEASURES, PLATE 16, Y-COÖRDINATE.

Date of Measures, 1895, Dec. 20.

Temperature, 66.2, 67.2. Circle right 92° 26′ 22″, 26′ 22″.

Runs, +.0210, +.0210. Circle left 26 22, 26 23.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	9.0260	96	9.5675	0.5415	0.2659	+.0012	96.2671	D.
W	9.5195	96	10.0415	0.5220				
E	9.0290	96	9.5735	0.5445	0.2660	+.0012	96.2672	D.
W	9.5225	96	10.0420	0.5195				
142 E	9.0060	96	9.5615	0.5555	0.2738	+.0012	96.2750	J.
W	9.4875	96	10.0270	0.5395				
E	8.9900	96	9.5435	0.5535	0.2726	+.0012	96.2738	J.
W	9.4700	96	10.0070	0.5370				
18 *m*, E	9.0355	20	10.1710	1.1355	0.5642	—.0006	20.5636	D.
W	9.5095	20	10.6310	1.1215				
E	9.0260	20	10.1680	1.1420	0.5670	—.0006	20.5664	D.
W	9.5100	20	10.6360	1.1260				
143 E	9.0020	20	10.1445	1.1425	0.5709	—.0007	20.5702	J.
W	9.4890	20	10.6300	1.1410				
E	8.9905	20	10.1375	1.1470	0.5709	—.0006	20.5703	J.
W	9.5140	20	10.6505	1.1365				
24 *p*, E	8.9915	69	9.7080	0.7165	0.3524	+.0040	69.3564	J.
W	9.4880	69	10.1810	0.6930				
E	8.9720	69	9.6855	0.7135	0.3514	+.0040	69.3554	J.
W	9.5175	69	10.2095	0.6920				
144 E	9.0290	69	9.7315	0.7025	0.3466	+.0040	69.3506	D.
W	9.5015	69	10.1855	0 6840				
E	9.0235	69	9.7235	0.7000	0.3439	+.0040	69.3479	D.
W	9.5155	69	10.1910	0.6755				
A 12, E	8.9970	41	10.8990	1.9020	0.9494	—.0017	41.9477	J.
W	9.5215	41	11.4170	1.8955				
145 E	9.0200	41	10.9095	1.8895	0.9430	—.0017	41.9413	D.
W	9.5215	41	11.4040	1.8825				
A 22, E	8.9825	83	9.1040	0.1215	0.0536	+.0038	83.0574	J.
W	9.5035	83	9.5965	0.0930				
146 E	9.0220	83	9.1295	0.1075	0.0469	+.0038	83.0507	D.
W	9.5200	83	9.6000	0.0800				
A 24, E	9.0305	57	10.2435	1.2130	0.6024	+.0032	57.6056	D.
W	9.5285	57	10.7250	1.1965				
147 E	9.0250	57	10.2495	1.2245	0.6098	+.0032	57.6130	J.
W	9.4950	57	10.7095	1.2145				

RESULTS OF THE MEASURES, PLATE 16, Y-COÖRDINATE (*Continued*).

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 28, E	9.0200	116	9.8330	0.8130	0.4038	—.0002	116.4036	D.
W	9.5175	116	10.3195	0.8020				
148 E	9.0010	116	9.8325	0.8315	0.4146	—.0009	116.4137	J.
W	9.4815	116	10.3085	0.8270				
A 30, E	9.0285	84	10.0495	1.0210	0.5078	+.0015	84.5093	D.
W	9.5280	84	10.5380	1.0100				
149 E	8.9935	84	10.0305	1.0370	0.5125	+.0016	84.5141	J.
W	9.4895	84	10.5025	1.0130				
A 39, E	9.0420	42	10.6310	1.5890	0.7956	—.0013	42.7943	D.
W	9.5200	42	11.1135	1.5935				
150 E	8.9830	42	10.5880	1.6050	0.8021	—.0013	42.8008	J.
W	9.5045	42	11.1080	1.6035				

RESULTS OF THE MEASURES, PLATE 16, X-COÖRDINATE (Rev'd).

Date of Measures, 1895, Dec. 30.

Temperature, 64.5, 67.2. Circle right 2° 26′ 20″, 26′ 21″.

Runs, +.0200, +.0210. Circle left 26 20, 26 22.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	9.5160	101	11.0500	1.5340	0.4031	—.0002	101.4029	D.
W	9.0245	101	9.1030	0.0785				
E	9.5300	101	11.0610	1.5310	0.4021	—.0002	101.4019	D.
W	9.0225	101	9.1000	0.0775				
151 E	9.5415	101	11.0775	1.5360	0.4048	—.0002	101.4046	D.
W	9.0030	101	9.0860	0.0830				
E	9.5390	101	11.0700	1.5310	0.4029	—.0002	101.4027	D.
W	9.0100	101	9.0905	0.0805				
18 *m*, E	9.5285	29	11.3735	1.8450	0.5610	+.0004	29.5614	D.
W	9.0095	29	9.4085	0.3990				
E	9.5220	29	11.3645	1.8425	0.5605	+.0004	29.5609	D.
W	9.0225	29	9.4220	0.3995				
152 E	9.5385	29	11.3825	1.8440	0.5605	+.0004	29.5609	D.
W	9.0190	29	9.4170	0.3980				
E	9.5445	29	11.3855	1.8410	0.5602	+.0004	29.5606	D.
W	9.0080	29	9.4080	0.4000				
24 *p*, E	9.5140	64	10.2890	0.7750	0.5252	+.0039	64.0291	D.
W	9.0160	63	10.3420	1.3260				
E	9.5190	64	10.2900	0.7710	0.5246	+.0039	64.0285	D.
W	9.0215	63	10.3490	1.3275				
153 E	9.5325	64	10.3085	0.7760	0.5254	+.0039	64.0293	D.
W	9.0260	63	10.3515	1.3255				
E	9.5080	64	10.2800	0.7720	0.5254	+.0039	64.0293	D.
W	9.0110	63	10.3405	1.3295				
A 12, E	9.5100	58	10.3395	0.8295	0.5556	+.0034	58.0590	D.
W	9.0080	57	10.4010	1.3930				
154 E	9.5200	58	10.3485	0.8285	0.5560	+.0034	58.0594	D.
W	9.0260	57	10.4215	1.3955				
A 22, E	9.5460	65	10.4450	0.8990	0.5916	+.0028	65.0944	D.
W	9.0245	64	10.4920	1.4675				
155 E	9.5380	65	10.4355	0.8975	0 5892	+.0028	65.0920	D.
W	9.0485	64	10.5080	1.4595				
A 24, E	9.5120	66	10.3005	0.7885	0.5352	+.0034	66.0386	D.
W	9.0100	65	10.3625	1.3525				
156 E	9.5330	66	10.3275	0.7945	0.5385	+.0034	66.0419	D.
W	9.0330	65	10.3925	1.3595				

RESULTS OF THE MEASURES, PLATE 16, X-COÖRDINATE (Rev'd).

(*Continued*).

Desig. of Star.	Microm. Readings.			Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
	On Star.	On Scale.						
		Line	Reading.					
A 28, E	9.5420	80	10.7490	1.2070	0.7395	+.0019	80.2414	D.
W	9.0260	79	10.7770	1.7510				
157 E	9.5075	80	10.7085	1.2010	0.7392	+.0019	80.2411	D.
W	9.0120	79	10.7680	1.7560				
A 30, E	9.5300	93	10.3625	0.8325	0.5552	+.0004	93.0556	D.
W	9.0220	92	10.4105	1.3885				
158 E	9.5225	93	10.3615	0.8390	0.5550	+.0004	93.0554	D.
W	9.0205	92	10.4015	1.3810				
A 39, E	9.5190	112	10.0400	0.5210	0.4010	—.0012	111.8998	D.
W	9.0290	111	10.1120	1.0830				
159 E	9.5150	112	10.0440	0.5290	0.4031	—.0012	111.9019	D.
W	9.0200	111	10.1035	1.0835				

RESULTS OF THE MEASURES, PLATE 16, Y-COÖRDINATE (Rev'd).

Date of Measures, 1895, Dec. 31.

Temperature, 66.5, 68.0. Circle right 272° 26′ 20″, 26′ 21″.

Runs, +.0190, +.0200. Circle left 26 21, 26 21.

Desig. of Star.	Microm. Readings.			Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
	On Star.	On Scale. Line	On Scale. Reading.					
A 34, E	9.5165	34	9.7095	0.1930	0.1004	+.0018	34.1022	D.
W	9.0100	34	9.2185	0.2085				
E	9.5295	34	9.7215	0.1920	0.0998	+.0018	34.1016	D.
W	9.0260	34	9.2330	0.2070				
160 E	9.5090	34	9.6995	0.1905	0.0971	+.0017	34.0988	D.
W	9.0500	34	9.2480	0.1980				
E	9.5200	34	9.7105	0.1905	0.0991	+.0018	34.1009	D.
W	9.0205	34	9.2265	0.2060				
18 *m*, E	9.5160	109	11.1030	1.5870	0.8005	—.0002	109.8003	D.
W	9.0165	109	10.6315	1.6150				
E	9.5090	109	11.0955	1.5865	0.8018	—.0002	109.8016	D.
W	9.0105	109	10.6310	1.6205				
161 E	9.5080	109	11.1010	1.5930	0.8034	—.0002	109.8032	D.
W	9.0385	109	10.6590	1.6205				
E	9.5070	109	11.1000	1.5930	0.8026	—.0002	109.8024	D.
W	9.0185	109	10.6360	1.6175				
24 *p*, E	9.5265	61	9.5410	0.0145	0.0124	+.0039	61.0163	D.
W	9.0210	61	9.0560	0.0350				
E	9.5105	61	9.5215	0.0110	0.0120	+.0040	61.0160	D.
W	9.0115	61	9.0485	0.0370				
162 E	9.5300	61	9.5415	0.0115	0.0125	+.0040	61.0165	D.
W	9.0295	61	9.0680	0.0385				
E	9.5295	61	9.5400	0.0105	0.0114	+.0039	61.0153	D.
W	9.0315	61	9.0665	0.0350				
A 12, E	9.5065	88	10.3485	0.8420	0.4228	+.0008	88.4236	D.
W	9.0415	88	9.8905	0.8490				
163 E	9.5330	88	10.3780	0.8450	0.4226	+.0008	88 4234	D.
W	9.0330	88	9.8785	0.8455				
A 22, E	9.5155	47	10.1300	0.6145	0.3155	+.0011	47.3166	D.
W	9.0340	47	9.6815	0.6475				
164 E	9.5275	47	10.1430	0.6155	0.3161	+.0011	47.3172	D.
W	9.0425	47	9.6915	0.6490				
A 24, E	9.5175	72	11.0240	1.5165	0.7601	+.0019	72.7620	D.
W	9.0190	72	10.5430	1.5240				
165 E	9.5195	72	11.0320	1.5125	0.7605	+.0019	72.7624	D.
W	9.0305	72	10.5600	1.5295				

RESULTS OF THE MEASURES, PLATE 16, Y-COÖRDINATE (Rev'd).

(*Continued*).

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 28, E	9.5265	13	11.4460	1.9195	0.9624	—.0016	13.9608	D.
W	9.0190	13	10.9490	1.9300				
166 E	9.5190	13	11.4395	1.9205	0.9635	—.0016	13.9619	D.
W	9.0360	13	10.9695	1.9335				
A 30, E	9.5235	45	11.2410	1.7175	0.8630	—.0004	45.8626	D.
W	9.0235	45	10.7580	1.7345				
167 E	9.5475	45	11.2600	1.7125	0.8609	—.0004	45.8605	D.
W	9.0590	45	10.7900	1.7310				
A 39, E	9.5300	87	10.6725	1.1425	0.5742	+.0024	87.5766	D.
W	9.0330	87	10.1875	1.1545				
168 E	9.5170	87	10.6610	1.1440	0.5745	+.0024	87.5769	D.
W	9.0085	87	10.1625	1.1540				

RESULTS OF THE MEASURES, PLATE 16, STANDARDS.

Date of Measures, 1896, Jan. 2. Y-COÖRDINATE (Rev'd).

Temperature, 61.7, 65.8. Circle right 272° 26′ 20″, 26′ 20″.

Runs, +.0180, +.0200. Circle left 26 19, 26 20.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	9.0325	34	9.2200	0.1875	0.0986	+.0017	34.1003	D.
W	9.5120	34	9.7190	0.2070				
169 E	9.0260	34	9.2120	0.1860	0.0980	+.0017	34.0997	D.
W	9.5220	34	9.7280	0.2060				
18 *m*, E	9.0155	109	10.6105	1.5950	0.8022	—.0002	109.8020	D.
W	9.5350	109	11.1490	1.6140				
170 E	9.0180	109	10.6080	1.5900	0.8032	—.0002	109.8030	D.
W	9.5065	109	11.1295	1.6230				

X-COÖRDINATE (Rev'd).

Circle right 2° 26′ 19″, 26′ 20″.

Circle left 26 21, 26 20.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	8.9930	101	10.5325	1.5395	0.4074	—.0001	101.4073	J.
W	9.4660	101	9.5560	0.0900				
171 E	9.0010	101	10.5415	1.5405	0.4082	—.0001	101.4081	J.
W	9.4960	101	9.5885	0.0925				
18 *m*, E	9.0065	29	10.8350	1.8285	0.5560	+.0005	29.5565	J.
W	9.4955	29	9.8910	0.3955				
172 E	9.0035	29	10.8305	1.8270	0.5578	+.0005	29.5583	J.
W	9.4965	29	9.9005	0.4040				

RESULTS OF THE MEASURES, PLATE 16, STANDARDS (*Continued*).

X-COÖRDINATE.

Circle right 182° 26′ 22″, 26′ 21″.

Circle left 26 20, 26 21.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	9.5220	28	10.7230	1.2010	0.4624	+.0007	28.9631	D.
W	9.0155	29	9.6640	0.6485				
173 E	9.5200	28	10.7190	1.1990	0.4611	+.0007	28.9618	D.
W	9.0275	29	9.6730	0.6455				
18 *m*, E	9.5305	100	10.4165	0.8860	0.3029	+.0007	100.8036	D.
W	9.0255	101	9.3510	0.3255				
174 E	9.5365	100	10.4160	0.8795	0.3010	+.0007	100.8017	D.
W	9.0235	101	9.3480	0.3245				

Y-COÖRDINATE.

Circle right 92° 26′ 19″, 26′ 19″.

Circle left 26 21, 26 19.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	9.5005	96	10.0550	0.5545	0.2721	+0.0012	96.2733	J.
W	9.0110	96	9.5450	0.5340				
175 E	9.5175	96	10.0715	0.5540	0.2721	+0.0013	96.2734	J.
W	8.9945	96	9.5290	0.5345				
18 *m*, E	9.4800	20	10.6225	1.1425	0.5686	—0.0005	20.5681	J.
W	9.0060	20	10.1380	1.1320				
176 E	9.5045	20	10.6440	1.1395	0.5638	—0.0006	20.5632	J.
W	9.0030	20	10.1185	1.1155				

RESULTS OF THE MEASURES, PLATE 16, FAINT STARS, X-COÖRDINATE.

Date of Measures, 1896, Jan. 3.

Temperature, 65.0, 64.0. Circle right 182° 26′ 20″, 26′ 20″

Runs, +.0180, +.0200. Circle left 26 21, 26 22.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	9.0240	28	10.2205	1.1965	0.4604	+.0007	28.9611	D.
W	9.5200	29	10.1650	0.6450				
E	9.0140	28	10.2115	1.1975	0.4612	+.0007	28.9619	D.
W	9.5095	29	10.1570	0.6475				
177 E	8.9820	28	10.1925	1.2105	0.4685	+.0007	28.9692	J.
W	9.4925	29	10.1560	0.6635				
E	9.0040	28	10.2160	1.2120	0.4678	+.0007	28.9685	J.
W	9.5025	29	10.1615	0.6590				
18 *m*, E	9.0155	100	9.9095	0.8940	0.3041	+.0007	100.8048	D.
W	9.5295	101	9.8520	0.3225				
E	9.0140	100	9.9015	0.8875	0.3022	+.0007	100.8029	D.
W	9.5205	101	9.8420	0.3215				
178 E	9.0020	100	9.9115	0.9095	0.3135	+.0007	100.8142	J.
W	9.5145	101	9.8590	0.3445				
E	9.0100	100	9.9090	0.8990	0.3088	+.0007	100.8095	J.
W	9.5080	101	9.8440	0.3360				
24 *p*, E	9.0130	65	10.9980	1.9850	0.8474	+.0027	66.3501	J.
W	9.4900	66	10.8945	1.4045				
E	8.9865	65	10.9670	1.9805	0.8464	+.0027	66.3491	J.
W	9.5075	66	10.9125	1.4050				
179 E	9.0345	65	10.9715	1.9370	0.8314	+.0027	66.3341	D.
W	9.5100	66	10.8985	1.3885				
E	9.0080	65	10.9500	1.9420	0.8329	+.0027	66.3356	D.
W	9.5125	66	10.9020	1.3895				
A 5, E	8.9980	92	9.9125	0.9145	0.3194	+.0012	92.8206	J.
W	9.5015	93	9.8645	0.3630				
180 E	9.0480	92	9.9700	0.9220	0.3170	+.0012	92.8182	D.
W	9.5300	93	9.8760	0.3460				
A 6, E	9.0015	91	10.7850	1.7835	0.7509	+.0010	92.2519	J.
W	9.5090	92	10.7290	1.2200				
181 E	9.0230	91	10.8035	1.7805	0.7496	+.0010	92.2506	D.
W	9.5190	92	10.7370	1.2180				
A 11, E	9.0175	76	10.5325	1.5150	0.6195	+.0032	77.1227	D.
W	9.5260	77	10.4890	0.9630				
182 E	8.9870	76	10.5045	1.5175	0.6191	+.0033	77.1224	J.
W	9.4915	77	10.4505	0.9590				

RESULTS OF THE MEASURES, PLATE 16, FAINT STARS, X-COÖRDINATE, (*Continued*).

Desig. of Star.	Microm. Readings.			Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
	On Star.	On Scale.						
		Line	Reading.					
A 26, E	9.0145	59	10.8215	1.8070	0.7672	+.0024	60.2696	D.
W	9.5225	60	10.7845	1.2620				
183 E	8.9970	59	10.8170	1.8200	0.7719	+.0025	60.2744	J.
W	9.5070	60	10.7745	1.2675				
A 27, E	9.0595	52	10.2660	1.2065	0.4642	+.0012	52.9654	D.
W	9.5205	53	10.1710	0.6505				
184 E	9.0005	52	10.2135	1.2130	0.4659	+.0012	52.9671	J.
W	9.4920	53	10.1425	0.6505				
A 36, E	9.0485	26	9.6730	0.6245	0.1725	+.0025	26.6750	D.
W	9.5115	27	9.5770	0.0655				
185 E	9.0050	26	9.6220	0.6170	0.1728	+.0025	26.6753	J.
W	9.5140	27	9.5880	0.0740				

RESULTS OF THE MEASURES, PLATE 16, FAINT STARS, Y-COÖRDINATE.

Date of Measures, 1896, Jan. 4.

Temperature, 64.0, 66.2. Circle right 92° 26′ 19″, 26′ 19″.

Runs, +.0200, +.0210. Circle left 26 19, 26 21.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	9.0150	96	9.5495	0.5345	0.2620	+.0012	96.2632	D.
W	9.5160	96	10.0295	0.5135				
E	9.0170	96	9.5510	0.5340	0.2628	+.0012	96.2640	D.
W	9.5165	96	10.0335	0.5170				
186 E	9.0085	96	9.5690	0.5605	0.2755	+.0012	96.2767	J.
W	9.4880	96	10.0295	0.5415				
E	9.0320	96	9.5880	0.5560	0.2716	+.0012	96.2728	J.
W	9.5180	96	10.0485	0.5305				
18 *m*, E	9.0290	20	10.1620	1.1330	0.5639	—.0007	20.5632	D.
W	9.5135	20	10.6360	1.1225				
E	9.0155	20	10.1585	1.1430	0.5655	—.0007	20.5648	D.
W	9.5230	20	10.6420	1.1190				
187 E	9.0130	20	10.1445	1.1315	0.5661	—.0006	20.5655	J.
W	9.4850	20	10.6180	1.1330				
E	8.9850	20	10.1320	1.1470	0.5684	—.0006	20.5678	J.
W	9.4935	20	10.6200	1.1265				
24 *p*, E	8.9920	69	9.7005	0.7085	0.3480	+.0040	69.3520	J.
W	9.5180	69	10.2015	0.6835				
E	9.0010	69	9.7045	0.7035	0.3468	+.0040	69.3508	J.
W	9.4785	69	10.1620	0.6835				
188 E	9.0300	69	9.7220	0.6920	0.3428	+.0040	69.3468	D.
W	9.5080	69	10.1870	0.6790				
E	9.0195	69	9.7105	0.6910	0.3422	+.0040	69.3462	D.
W	9.5175	69	10.1955	0.6780				
A 5, E	8.9940	34	10.8205	1.8265	0.9074	—.0006	34.9068	J.
W	9.4920	34	11.2950	1.8030				
189 E	9.0085	34	10.8280	1.8195	0.9062	—.0006	34.9056	D.
W	9.5250	34	11.3305	1.8055				
A 6, E	8.9910	57	10.8785	1.8875	0.9364	+.0024	57.9388	J.
W	9.4985	57	11.3565	1.8580				
190 E	9.0220	57	10.9020	1.8800	0.9351	+.0023	57.9374	D.
W	9.5195	57	11.3800	1.8605				
A 11, E	9.0160	70	9.7595	0.7435	0.3686	+.0039	70.3725	D.
W	9.5215	70	10.2525	0.7310				
191 E	8.9910	70	9.7385	0.7475	0.3702	+.0040	70.3742	J.
W	9.4970	70	10.2305	0.7335				

RESULTS OF THE MEASURES, PLATE 16, FAINT STARS, Y-COÖRDINATE. —(*Continued*).

Desig. of Star.	Microm. Readings.			Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
	On Star.	On Scale.						
		Line	Reading.					
A 26, E	9.0195	108	9.5615	0.5420	0.2715	+.0012	108.2727	D.
W	9.5140	108	10.0580	0.5440				
192 E	8.9970	108	9.5405	0.5435	0.2686	+.0012	108.2698	J.
W	9.4985	108	10.0295	0.5310				
A 27, E	9.0430	55	9.8350	0.7920	0.3931	+.0019	55.3950	D.
W	9.5300	55	10.3105	0.7805				
193 E	8.9830	55	9.7735	0.7905	0.3938	+.0019	55.3957	J.
W	9.5060	55	10.2905	0.7845				
A 36, E	9.0330	61	10.7220	1.6890	0.8431	+.0016	61.8447	D.
W	9.5340	61	11.2175	1.6835				
194 E	8.9930	61	10.6880	1.6950	0.8465	+.0016	61.8481	J.
W	9.5040	61	11.1950	1.6910				

RESULTS OF THE MEASURES, PLATE 16, FAINT STARS, X-COÖRDINATE (Rev'd).

Date of Measures, 1896, Jan. 6.

Temperature, 61.8, 69.0. Circle right 2° 26′ 20″, 26′ 22″.

Runs, +.0190, +.0190. Circle left 26 22, 26 20.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	9.5100	101	11.0410	1.5310	0.4034	—.0001	101.4033	D.
W	9.0100	101	9.0925	0.0825				
E	9.5450	101	11.0685	1.5235	0.3984	—.0001	101.3983	D.
W	9.0300	101	9.1000	0.0700				
195 E	9.4940	101	11.0385	1.5445	0.4076	—.0001	101.4075	J.
W	9.0050	101	9.0910	0.0860				
E	9.5110	101	11.0410	1.5300	0.4038	—.0001	101.4037	J.
W	8.9890	101	9.0740	0.0850				
18 *m*, E	9.5115	29	11.3415	1.8300	0.5545	+.0005	29.5550	D.
W	9.0165	29	9.4045	0.3880				
E	9.5105	29	11.3410	1.8305	0.5556	+.0005	29.5561	D.
W	9.0155	29	9.4075	0.3920				
196 E	9.4920	29	11.3125	1.8205	0.5548	+.0005	29.5553	J.
W	9.0090	29	9.4075	0.3985				
E	9.5005	29	11.3270	1.8265	0.5575	+.0005	29.5580	J.
W	8.9860	29	9.3895	0.4035				
24 *p*, E	9.5060	64	10.2710	0.7650	0.5232	+.0041	64.0273	J.
W	8.9920	63	10.3200	1.3280				
E	9.4990	64	10.2505	0.7515	0.5190	+.0041	64.0231	J.
W	8.9945	63	10.3190	1.3245				
197 E	9.5255	64	10.2925	0.7670	0.5224	+.0040	64.0264	D.
W	9.0165	63	10.3390	1.3225				
E	9.5115	64	10.2715	0 7600	0.5198	+.0040	64.0238	D.
W	9.0130	63	10.3320	1.3190				
A 5, E	9.5120	37	11.3295	1.8175	0.5501	+.0016	37.5517	J.
W	8.9930	37	9.3760	0.3830				
198 E	9.5560	37	11.3690	1.8130	0.5511	+.0016	37.5527	D.
W	9.0265	37	9.4180	0.3915				
A 6, E	9.5025	38	10.4660	0.9635	0.6210	+.0008	38.1218	J.
W	9.0035	37	10.5240	1.5205				
199 E	9.5360	38	10.4995	0.9635	0.6229	+.0008	38.1237	D.
W	9.0425	37	10.5705	1.5280				
A 11, E	9.5240	53	10.7490	1.2250	0.7534	+.0005	53.2539	D.
W	9.0320	52	10.8205	1.7885				
200 E	9.5050	53	10.7250	1.2200	0.7529	+.0005	53.2534	J.
W	8.9960	52	10.7875	1.7915				

RESULTS OF THE MEASURES, PLATE 16, FAINT STARS, X-COÖRDINATE (Rev'd).—(*Continued*).

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 26, E	9.5435	70	10.4790	0.9355	0.6041	+.0034	70.1075	D.
W	9.0150	69	10.4960	1.4810				
201 E	9.4910	70	10.4200	0.9290	0.5988	+.0034	70.1022	J.
W	9.0135	69	10.4795	1.4660				
A 27, E	9.5405	77	11.0675	1.5270	0.4020	+.0040	77.4060	D.
W	9.0415	77	9.1225	0.0810				
202 E	9.5035	77	11.0325	1.5290	0 4030	+.0039	77.4069	J.
W	9.0020	77	9.0850	0.0830				
A 36, E	9.5270	104	9.6475	0.1205	0.1985	+.0004	103.6989	D.
W	9.0240	103	9.6975	0.6735				
203 E	9.4775	104	9.6045	0.1270	0.1990	+.0004	103.6994	J.
W	9.0025	103	9.6715	0.6690				

RESULTS OF THE MEASURES, PLATE 16, FAINT STARS, Y-COÖRDINATE. —(Rev'd).

Date of Measures, 1896, Jan. 7.

Temperature, 60.2, 66.0. Circle right 272° 26′ 20″, 26′ 20″.

Runs, +.0200, +.0200. Circle left 26 20, 26 20.

Desig. of Star.	Microm. Readings. On Star.	On Scale. Line	On Scale. Reading.	Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
A 34, E	9.5205	34	9.7105	0.1900	0.0980	+.0017	34.0997	D.
W	9.0085	34	9.2105	0.2020				
E	9.5220	34	9.7100	0.1880	0.0969	+.0017	34.0986	D.
W	9.0205	34	9.2200	0.1995				
204 E	9.5080	34	9.7050	0.1970	0.1026	+.0017	34.1043	J.
W	8.9900	34	9.2035	0.2135				
E	9.4595	34	9.6605	0.2010	0.1022	+.0017	34.1039	J.
W	8.9575	34	9.1655	0.2080				
18 *m*, E	9.5170	109	11.1120	1.5950	0.8025	—.0003	109.8022	D.
W	9.0185	109	10.6335	1.6150				
E	9.5035	109	11.0955	1.5920	0.8016	—.0003	109.8013	D.
W	9.0300	109	10.6445	1.6145				
205 E	9.5275	109	11.1285	1.6010	0.8099	—.0002	109.8097	J.
W	8.9890	109	10.6275	1.6385				
E	9.5245	109	11.1220	1.5975	0.8070	—.0003	109.8067	J.
W	9.0090	109	10.6395	1.6305				
24 *p*, E	9.4975	61	9.4980	0.0005	0.0102	+.0040	61.0142	J.
W	8.9900	61	9.0305	0.0405				
E	9.4800	61	9.4725	—0.0075	0.0102	+.0040	61.0142	J.
W	8.9920	61	9.0405	0.0485				
206 E	9.5430	61	9.5480	0.0050	0.0098	+.0040	61.0138	D.
W	9.0410	61	9.0750	0.0340				
E	9.5070	61	9.5075	0.0005	0.0088	+.0040	61.0128	D.
W	9.0400	61	9.0745	0.0345				
A 5, E	9.5000	95	10.4290	0.9290	0.4668	+.0007	95.4675	J.
W	9.0145	95	9.9525	0.9380				
207 E	9.5100	95	10.4345	0.9245	0.4646	+.0006	95.4652	D.
W	9.0265	95	9.9605	0.9340				
A 6, E	9.5235	72	10.3795	0.8560	0.4335	+.0028	72.4363	J.
W	9.0055	72	9.8835	0.8780				
208 E	9.5270	72	10.3800	0.8530	0.4389	+.0027	72.4416	D.
W	9.0315	72	9.9340	0.9025				
A 11, E	9.5300	59	11.5250	1.9950	0.5019	+.0031	60.0050	D.
W	9.0345	60	9.0470	0.0125				
209 E	9.5090	59	11.4735	1.9645	0.4909	+.0031	59.9940	J.
W	9.0005	60	8.9995	—0.0010				

RESULTS OF THE MEASURES, PLATE 16, FAINT STARS, Y-COÖRDINATE (Rev'd).—(*Continued*).

Desig. of Star.	Microm. Readings.			Diff.	Mean / 2	Screw and Div. Error.	Final Reading.	Obs'r.
	On Star.	On Scale.						
		Line	Reading.					
A 26, E	9.5285	22	9.7310	0.2025	0.1060	+.0007	22.1067	D.
W	9.0280	22	9.2495	0.2215				
210 E	9.4900	22	9.6860	0.1960	0.1020	+.0008	22.1028	J.
W	8.9985	22	9.2105	0.2120				
A 27, E	9.5440	74	11.5065	1.9625	0.9815	+.0013	74.9828	D.
W	9.0470	74	11.0105	1.9635				
211 E	9.5165	74	11.4730	1.9565	0.9790	+.0013	74.9803	J.
W	9.0035	74	10.9630	1.9595				
A 36, E	9.5370	68	10.5845	1.0475	0.5250	+.0015	68.5265	D.
W	9.0580	68	10.1105	1.0525				
212 E	9.4810	68	10.5315	1.0505	0.5261	+.0015	68.5276	J.
W	9.0055	68	10.0595	1.0540				

7. We take up next the instrumental corrections which must be applied to the observations, so as to obtain the true rectangular coördinates of the stars on the plate. These corrections are two in number, the angle correction and the scale correction. The angle correction is needed because it was not possible to turn the plate through an angle of exactly 90° when passing from the measurement of one coördinate to that of the other. The angle through which the plate was turned could always be made very nearly 90°, and its amount could also be measured with very high precision, but it was impossible to make it exactly 90°, within the limits of measurement by the position circle microscopes. A correction is, therefore, needed to make the measured coördinates truly rectangular with respect to each other.

The scale correction has been already mentioned. It is simply a correction proportional to the measured coördinate, of such a magnitude as to make the difference of coördinates of the standard stars constant on all days when measures of the coördinate in question were made.

The circle readings were reduced in the following way: The number of separate positions in which coördinates were measured on each plate was eight: These were as follows:

1. x-coördinate.
2. y-coördinate.
3. x-coördinate, reversed.
4. y-coördinate, reversed.

5, 6, 7, 8. The same in the special standard star measures, made for the purpose of securing uniformity of scale value in both coördinates.

As an example of the angle measures, let us take those for plate 16, which were as follows, each number being, of course, the mean of all the readings taken in one position of the plate.

1.	182° 26′ 21″	x-coördinate.
2.	92° 26′ 22″	y-coördinate.
3.	2° 26′ 20″	x-coördinate, reversed.
4.	272° 26′ 20″	y-coördinate, reversed.
5.	182° 26′ 21″	x-coördinate, special standard star measures.
6.	92° 26′ 20″	y-coördinate, special measures.
7.	2° 26′ 20″	x-coördinate, special measures, reversed.
8.	272° 26′ 20″	y-coördinate, special measures, reversed.
Mean	26′ 20″	

It is clear that if we had been able to turn the plate exactly 90° each time, all the above readings of minutes and seconds would have been exactly equal to the mean given at the foot of the column. If we let:

$Q + i$ be the mean of all the readings, omitting the degrees,
Q be the reading actually obtained in any case,

then i will be the correction required by the reading actually obtained, to reduce it to what it should have been. In some cases it was more convenient to use as the standard reading to which the actual readings are to be reduced, some number which was nearly equal to the majority of the readings instead of the arithmetical mean of all. In this way i was generally made quite small.

Having obtained the value of i, we can proceed to the correction of the measured coördinates. Let:

x_s, y_s, x_s', y_s', be the coördinates obtained for the two standard stars in the special measures made for the purpose of getting a uniform scale value for both coördinates.
x, y, x', y', be the corresponding coördinates of the same standard stars in any set of measures.
i_s, i, be the values of i belonging to the special standard measures and the other set of measures.

To get the true distance between the standard stars parallel to the x and y-axes, we must correct the ones obtained directly from the special standard measures by adding:

to $x_s - x_s'$, the quantity $-(y_s - y_s')\, i_s \sin 1''$
to $y_s - y_s'$, the quantity $+(x_s - x_s')\, i_s \sin 1''$

In making these special standard measures in two coördinates the greatest care was taken to insure the complete elimination of temperature effects by using the principle of repetition in the reverse order, and by making all the measures in a consecutive series on one day. Consequently, we may assume that the corrected $x_s - x_s'$ and $y_s - y_s'$ are measured at the same temperature, and are, therefore, expressed in the same unit of measure. This unit of measure is of course the mean millimetre of the scale at the mean temperature of the day on which the special standard

measures were made. Since it is immaterial what the absolute length of our linear unit may be, we shall assume that the corrected values so obtained for $x_s - x_s'$ and $y_s - y_s'$ in these special standard measures are the true values of these quantities. Hereafter, in speaking of $x_s - x_s'$ and $y_s - y_s'$, we shall always mean the corrected values of these quantities obtained from those directly measured in the manner just explained.

For any other set of measures, in which we find the values to be:

$$x - x', \qquad y - y',$$

the corresponding position circle error being i, we must calculate the corrections as follows.

To correct for the angle error, we must add to every measured x, the quantity:

$$-iy \sin 1''$$

and to every measured y, the quantity:

$$+ix \sin 1.''$$

To correct for the scale errors, we must add to every measured x the quantity:

$$x\left(1 - \frac{x - x'}{x_s - x'_s}\right),$$

and to every measured y, the quantity:

$$y\left(1 - \frac{y - y'}{y_s - y_s'}\right).$$

It is to be noted that in using these formulæ the proper signs must be affixed to the measured values of the coördinates. These measured values are obtained by simply subtracting the scale-reading obtained for the central star from the scale-reading obtained in the measure of any other star. The signs given to the x and y obtained in this way depend on the following rule:

The x-coördinate of a star is positive if the right ascension of the star is greater than that of the central star. The y-coördinate of a star is positive if the star is nearer than the central star to the North pole of the heavens.

The following Table gives the values of the quantity:

$$i \sin 1'' \times 10^4$$

for each of the plates measured. Plate 16 appears twice in the

Table, because, as has already been stated, a number of faint stars were measured on this plate, after the work originally projected had been finished. The faint star measures were reduced in exactly the same manner as the others, treating them quite independently. Quantities belonging to the faint stars will be found in the Table in the line numbered "16*f*" in the first column.

ANGLE CORRECTION FACTOR.

Plate.	Mean $Q+i$	Correction Factor, $i \sin 1'' \times 10^4$							
		Star Measures.				Special Standard Measures.			
		x	y	x rev'd.	y rev'd.	x	y	x rev'd.	y rev'd.
16	26′ 20″	—.0485	—.0970	.0000	.0000	—.0485	.0000	.0000	.0000
16*f*	26 20	—.0485	+.0485	—.0485	.0000	—.0485	.0000	.0000	.0000
18	43 42	+.0970	—.0485	+.3878	+.2424	—.0970	—.0485	—.0485	+.0970
22	27 52	—.0970	—.1939	—.0485	+.0970	+.0970	+.1454	.0000	+.1939
24	20 31	+.3878	.0000	.0000	—.0485	+.0970	.0000	—.0485	.0000

Proceeding now with the further reduction of the special standard measures, we have in the following Table the computation of the corrected values of the quantities:

$$x_s - x_s', \qquad y_s - y_s'.$$

The Table needs little or no explanation. The numbers in the last column, headed "Adopted Mean," are the final corrected values, reduced to the same unit of measure, in the manner described above. The rotation numbers refer to the former table containing the results of the measures. The quantities for plates 16 and 16*f* are of course the same, as it was not necessary to make the special standard measures a second time on the same plate.

REDUCTION OF SPECIAL STANDARD MEASURES.

Plate.	Coördinate.	Rot'n Nos.	Scale Reading.		Diff.	Angle Corr'n.	Corr'd Diff.	Adopted Mean.
			A 34	18 *m*				
16	*x*	173,174	28.9624	100.8026	71.8402	— 4	71.8398	71.8450
	x, rev.	171,172	101.4077	29.5574	71.8503	0	71.8503	
	y	175,176	96.2734	20.5656	75.7078	0	75.7078	75.7052
	y, rev.	169,170	34.1000	109.8025	75.7025	0	75.7025	
16 *f*	*x*	173,174	28.9624	100.8026	71.8402	— 4	71 8398	71.8450
	x, rev.	171,172	101.4077	29.5574	71.8503	0	71.8503	
	y	175,176	96.2734	20.5656	75.7078	0	75.7078	75.7052
	y, rev.	169,170	34.1000	109.8025	75.7025	0	75.7025	
18	*x*	21,22	29.2054	100.9409	71.7355	— 7	71.7348	71.7319
	x, rev.	23,24	101.1554	29.4260	71.7294	— 4	71.7290	
	y	19,20	94.9802	19.1614	75.8188	+ 3	75.8191	75.8200
	y, rev.	25,26	35.3816	111.2032	75.8216	— 7	75.8209	
22	*x*	85,86	32.7652	104.5176	71.7524	+ 7	71.7531	71.7572
	x, rev.	83,84	97.6076	25.8464	71.7612	0	71.7612	
	y	87,88	93.0331	17.2642	75.7689	—10	71.7679	71.7692
	y, rev.	81,82	37.3382	113.1101	75.7719	—14	71.7705	
24	*x*	129,130	27.9004	99.6263	71.7259	+ 7	71.7266	71.7259
	x, rev.	127,128	102.4740	30.7484	71.7256	— 4	71.7252	
	y	131,132	93.9676	18.1783	75.7893	0	75.7893	75.7906
	y, rev.	125,126	36.4047	112.1966	75.7919	0	75.7919	

The reductions are continued in the next Table. The numbers in the columns "Stars Coördinate" are obtained from the Table containing the original measures, by simply subtracting the scale reading corresponding to the central star from that belonging to the star in question. In doing this, of course the means of the measures were used, both for the central star and for the other; the very small angle corrections were computed in the manner already explained. The quantity in the column headed "Difference" ought to be equal to the quantity corresponding to it in the column "Adopted Mean" of the preceding Table. Any excess has been taken to be caused by a change in the temperature of the scale between the days when the special standard measures and the other measures were made. Such differences are set down in the column "Excess over Adopted Mean." The last column is headed "Correction Factor," and gives the factor by which each of the coördinates as measured must be multiplied, in

order to get the scale correction, which must be added to the measured coördinate. This factor is computed by dividing the quantity in the column "Excess over adopted mean" by the quantity in the adjacent column headed "Diff."

COMPUTATION OF SCALE CORRECTION FACTORS.

Plate.	Coördinate.	Rot'n Nos.	Star's Coördinate, and Angle Correction. A 34		18 *m*		Diff.	Excess over Adopted Mean.	Corr'n Factor. $\times 10^4$
16	*x*	133,134	+37.3767	— 1	—34.4636	+ 2	71.8400	—.0050	+.70
	x, rev.	151,152	+37.3740	0	—34.4680	0	71.8420	—.0030	+.42
	y	142,143	—26.9182	— 4	+48.7850	+ 3	75.7039	—.0013	+.17
	y, rev.	160,161	—26.9152	0	+48.7859	0	75.7011	—.0041	+.54
16*f*	*x*	177,178	+37.3770	— 1	—34.4656	+ 2	71.8423	—.0027	+.38
	x, rev.	195,196	+37.3780	— 1	—34.4691	+ 2	71.8468	+.0018	—.25
	y	186,187	—26.9202	+ 2	+48.7837	— 2	75.7035	—.0017	+.22
	y, rev.	204,205	—26.9122	0	+48.7912	0	75.7034	—.0018	+.24
18	*x*	1,2	+37.3343	+ 3	—34.3981	— 5	71.7332	+.0013	—.18
	x, rev.	27,28	+37.3326	+10	—34.3955	—19	71.7310	—.0009	+.13
	y	10,11	—26.9846	— 2	+48.8400	+ 2	75.8250	+.0050	—.66
	y, rev.	36,37	—26.9810	+ 9	+48.8404	— 8	75.8197	—.0003	+.04
22	*x*	45,46	+37.3393	— 3	—34.4183	+ 5	71.7568	—.0004	+.06
	x, rev.	63,64	+37.3384	— 1	—34.4193	+ 2	71.7574	+.0002	—.03
	y	54,55	—26.9479	— 7	+48.8156	+ 7	75.7649	—.0043	+.57
	y, rev.	72,73	—26.9528	+ 4	+48.8137	— 3	75.7658	—.0034	+.45
24	*x*	89,90	+37.3296	+10	—34.3932	—19	71.7257	—.0002	+.03
	x, rev.	107,108	+37.3314	0	—34.3936	0	71.7250	—.0009	+.13
	y	98,99	—26.9631	0	+48.8246	0	75.7877	—.0029	+.38
	y, rev.	116,117	—26.9622	— 2	+48.8281	+ 2	75.7907	+.0001	—.01

8. The foregoing calculations put us in possession of all the materials needed for the reduction of the measures of the several stars treated in the present research. The following Table contains the computation of the final adopted coördinates of all these stars. The corrections applied in the Table to the mean measured coördinates are the angle correction already explained, and the scale correction. This latter is obtained, as we have already stated, by multiplying the correction factor contained in the last column of the preceding Table by the coördinate whose correction is sought. The final adopted values in the last column are simply the means of the corrected results, as given in the preceding column for the direct and reversed positions.

PLATE 16.

Star.	Coördinate.	Rot'n No.	Measured Coörd.	Correction.		Corrected Coördinate.	Adopted Value.
				Angle.	Scale.		
A 34	*x*	133	+37.3767	— 1	+26	+37.3792	+37.3774
	x, rev.	151	+37.3740	0	+16	+37.3756	
	y	142	—26.9182	— 4	— 5	—26.9191	—26.9179
	y, rev.	160	—26.9152	0	—15	—26.9167	
18 *m*	*x*	134	—34.4636	+ 2	—24	—34.4658	—34.4676
	x, rev.	152	—34.4680	0	—14	—34.4694	
	y	143	+48.7850	+ 3	+ 8	+48.7861	+48.7873
	y, rev.	161	+48.7859	0	+26	+48.7885	
A 12	*x*	136	— 5.9612	+ 1	— 4	— 5.9615	— 5.9658
	x, rev.	154	— 5.9698	0	— 3	— 5.9701	
	y	145	+27.4081	+ 1	+ 5	+27.4087	+27.4088
	y, rev.	163	+27.4075	0	+15	+27.4090	
A 22	*x*	137	+ 1.0661	— 1	+ 1	+ 1.0661	+ 1.0652
	x, rev.	155	+ 1.0642	0	0	+ 1.0642	
	y	146	—13.7014	0	— 2	—13.7016	—13.7007
	y, rev.	164	—13.6991	0	— 7	—13.6998	
A 24	*x*	138	+ 2.0184	+ 1	+ 1	+ 2.0186	+ 2.0150
	x, rev.	156	+ 2.0112	0	+ 1	+ 2.0113	
	y	147	+11.7433	0	+ 2	+11.7435	+11.7452
	y, rev.	165	+11.7462	0	+ 6	+11.7468	
A 28	*x*	139	+16.2146	— 2	+11	+16.2155	+16.2142
	x, rev.	157	+16.2122	0	+ 7	+16.2129	
	y	148	—47.0560	— 2	— 8	—47.0570	—47.0570
	y, rev.	166	—47.0546	0	—25	—47.0571	
A 30	*x*	140	+29.0284	— 1	+20	+29.0303	+29.0290
	x, rev.	158	+29.0265	0	+12	+29.0277	
	y	149	—15.1591	— 3	— 3	—15.1597	—15.1574
	y, rev.	167	—15.1544	0	— 8	—15.1552	
A 39	*x*	141	+47.8795	+ 1	+34	+47.8830	+47.8784
	x, rev.	159	+47.8718	0	+20	+47.8738	
	y	150	+26.5550	— 5	+ 5	+26.5550	+26.5586
	y, rev.	168	+26.5608	0	+14	+26.5622	

PLATE 16. FAINT STARS.

Star.	Coördinate.	Rot'n No.	Measured Coörd.	Correction.		Corrected Coördinate.	Adopted Value.
				Angle.	Scale.		
A 34	x	177	+37.3770	— 1	+14	+37.3783	+37.3776
	x, rev.	195	+37.3780	— 1	— 9	+37.3770	
	y	186	—26.9202	+ 2	— 6	—26.9206	—26.9167
	y, rev.	204	—26.9122	0	— 6	—26.9128	
18 m	x	178	—34.4656	+ 2	—13	—34.4667	—34.4674
	x, rev.	196	—34.4691	+ 2	+ 9	—34.4680	
	y	187	+48.7837	— 2	+11	+48.7846	+48.7885
	y, rev.	205	+48.7912	0	+12	+48.7924	
A 5	x	180	—26.4772	+ 2	—10	—26.4780	—26.4750
	x, rev.	198	—26.4730	+ 2	+ 7	—26.4721	
	y	189	+34.4428	— 1	+ 8	+34.4435	+34.4484
	y, rev.	207	+34.4526	0	+ 8	+34.4534	
A 6	x	181	—25.9090	+ 1	—10	—25.9099	—25.9058
	x, rev.	199	—25.9024	+ 1	+ 6	—25.9017	
	y	190	+11.4109	— 1	+ 3	+11.4111	+11.4183
	y, rev.	208	+11.4252	0	+ 3	+11.4255	
A 11	x	182	—10.7804	0	— 4	—10.7808	—10.7760
	x, rev.	200	—10.7716	0	+ 3	—10.7713	
	y	191	— 1.0244	— 1	0	— 1.0245	— 1.0194
	y, rev.	209	— 1.0143	0	0	— 1.0143	
A 26	x	183	+ 6.0702	— 2	+ 2	+ 6.0702	+ 6.0747
	x, rev.	201	+ 6.0796	— 2	— 2	+ 6.0792	
	y	192	—38.9222	0	— 9	—38.9231	—38.9165
	y, rev.	210	—38.9090	0	— 9	—38.9099	
A 27	x	184	+13.3760	+ 1	+ 5	+13.3766	+13.3788
	x, rev.	202	+13.3812	+ 1	— 3	+13.3810	
	y	193	+13.9536	+ 1	+ 3	+13.9540	+13.9610
	y, rev.	211	+13.9678	0	+ 3	+13.9681	
A 36	x	185	+39.6670	0	+15	+39.6685	+39.6708
	x, rev.	203	+39.6740	0	—10	+39.6730	
	y	194	+ 7.5026	+ 2	+ 2	+ 7.5030	+ 7.5082
	y, rev.	212	+ 7.5132	0	+ 2	+ 7.5134	

PLATE 18.

Star.	Coördinate.	Rot'n No.	Measured Coörd.	Correction.		Corrected Coörd.	Adopted Value.
				Angle.	Scale.		
A 34	x	1	+37.3343	+ 3	— 7	+37.3339	+37.3340
	x, rev.	27	+37.3326	+10	+ 5	+37.3341	
	y	10	—26.9846	— 2	+18	—26.9830	—26.9816
	y, rev.	36	—26.9810	+ 9	— 1	—26.9802	
18 m	x	2	—34.3981	— 5	+ 6	—34.3980	—34.3979
	x, rev.	28	—34.3955	—19	— 4	—34.3978	
	y	11	+48.8400	+ 2	—32	+48.8370	+48.8384
	y, rev.	37	+48.8404	— 8	+ 2	+48.8398	
A 12	x	4	— 5.9294	— 3	+ 1	— 5.9296	— 5.9282
	x, rev.	30	— 5.9256	—11	— 1	— 5.9268	
	y	13	+27.4096	0	—18	+27.4078	+27.4116
	y, rev.	39	+27.4154	— 1	+ 1	+27.4154	
A 22	x	5	+ 1.0421	+ 1	0	+ 1.0422	+ 1.0444
	x, rev.	31	+ 1.0461	+ 5	0	+ 1.0466	
	y	14	—13.7172	0	+ 9	—13.7163	—13.7141
	y, rev.	40	—13.7118	0	— 1	—13.7119	
A 24	x	6	+ 2.0377	— 1	0	+ 2.0376	+ 2.0360
	x, rev.	32	+ 2.0349	— 5	0	+ 2.0344	
	y	15	+11.7374	0	— 8	+11.7366	+11.7394
	y, rev.	41	+11.7421	+ 1	0	+11.7422	
A 28	x	7	+16.1402	+ 5	— 3	+16.1404	+16.1411
	x, rev.	33	+16.1398	+18	+ 2	+16.1418	
	y	16	—47.0814	— 1	+31	—47.0784	—47.0812
	y, rev.	42	—47.0841	+ 4	— 2	—47.0839	
A 30	x	8	+29.0033	+ 2	— 5	+29.0030	+29.0038
	x, rev.	34	+29.0036	+ 6	+ 4	+29.0046	
	y	17	—15.2122	— 1	+10	—15.2113	—15.2102
	y, rev.	43	—15.2096	+ 7	— 1	—15.2090	
A 39	x	9	+47.9234	— 3	— 9	+47.9222	+47.9238
	x, rev.	35	+47.9257	—10	+ 6	+47.9253	
	y	18	+26.4767	— 2	—17	+26.4748	+26.4772
	y, rev.	44	+26.4782	+12	+ 1	+26.4795	

PLATE 22.

Star.	Coördinate.	Rot'n No.	Measured Coörd.	Correction.		Corrected Coördinate.	Adopted Value.
				Angle.	Scale.		
A 34	x	45	+37.3393	— 3	+ 2	+37.3392	+37.3387
	x, rev.	63	+37.3384	— 1	— 1	+37.3382	
	y	54	—26.9479	— 7	—15	—26.9501	—26.9518
	y, rev.	72	—26.9528	+ 4	—12	—26.9536	
18 m	x	46	—34.4183	+ 5	— 2	—34.4180	—34.4185
	x, rev.	64	—34.4193	+ 2	+ 1	—34.4190	
	y	55	+48.8156	+ 7	+28	+48.8191	+48.8174
	y, rev.	73	+48.8137	— 3	+22	+48.8156	
A 12	x	48	— 5.9416	+ 3	0	— 5.9413	— 5.9414
	x, rev.	66	— 5.9416	+ 1	0	— 5.9415	
	y	57	+27.4098	+ 1	+16	+27.4115	+27.4091
	y, rev.	75	+27.4056	— 1	+12	+27.4067	
A 22	x	49	+ 1.0501	— 1	0	+ 1.0500	+ 1.0494
	x, rev.	67	+ 1.0488	— 1	0	+ 1.0487	
	y	58	—13.7084	0	— 8	—13.7092	—13.7084
	y, rev.	76	—13.7070	0	— 6	—13.7076	
A 24	x	50	+ 2.0238	+ 1	0	+ 2.0239	+ 2.0236
	x, rev.	68	+ 2.0233	+ 1	0	+ 2.0234	
	y	59	+11.7408	0	+ 7	+11.7415	+11.7396
	y, rev.	77	+11.7372	0	+ 5	+11.7377	
A 28	x	51	+16.1613	— 5	+ 1	+16.1609	+16.1621
	x, rev.	69	+16.1635	— 2	0	+16.1633	
	y	60	—47.0635	— 3	—27	—47.0665	—47.0686
	y, rev.	78	—47.0687	+ 2	—21	—47.0706	
A 30	x	52	+29.0108	— 1	+ 2	+29.0109	+29.0096
	x, rev.	70	+29.0085	— 1	— 1	+29.0083	
	y	61	—15.1865	— 6	— 9	—15.1880	—15.1880
	y, rev.	79	—15.1876	+ 3	— 7	—15.1880	
A 39	x	53	+47.8982	+ 3	+ 3	+47.8988	+47.8995
	x, rev.	71	+47.9002	+ 1	— 1	+47.9002	
	y	62	+26.5150	— 9	+15	+26.5156	+26.5126
	y, rev.	80	+26.5080	+ 5	+12	+26.5097	

PLATE 24.

Star.	Coördinate.	Rot'n No.	Measured Coörd.	Correction.		Corrected Coörd.	Adopted Value.
				Angle.	Scale.		
A 34	x	89	+37.3296	+10	+ 1	+37.3307	+37.3313
	x, rev.	107	+37.3314	0	+ 5	+37.3319	
	y	98	—26.9631	0	—10	—26.9641	—26.9632
	y, rev.	116	—26.9622	— 2	0	—26.9624	
18 m	x	90	—34.3932	—19	— 1	—34.3952	—34.3946
	x, rev.	108	—34.3936	0	— 4	—34.3940	
	y	99	+48.8246	0	+19	+48.8265	+48.8274
	y, rev.	117	+48.8281	+ 2	0	+48.8283	
A 12	x	92	— 5.9245	—11	0	— 5.9256	— 5.9252
	x, rev.	110	— 5.9248	0	— 1	— 5.9249	
	y	101	+27.4103	0	+10	+27.4113	+27.4112
	y, rev.	119	+27.4112	0	0	+27.4112	
A 22	x	93	+ 1.0443	+ 5	0	+ 1.0448	+ 1.0456
	x, rev.	111	+ 1.0463	0	0	+ 1.0463	
	y	102	—13.7120	0	— 5	—13.7125	—13.7101
	y, rev.	120	—13.7077	0	0	—13.7077	
A 24	x	94	+ 2.0306	— 5	0	+ 2.0301	+ 2.0306
	x, rev.	112	+ 2.0312	0	0	+ 2.0312	
	y	103	+11.7366	0	+ 5	+11.7371	+11.7378
	y, rev.	121	+11.7385	0	0	+11.7385	
A 28	x	95	+16.1429	+18	0	+16.1447	+16.1434
	x, rev.	113	+16.1418	0	+ 2	+16.1420	
	y	104	—47.0765	0	—18	—47.0783	—47.0771
	y, rev.	122	—47.0758	— 1	0	—47.0759	
A 30	x	96	+28.9922	+ 6	+ 1	+28.9929	+28.9948
	x, rev.	114	+28.9964	0	+ 4	+28.9968	
	y	105	—15.1950	0	— 6	—15.1956	—15.1936
	y, rev.	123	—15.1914	— 1	0	—15.1915	
A 39	x	97	+47.9140	—10	+ 1	+47.9131	+47.9130
	x, rev.	115	+47.9122	0	6	+47.9128	
	y	106	+26.5082	0	+10	+26.5092	+26.5092
	y, rev.	124	+26.5095	— 2	0	+26.5093	

9. From the final adopted values of the coördinates given in the last column of the preceding Table, the position angle and distance of each star with respect to the central star were computed. The computation was made by means of the following formulae, in which s and p designate distance and position angle:

$$s \sin p = x$$
$$s \cos p = y$$

The results of the new measures obtained in this way are set down in the next Table, side by side with the corresponding results of the measures obtained under Mr. Rutherfurd's direction, soon after the plates were made. These values were taken from my paper on the Pleiades without the application of any correction whatever. For the position angles the Table gives the direct discordance of the old and new measures, the same quantities corrected by the addition of a constant, and finally in the last column, the discordance expressed in arc of a great circle. These final values are obtained from the numbers in the preceding column by multiplying each by the sine of the distance of the star in question from the central star.

In the case of the distances, the old measures are expressed in terms of the glass scale of Rutherfurd's machine, while the new measures are in millimetres. It was therefore necessary to find the ratio of the space of the Rutherfurd scale to the millimetre of the scale of the Repsold machine. In the case of each plate the ratio adopted was obtained by dividing the sum of the old measures by the sum of the new ones. The sums used in this way are set down in the Table. The fifth column gives the new measures reduced to the old Rutherfurd scale by means of the ratio so obtained. The differences in the next to the last column are therefore also expressed in terms of the Rutherfurd scale. In the final column they are given in seconds of arc, using for the ratio of the Rutherfurd scale to the second of arc the value:

1 division of the Rutherfurd scale = $28''.01$.

Plate 16.

Star.	Mag.	Position Angle.		Old Measures *minus* New Measures.		
		Old Measure.	New Measure.	Obs'd.	Corr'd.	In Sec.
		° ′ ″	′ ″	″	″	″
A 34	7.2	125 44 50	45 36	—46	0	0.00
18 *m*	6.3	324 44 44	45 34	—50	— 4	— .06
A 12	7.5	347 42 26	43 14	—48	— 2	— .01
A 22	7.0	175 32 20	33 16	—56	—10	— .04
A 24	7.0	9 43 12	44 6	—54	— 8	— .02
A 28	7.0	160 58 36	59 16	—40	+ 6	+ .08
A 30	8.4	117 33 28	34 16	—48	— 2	— .02
A 39	7.7	60 58 28	58 57	—29	+17	+ .41

Star.	Mag.	Distance.			Old Measures *minus* New Measures.	
		Old Measure. Ru. Scale.	New Measure. Millimetres.	New Meas. Ru. Scale.	Scale.	In Sec.
						″
A 34	7.2	86.9490	46.0613	86.9532	—.0042	—0.12
18 *m*	6.3	112.7634	59.7346	112.7654	—.0020	— .06
A 12	7.5	52.9467	28.0505	52.9530	—.0063	— .18
A 22	7.0	25.9518	13.7421	25.9420	+.0098	+ .27
A 24	7.0	22.5020	11.9168	22.4962	+.0058	+ .16
A 28	7.0	93.9548	49.7721	93.9585	—.0037	— .10
A 30	8.4	61.8204	32.7479	61.8207	—.0003	— .01
A 39	7.7	103.3588	54.7512	103.3579	+.0009	+ .03
Sum,		560.2469	296.7765			

Plate 16. "Faint Stars."

Star.	Mag.	Position Angle.		Old Measures *minus* New Measures.		
		Old Measure.	New Measure.	Obs'd.	Corr'd.	In Sec.
		° ′ ″	′ ″	″	″	
A 34	7.2	125 44 50	45 32	—42	+12	+0.14
18 *m*	6.3	324 44 44	45 36	—52	+ 2	+ .03
A 5	9.1	322 26 5	27 22	—77	—23	— .26
A 6	9.0	293 46 9	47 10	—61	— 7	— .05
A 11	9.1	264 35 4	35 45	—41	+13	+ .04
A 26	9.0	171 7 6	7 41	—35	+19	+ .19
A 27	8.5	43 46 0	46 48	—48	+ 6	+ .03
A 36	8.5	79 15 39	16 58	—79	—25	— .26

Star.	Mag.	Distance.			Old Measures *minus* New Measures.	
		Old Measure. Ru. Scale.	New Measure. Millimeters.	New Meas. Ru. Scale.	Scale.	In Sec.
						″
A 34	7.2	86.9490	46.0608	86.9544	—.0054	—0.15
18 *m*	6.3	112.7634	59.7353	112.7695	—.0061	— .17
A 5	9.1	82.0217	43.4467	82.0197	+.0020	+ .06
A 6	9.0	53.4466	28.3106	53.4454	+.0012	+ .03
A 11	9.1	20.4362	10.8241	20.4340	+.0022	+ .06
A 26	9.0	74.3612	39.3877	74.3570	+.0042	+ .12
A 27	8.5	36.5050	19.3365	36.5040	+.0010	+ .03
A 36	8.5	76.2216	40.3750	76.2208	+.0008	+ .02
Sum		542.7047	287.4767			

Plate 18.

Star.	Mag.	Position Angle.		Old Measures *minus* New Measures.		
		Old Measure.	New Measure.	Obs'd.	Corr'd.	In Sec.
		° ′ ″	′ ″	′ ″	″	″
A 34	7.2	125 48 26	51 22	—2 56	—20	—0.24
18 *m*	6.3	324 48 4	50 32	—2 28	+ 8	+ .12
A 12	7.5	347 46 8	47 48	—1 40	+56	+ .40
A 22	7.0	175 35 48	38 42	—2 54	—18	— .06
A 24	7.0	9 47 46	50 21	—2 35	+ 1	.00
A 28	7.0	161 2 13	4 35	—2 22	+14	+ .18
A 30	8.4	117 36 56	40 25	—3 29	—53	— .45
A 39	7.7	61 2 22	4 48	—2 26	+10	+ .14

Star.	Mag.	Distance.			Old Measures *minus* New Measures.	
		Old Measure. Ru. Scale.	New Measure. Millimetres.	New Meas. Ru. Scale.	Scale.	In Sec.
						″
A 34	7.2	86.9566	46.0636	86.9640	—.0074	—0.21
18 *m*	6.3	112.7787	59.7363	112.7768	+.0019	+ .05
A 12	7.5	52.9521	28.0453	52.9471	+.0050	+ .14
A 22	7.0	25.9632	13.7538	25.9660	—.0028	— .08
A 24	7.0	22.5045	11.9146	22.4938	+.0107	+ .30
A 28	7.0	93.9590	49.7711	93.9635	—.0045	— .13
A 30	8.4	61.8324	32.7502	61.8296	+.0028	+ .08
A 39	7.7	103.3596	54.7515	103.3660	—.0064	— .18
Sum,		560.3061	296.7864			

Plate 22.

Star.	Mag.	Position Angle.		Old Measures *minus* New Measures.		
		Old Measure.	New Measure.	Obs'd.	Corr'd.	In Sec.
		° ′ ″	′ ″	′ ″	″	″
A 34	7.2	125 49 57	49 21	+0 36	+ 6	+0.07
18 *m*	6.3	324 49 17	48 52	+0 25	— 5	— .08
A 12	7.5	347 47 2	46 10	+0 52	+22	+ .16
A 22	7.0	175 37 35	37 21	+0 14	—16	— .06
A 24	7.0	9 46 36	46 49	—0 13	—43	— .13
A 28	7.0	161 3 17	2 56	+0 21	— 9	— .12
A 30	8.4	117 38 54	38 4	+0 50	+20	+ .17
A 39	7.7	61 3 5	2 7	+0 58	+28	+ .39

Star.	Mag.	Distance.			Old Measures *minus* New Measures.	
		Old Measure. Ru. Scale.	New Measure. Millimetres.	New Meas. Ru. Scale.	Scale.	In Sec.
						″
A 34	7.2	86.9402	46.0497	86.9310	+.0092	+0.26
18 *m*	6.3	112.7456	59.7309	112.7579	—.0123	— .34
A 12	7.5	52.9402	28.0457	52.9436	—.0034	— .10
A 22	7.0	25.9606	13.7485	25.9539	+.0067	+ .19
A 24	7.0	22.4920	11.9127	22.4884	+.0036	+ .10
A 28	7.0	93.9419	49.7660	93.9465	—.0046	— .13
A 30	8.4	61.8146	32.7450	61.8148	—.0002	— .01
A 39	7.7	103.3512	54.7475	103.3504	+.0008	+ .02
Sum,		560.1863	296.7460			

PLATE 24.

Star.	Mag.	Position Angle.		Old Measures *minus* New Measures.		
		Old Measure.	New Measure.	Obs'd.	Corr'd.	In Sec.
		° ′ ″	′ ″	′ ″	″	″
A 34	7.2	125 50 23	50 22	+0 01	—17	—0.20
18 *m*	6.3	324 50 28	50 19	+0 09	— 9	— .14
A 12	7.5	347 49 5	48 9	+0 56	+38	+ .27
A 22	7 0	175 38 27	38 20	+0 7	—11	— .04
A 24	7.0	9 49 34	48 53	+0 41	+23	+ .07
A 28	7.0	161 4 28	4 21	+0 7	—11	— .14
A 30	8.4	117 39 16	39 18	—0 2	—20	— .17
A 39	7.7	61 3 15	2 43	+0 32	+14	+ .20

Star.	Mag.	Distance.			Old Measures *minus* New Measures.	
		Old Measure. Ru. Scale.	New Measure. Millimeters.	New Meas. Ru. Scale.	Scale.	In Sec.
						″
A 34	7.2	86.9350	46.0503	86.9358	—.0008	—0.02
18 *m*	6.3	112.7509	59.7251	112.7517	—.0008	— .02
A 12	7.5	52.9480	28.0443	52.9432	+.0048	+ .13
A 22	7.0	25.9598	13.7499	25.9577	+.0021	+ .06
A 24	7.0	22.4990	11.9121	22.4882	+.0108	+ .30
A 28	7.0	93.9391	49.7681	93.9544	—.0153	— .43
A 30	8.4	61.7977	32.7345	61.7976	+.0001	.00
A 39	7.7	103.3731	54.7575	103.3736	—.0005	— .01
Sum		560.2026	296.7418			

10. The final result of the whole research is contained in the following Table, which requires little or no explanation. It may be well to repeat, however, that the discordances in position angle have been corrected by a constant, so as to make the sum of the discordances zero for any given plate. This is equivalent to correcting the orientation of the plate in its holder, so as to make it the same for the old and new measures. The position angle discordances were turned into arc of a great circle, by multiplying each discordance by the sine of the distance of the star in question from the central star. This operation has caused the sum of the position angle discordances to differ somewhat from zero in the Table. The distance discordances have also been computed in such a way as to make their sum zero.

FINAL TABLE OF DISCORDANCES,

RUTHERFURD MEASURES *minus* NEW MEASURES.

Star.	Plate 16.		Plate 18.		Plate 22.		Plate 24.		Means.		Mag.
	Angle.	Dist.	Angle.	Dist.	Angle.	Dist.	Angle.	Dist.	Angle.	Dist.	
	″	″	″	″	″	″	″	″	″	″	
A 34	0.00	—0.12	—0.24	—0.21	+0.07	+0.26	—0.20	—0.02	—.09	—.02	7.2
18 *m*	— .06	— .06	+ .12	+ .05	— .08	— .34	— .14	— .02	—.04	—.09	6.3
A 12	— .01	— .18	+ .40	+ .14	+ .16	— .10	+ .27	+ .13	+.20	.00	7.5
A 22	— .04	+ .27	— .06	— .08	— .06	+ .19	— .04	+ .06	—.05	+.11	7.0
A 24	— .02	+ .16	.00	+ .30	— .13	+ .10	+ .07	+ .30	—.02	+.22	7.0
A 28	+ .08	— .10	+ .18	— .13	— .12	— .13	— .14	— .43	.00	—.20	7.0
A 30	— .02	— .01	— .45	+ .08	+ .17	— .01	— .17	.00	—.12	+.02	8.4
A 39	+ .41	+ .03	+ .14	— .18	+ .39	+ .02	+ .20	— .01	+.28	—.04	7.7
	″	″							″	″	
A 34	+0.14	—0.15							+.14	—.15	7.2
18 *m*	+ .03	— .17							+.03	—.17	6.3
A 5	— .26	+ .06							—.26	+.06	9.1
A 6	— .05	+ .03							—.05	+.03	9.0
A 11	+ .04	+ .06							+.04	+.06	9.1
A 26	+ .19	+ .12							+.19	+.12	9.0
A 27	+ .03	+ .03							+.03	+.03	8.5
A 36	— .26	+ .02							—.26	+.02	8.5

If we regard the numbers in the above Table as residuals we get by the formula

$$r = \sqrt{\frac{[vv]}{n-1}},$$

the values:

$r = \pm 0''.16$, for the distances,
$r = \pm 0''.19$, for the position angles.

As these numbers involve the uncertainty of both the old and the new measures, we may draw the conclusion that the positions of the individual stars on the plates are determined by either set of measures with a mean error which will not differ much from $0''.1$. We may further conclude that measures of the Rutherfurd plates made at the present time will furnish results practically identical with those that would have been obtained if the plates had been measured twenty years earlier.

NOTES.

Note on Prof. Jacoby's Paper on the Reduction of Stellar Photographs. (Annals Vol. IX. p. 101.)

M. Prosper Henry has kindly pointed out (*Bull. du Com. Perm. Tome* 3) that the above paper contains an inconsistency, inasmuch as I have used the true declination of the centre of the plate instead of the apparent declination in computing the transformation tables. The very slight effect of this might be neglected, were it not for the fact that it can be taken into account fully by slightly changing my refraction formula for x. The changes required are:

page 104, line 8,

for:

$$M_x = \beta\,(1 + H^2 - G\tan\delta)\sin 1'',$$

put:

$$M_x = \beta\,(1 + H^2)\sin 1'',$$

page 104, line 15 from bottom,

dele:

$$\tan l = \tfrac{1}{2}\tan\phi$$

page 104, line 14 from bottom,

for:

$$w_1 = \beta\cos\phi\sec(\phi - \delta)\sec\delta\sin 1''$$

put:

$$w_1 = k\sin 1'',$$

page 104, line 13 from bottom,

for:

$$w_2 = \tfrac{1}{4}\beta \sin 2\phi \sec^2(\phi - \delta) \sec\delta \cos(l + \delta) \operatorname{cosec} l \sin^2 1'' \quad \sin 1'',$$

put:

$$w_2 = \beta \cos^2\phi \sec^2(\varphi - \delta) \sin^2 1^m \sin 1'',$$

for:

$$[1.1308 - 10]$$

put:

$$[1.7328 - 10].$$

These changes in the refraction formulæ cause the discordances between the results of M. Henry's reduction and my own to disappear almost completely.

Another small quantity which I neglected, and which appears to have been neglected also by M. Henry, arises from the quantity c, or the error of centreing the plate in declination. It is easy to see that the values of $\Delta\alpha$ obtained in my paper require the correction:

$$d\,\Delta\alpha = + c\,A_1\,(x \sec\delta).$$

VI.—*Coleopterological Notices.*

VII.

BY THOS. L. CASEY.

Read Nov. 16, 1896.

All taxonomic investigation, in fields touched upon in the following studies, must be more or less imperfect at the present stage of knowledge of the arthropod fauna of the world. This can be brought prominently into evidence, if we consider the usual proportion of previously described species contained in any independent collection subsequently made, in any particular group and over the same geographic area. Although this new collection may comprise several times the number of species previously known, it is virtually safe to say that there will be a considerable proportion of the latter unrepresented. In this way we may be enabled to foretell in a measure the real extent of the particular group in any given region.

For example, the revision of the Scydmænidæ, which is included below, makes known some 175 species as inhabiting the United States. If an independent collection were now formed, containing 175 species, it would probably include at least 75 not mentioned in this revision. The next independent set of 175 would include perhaps 10 per cent. less of unknown forms, or say 68, the next 61; then in succession 55, 50, 45, 41, 37, 33, 30, 27, 24, 22, 20, 18, 16, 14, 13, 12, 11, 10, 9, 8, 7, 6, 5 and 4, making a total of 721, which, added to the original 175, would indicate about 896 species. This, of course, is an almost purely fanciful supposition, and yet it is possibly not so very far wide of the truth, judging from isolated sets of species received from time to time. There should be but little hesitation in stating that there are within the American continent, north of Mexico, about 1,000 species of Scydmænidæ, 2,000 of Pselaphidæ, 10,000 of Staphylinidæ and 80,000 of the order Coleoptera. As a corollary to this

we might go further, and, in giving to the Palæarctic fauna a like number of 80,000 species, the tropics of both hemispheres 450,000 species, and to Australasia and temperate South America and Africa 90,000, state a total for the Coleoptera of the world of 700,000. Going still further, if we add to this 600,000 Hymenoptera, 600,000 Diptera and 900,000 of all other orders, we have as a grand total for the Insecta of 2,800,000, which almost baffles belief, and yet this estimate does not greatly differ from several others which have been suggested.

There will, of course, always be argument and dispute as to what proportion of these are really species, and what so-called races or varieties, but this is a question which need not especially interest us at present, in view of the perfectly arbitrary meaning usually attached to these terms. Species, as meant in this connection, are aggregates which differ morphologically from each other in several constant and evident structural characters, and we can proceed by no other criterion than this in our determinations, until life-histories and other purely biologic matters can be investigated.

To those who believe that there must necessarily be a large amount of structural difference between species in the Insecta, no better object lesson could be cited than that afforded by the genus Lachnosterna, where forms mutually so very similar as to be formerly lumped together in almost every cabinet, were shown some time since to have their complicated genitalia so arranged as to even prohibit sexual union. Another equally cogent example occurs in the genus Reichenbachia, where the species would be mutually undistinguishable, in many cases, were it not for modifications of the male antennæ, so radically divergent as to proclaim beyond peradventure their specific distinctness. In arranging my collection of Brazilian Barini, I have frequently been astonished at the approximation of species in external form and facies, there being several instances where forms are mutually almost inseparable from a dorsal point of view, yet wholly different in the sculpture of the under surface or in some other remarkable special manner.

These examples are cited in order to assist in counteracting, to some extent, if possible, a somewhat general movement in favor of a subdivision of biologic forms into species, races and varieties on wholly arbitrary assumptions. No doubt, future knowledge

will prove some of our present concepts to be correct, but when forms differ structurally, great caution should be exercised in drawing conclusions regarding the real nature or degree of relationship. The movement referred to is a natural and salutary reflex caused by the light shed by Darwin on the universality of variation and origin of species, but the variation alluded to by Darwin is very different from that which it is often assumed to be, and has reference solely to minute differences in definite directions due to gradual changes in environment, not to radical and constant divergence of form or special structure. In the opinion of the writer there is no real distinction between species and what are generally known as geographic races, when these differ morphologically to any evident extent; species are created in this way, and it merely becomes a question of time when divergence has reached such a stage as to call for a special designation. As for the term variety in its generally accepted meaning, it has no right to exist, and is simply a burden to nomenclature.

It is impossible to express the true status of every morphological entity; even the most isolated species are known to differ greatly among themselves in the amount or nature of their adherence to a fixed type, in their individuality, or in their dynamics, so to speak. At the present stage of knowledge it would therefore be the better course to recognize only species—that is, aggregates of individuals, which differ constantly from each other in well defined structure, even though intermediates known or suspected may not have yet been entirely exterminated in the common border lands—and synonyms, the latter including a large number of forms which at present come under the category of varieties, especially those founded upon color variations, which, in view of the rapidly increasing multiplicity of known species, should never be dignified by name. In other words, the time has not yet arrived for a trinomial nomenclature in the Insecta. The employment of three words to express subspecies or varieties of species, is not to be condemned so much from any inherent defect—since we must all admit that it has certain manifest advantages—as from the fact that it opens the door to names involving more than three words. If we go beyond the essential two words of the binomial system, there is absolutely no reason for stopping there, and it can readily be imagined into what confusion the expression of a race of a variety of a subspecies of a species by this

means would gradually lead us; but the whims of certain authors admit such refinement of classification in the genus Carabus, and perhaps others. When we know something of the true laws of relationship it will be time enough to devise some means of expressing them, perhaps by trinomials, quadrinomials or quinquenomials, or perhaps by some simpler exponential method, in which the longest names will not stand for the most unimportant forms.

NORFOLK, VA., July 21, 1896.

CICINDELIDÆ.

OMUS Esch.

The major part of the species of this genus adhere very closely to a common type of organization, and are more or less difficult to discriminate among themselves. They are uniformly nocturnal in habits and black in color, this being relieved in rare cases by a slight metallic reflection. The intromittent organ of the male conforms to the general asymmetric type of the Cicindelidæ, but is stouter and less acuminate than in Cicindela. Besides the sexual character relating to the anterior tarsi, which distinguishes this genus from Amblycheila, it should be stated that there are but two supraorbital setigerous punctures in the latter genus, while in Omus these punctures are three or four in number. The following table embraces all the species known to me:—

Elytra feebly punctato-rugose and dull, with large distant foveolæ; pronotum with the lateral margin somewhat explanate and more broadly reflexed, not attaining the base; body very stout, black, with feeble submetallic bronzy tinge ..... **dejeani** Rche.

Elytra deeply or more clearly punctate, the scattered foveolæ small and much less conspicuous; pronotum not explanate at the sides, the margin narrowly reflexed. 2

Elytra smooth and dull in lustre, impunctate throughout, the scattered foveolæ feeble 14

2—Body black, without metallic lustre 3

Body black with bronze lustre 13

3—Lateral margin of the prothorax distinctly reflexed, imperfectly attaining the base, the sides almost straight and strongly convergent from apex to base nearly as in *dejeani* 4

Lateral margin fine and but slightly reflexed 5

4—Labrum bisinuate at apex, the median lobe broadly rounded and moderately advanced.....**edwardsi** Cr.
Labrum more deeply bisinuate, the median lobe more prominent, with its apex transversely truncate; elytra narrower, more elongate and more parallel.....**montanus** n. sp.
5—The marginal bead attaining the base, though frequently more or less imperfectly so, either as a specific or individual peculiarity.....6
The marginal bead obliterated well before the base.....12
6—Sides of the prothorax very feebly convergent from apex to base and nearly straight; elytra short and strongly rounded at the sides; general form very stout (*hornianum* W. Horn, fide G. H. Horn) .....**horni** Lec.
Sides of the prothorax distinctly convergent from the apex.....7
7—The sides nearly straight or at most feebly arcuate behind the middle ...8
The sides strongly rounded behind the middle 11
8—Labrum bisinuate, the median lobe more prominent than the sides.....9
Labrum nearly truncate; pronotal sculpture moderately feeble.....10
9—Elytral punctures separated throughout the greater part of the surface.
Pronotum smoother, the vermiculate sculpture more obliterated.
Antennæ normal.
Base of the prothorax nearly ¾ as wide as the apex; body rather stout. **lugubris** n. sp.
Base slightly more than ½ as wide as the apex; body smaller and narrower.....**punctifrons** n. sp.
Antennæ decidedly stouter; form nearly as in *lecontei*, but with the elytra widest at or behind the middle.....**ambiguus** Schpp.
Pronotum and head more or less deeply vermiculato-rugose, the rugosity variable in coarseness.....**californicus** Esch.
Elytral punctures close-set and confluent nearly throughout. **confluens** n. sp.
10—Elytra widest before the middle, more pointed toward apex; body moderately slender.....**lecontei** Horn
11—Labrum nearly truncate, the median lobe very feeble and broadly rounded; sculpture of the head and pronotum deep and vermiculate as in *californicus*.....**sculptilis** n. sp.
Labrum deeply bisinuate, the median lobe more advanced; sculpture of the pronotum feebler and more obliterated.
Form stout. Southern Sierras.....**sequoiarum** Cr.
Form slender. Sea-coast regions of California.....**elongatus** n. sp.
12—Body rather slender, the pronotum feebly sculptured and with the converging sides nearly straight toward base.....**audouini** Rche.
13—Elytra broader posteriorly, the form nearly parallel; side margin of the pronotum not attaining the base.....**submetallicus** Horn
14—Elytra regularly oval in form; body rather stout; side margin of the pronotum attaining the base.....**lævis** Horn

In being strictly peculiar to the Pacific coast regions west of the crests of the Sierras, Omus is as characteristic in the Cicin-

delidæ as Brennus is among the Carabidæ, and the species of the two genera are about equally differentiated. The Pacific coast affords other instances of endemic genera which include numerous feebly differentiated species, such as Coniontis, and it is possible that all three of the types mentioned may be moderately ancient migrants from the Asiatic continent, which have become multi-differentiated at present, because of the numerous isolated local environments of those broken coast regions, but feebly so, as a rule, because of the geologically recent character of the lands west of the Sierras.

The new forms mentioned in the table are briefly described below.

O. montanus.—Somewhat narrow, elongate and subparallel, deep black and shining, *Head* feebly rugose, the median parts of the front nearly smooth; frontal impressions moderate; labrum deeply bisinuate, the six setigerous punctures large and deep, the median lobe advanced and truncate; antennæ ½ as long as the body, moderately stout toward base, the third and fourth joints feebly constricted near the middle. *Prothorax* between ¼ and ⅓ wider than long, rounded laterally at the apex, the sides rapidly convergent and very feebly arcuate thence to the base, the latter very indistinctly margined and ⅔ as wide as the apex; surface broadly and feebly convex, finely and feebly vermiculato-rugose, the side margins reflexed, more deeply at basal fifth or sixth; median line very fine. *Elytra* rather feebly convex, elongate, evenly oblong-oval, widest at the middle, scarcely more than ¼ wider than the prothorax and 2½ times as long; sides parallel and feebly arcuate; punctures moderately fine, rather sparse toward the middle but denser near the sides, feeble and scarcely closer toward apex; foveolæ indistinct. Length ♂ 15.5–17.5, ♀ 16.5–18.0 mm.; width ♂ 5.5–6.0, ♀ 6.0–6.7 mm.

California (Placer Co.).

Allied to *edwardsi*, but narrower and more elongate, with less convex male elytra, and with a distinctly different structure of the labrum as indicated in the table. The description is taken from the male, the female being a little more ventricose and with more convex elytra.

O. lugubris.—Moderately stout, deep black and somewhat dull throughout. *Head* much narrower than the prothorax, unevenly and not strongly rugose, the median parts of the front finely and sparsely punctate; labrum deeply sexpunctate, bisinuate, the advanced median lobe truncate; antennæ fully ½ as long as the body, relatively slender, gradually attenuated as usual, the third and fourth joints very feebly constricted at the middle. *Prothorax* relatively rather large, obtrapezoidal, the sides moderately convergent and almost straight from near the extreme apex to basal fifth, thence

rapidly rounded to the base, which is coarsely and rather distinctly beaded; side margins fine and acute; surface broadly and very feebly convex, finely and feebly vermiculato-rugose and dull; median line fine, more distinct near the base. *Elytra* rather ventricose, oval, fully ⅔ wider than the prothorax and about 2½ times as long; sides arcuate as in *californicus;* punctures deep, moderately coarse, isolated, closer and rather smaller near the sides and apex; foveolæ not well marked though visible. Length ♂ 17.5 mm.; width 6.7 mm.

California.

The two males before me are without more accurate indication of locality and represent a distinct species between *californicus* and *horni*. The elytra of the two specimens differ conspicuously in form, in one having the greatest width well before the middle and arcuately narrowing thence to the apex; in the other they are widest at the middle, but there is apparently no other distinguishing feature. The fine side margins of the prothorax do not perfectly attain the base, and the basal angles are extremely obtuse.

O. punctifrons.—Moderately ventricose and rather feebly convex, deep black, somewhat dull. *Head* moderate in size, rather feebly rugulose, the median parts of the front sparsely punctate; labrum bisinuate, the median lobe somewhat advanced and truncate; setigerous punctures moderate in size; antennæ scarcely ½ as long as the body, rather slender and but slightly attenuate toward apex, the basal joint notably thicker, third and fourth joints broadly constricted at the middle. *Prothorax* obtrapezoidal, ⅓ wider than long, widest at apical fourth, where the sides are rounded, the latter rather strongly convergent and very feebly but evenly arcuate thence to the basal margin, the fine lateral margin attaining the basal bead, the latter only evident toward the sides; surface broadly and feebly convex, flattened toward the middle, feebly vermiculato-rugose, the rugosities rather large; median line very fine. *Elytra* ½ longer than wide, ⅖ wider than the prothorax and 2½ times as long, widest at the middle; surface moderately convex, coarsely and deeply but not very closely punctate, the foveolæ not conspicuous. Length 14.5 mm.; width 5.5 mm.

California.

This species is allied somewhat to *californicus* but is smaller, broader, more ventricose and less convex, with much feebler rugulosity of the anterior parts of the body and a shorter and more transverse prothorax. It is represented by a single female from an unrecorded part of the State.

O. confluens.—Rather stout and feebly convex, distinctly dull, deep black. *Head* moderate in size, finely and feebly rugose; median parts of the front finely punctate, the impressions moderate; labrum bisinuate, deeply sexpunctate, the median lobe moderately advanced and truncate; antennæ

rather more than ½ as long as the body, not very stout, moderately attenuated, the basal joint thick and obconic and the third and fourth joints broadly constricted near the middle as usual. *Prothorax* ¼ wider than long, rounded laterally and widest at apical third, the sides thence rather strongly convergent and feebly but evenly arcuate to the basal angles, which are slightly obtuse but not very blunt ; lateral margin attaining the basal bead, the latter only visible toward the sides ; disk broadly and feebly convex, finely and feebly vermiculato-rugose, the median line fine. *Elytra* short, scarcely ½ longer than wide, ⅔ wider than the prothorax and 2⅔ times as long, widest at the middle, the sides evenly arcuate ; lateral margin distinctly reflexed, more broadly and conspicuously toward base; disk moderately convex, rather coarsely, closely and subconfluently punctate, the foveolæ small. Length 14.0 mm.; width 5.5 mm.

California.

The single female before me represents a species rather closely allied to the last but differing in its shorter, more densely punctured elytra and more elongate prothorax, the latter being more broadly rounded at the sides anteriorly. From *californicus* it differs in its shorter and broader form, in sculpture and in having the lateral margins of the elytra conspicuously reflexed toward base ; it is from an unrecorded part of the State.

O. sculptilis.—Moderately slender, strongly convex, shining and deep black. *Head* moderate in size, deeply and closely vermiculate, the front rugose throughout and not punctate; impressions moderate; labrum almost truncate, the median lobe very broadly and evenly arcuate, the lateral sinuations feebler than usual, the six setigerous punctures strong; antennæ moderate, fully ½ as long as the body, distinctly attenuate. *Prothorax* scarcely more than ⅕ wider than long, the sides moderately convergent from apex to base and broadly and rather evenly arcuate throughout, widest toward apex as usual; side margins attaining the basal bead, which is traceable entirely across the surface, as is also a line anterior to the base and another, broadly angulate, behind the apex; basal angles obtuse but not rounded; surface strongly convex, deeply and closely vermiculato-rugose throughout; median line fine but distinct between the transverse lines. *Elytra* evenly suboblong-oval, widest at the middle, fully ½ longer than wide, ⅖ wider than the prothorax and 2½ times as long, the sides feebly arcuate but more strongly near base and apex; margin finely reflexed; punctures strong and not confluent; foveolæ small. Length 16.0 mm.; width 5.6 mm.

California.

The only representative was taken by the author in the coast regions north of San Francisco; it is a male and represents a species allied to, and considerably resembling *californicus*, especially in sculpture, but differing in the rounded sides of the prothorax and feebly lobed labrum.

O. elongatus.—Elongate and but feebly ventricose, strongly convex, shining and deep black. *Head* slightly narrower than the prothorax, rather feebly rugose, the rugosities large; front not at all punctate toward the middle, the sublateral impressions rather strong and oblique; labrum strongly bisinuate, but with the median lobe only moderately advanced, very broadly arcuate and unevenly undulated, the punctures coarse and deep; antennæ moderate in thickness, attenuate toward tip, rather more than ½ as long as the body. *Prothorax* somewhat more than ¼ wider than long, the sides moderately strongly convergent from apex to base and broadly, almost evenly arcuate throughout, the lateral marginal line attaining the basal bead, the latter obliterated at the middle; ante-basal and post-apical transverse lines distinct; disk rather strongly convex, feebly vermiculato-rugose, the median line fine. *Elytra* evenly elongate-elliptical, widest at the middle, ⅔ wider than the prothorax and obviously more than 2½ times as long; sides evenly arcuate; reflexed margins fine, rather broader toward base; surface strongly convex, moderately coarsely and deeply and rather sparsely punctate, the foveolæ small but quite distinct. Length ♂ 16.5–17.5, ♀ 16.5 mm.; width ♂ 5.6–5.9, ♀ 6.2 mm.

California (near San Francisco). Mr. Dunn.

The description is drawn from the male, the female being more ventricose as usual, with the elytra much more shouldered at base and apparently more strongly punctured. This species differs from *lecontei* in having the elytra evenly elliptical and widest at the middle, and, from *ambiguus*, with which it is apparently most closely allied, it seems to differ in its less stout antennæ, less prominent basal angles of the prothorax and more rounded sides of the latter. *Ambiguus* is described in an entirely insufficient manner, the few diagnostic characters given being purely comparative.

DROMOCHORUS Guér.

This genus, which was considered a connecting bond between the Mantichorini and Cicindelini by Lacordaire, differs from Cicindela, not only quite radically in facies, but in the vestiture of the legs and antennæ, the legs and tarsi being clothed throughout with fine decumbent hairs and the second and third joints of the antennæ having numerous fine subdecumbent hairs in addition to the setæ, which pubescence is altogether lacking in Cicindela. In general the structural characters are similar to those of Cicindela, but the tibial spurs are much shorter and the body is wingless with rounded humeri. In all the species known to me the labrum is black with a rounded pale spot at the middle; they may be identified as follows from the males :—

Elytra with green foveolæ in a series near the suture and also irregularly disposed (*maga* Lec.).....**pilatei** Guér.
Elytra without green foveolæ.
Elytra dull but smooth, finely but very distinctly punctured, with a series of fine non-metallic foveolæ on each parallel to the suture.
sericeus n. sp.
Elytra densely dull, very indistinctly punctured.
Elytra evenly cylindric-oval, widest at the middle ; body deep black.
belfragei Sallé
Elytra much wider behind the middle ; body black, with strong and rich violaceous reflection.....**pruininus** n. sp.

Dromochorus is peculiar to Kansas, Louisiana and Texas, presumably extending well into Mexico. *Cicindela celeripes* and *cursitans* of LeConte probably constitute a distinct genus, and are not considered at the present time.

D. sericeus.—Subcylindric, strongly convex, deep black throughout, with a steel-blue metallic reflection only on the head behind and especially beneath the eyes. *Head* wider than the prothorax, the eyes prominent; surface with fine and feeble longitudinal rugæ, glabrous ; three labral teeth strong and acute ; antennæ slender, more than ½ as long as the body, the joints 5–11 extremely minutely and densely pubescent. *Prothorax* just visibly wider than long, somewhat narrower at base than at apex, slightly constricted behind the latter ; sides very feebly arcuate ; median and transversely angular lines fine and feeble ; surface sparsely clothed with decumbent hairs on the flanks. Scutellum triangular, wider than long. *Elytra* nearly twice as long as wide, about 3 times as long as the protherax and ¾ wider, widest near apical third ; surface glabrous, granulato-reticulate. Length 11.5–13.0 mm., width 3.7–4.4 mm.

Texas.

The two males before me are distinctly larger than the single female, and, in the latter, the elytra are relatively shorter.

D. pruininus.—Moderately ventricose, deep black and dull velvety in lustre, with strong violaceous reflection throughout. *Head* much wider than the prothorax, the eyes prominent ; rugæ of the vertex very feeble and only visible toward the eyes ; labral teeth moderate ; antennæ slender, but little more than ½ as long as the body. *Prothorax* feebly constricted near the base and apex, the former very much the narrower ; surface dull and sculptureless, with feeble impressed lines and lateral vestiture as in *sericeus*. *Elytra* distinctly less than twice as long as wide, wider posteriorly, the punctures fine, feeble and not well defined, the punctiform foveolæ obsolete. Length 12.0–14.0 mm.; width 4.0–4.4 mm.

Kansas.

Similar to *belfragei* but larger and stouter, with the elytra

broader posteriorly and with a strong violet reflection. The description is taken from the male; the single female in my cabinet is larger and stouter with the elytra broader and less dilated behind, but not relatively shorter than in the male. Three specimens.

CICINDELA Linn.

While it must be admitted that the numerous species of Cicindela present problems of great interest and difficulty to the taxonomist, it must be stated in the interests of fact, that the treatment applied thus far to our representatives of the genus has been of a very unsatisfactory kind. The paper of Mr. Schaupp (Bull. Bk. Ent. Soc.), which is that upon which our present synonymy rests, is superficial and betrays besides a certain lack of scientific acumen at times, so that a more complete revision is almost a matter of necessity. The fact that a considerable number of described forms are undoubted synonyms is not sufficient reason for the indiscriminate and unweighted lumping there applied.

Ground color is generally unimportant, but at times becomes of value. Markings are variable as a rule, but are in many cases surprisingly constant, and much careful study should consequently be exercised in determining the relationships of allied forms, since more or less special criteria must be applied in different parts of the series. Sculpture is important as a rule, but has been unaccountably disregarded by Mr. Schaupp, as, for example, in the cases of *abdominalis* and *scabrosa*, which are distinct species and not varietal forms of one. General form of the body, though usually a useful specific character in this genus, has been frequently neglected, as, for instance, in combining *obsoleta* and *vulturina*, and form and sculpture have both been overlooked in combining *sexgutata* and *patruela*, which are abundantly distinct species.

In *scutellaris* both ground color and degree of marking are very variable, and it is virtually certain that the varieties of this species now recognized are truly color variations, which ought not to have received distinctive names, especially since similar variations in ground color may appear in a large number of species. Very different, however, is the case of *purpurea* and its allies, where most of the forms united as varieties should be regarded rather as closely related species; two of them indeed—*decemno-*

tata and *splendida*—are undoubtedly entirely valid as species. *Cimarrona* is more elongate in bodily form than *purpurea*, and is probably a distinct species, very variable within itself in ground color and degree of marking. *Limbalis* Klug, from which *limbalis* Lec. does not differ perceptibly, is a very distinct and constant subspecies, in which the median band reaches the margin without the least tendency to spread longitudinally in any example known to me. *Graminea* Schpp., is also a good subspecies, generally above the average in point of size. The following are two additional subspecies of the *purpurea* type which do not seem to have been alluded to hitherto :—

C. lauta.—Similar in form to *purpurea*, but still shorter and a little more depressed, green, the head and prothorax with a slight coppery reflection, the legs polished, metallic and paler green, the elytra dull, of a deep and very rich sericeous green with a vivid blue lateral border. Markings as in the typical *purpurea*, a transverse and moderately reflexed median dash, not attaining the sides, and a small sutural remnant of the apical lunule. Prothorax very short and transverse, about twice as wide as long. Front sparsely punctate and having erect blackish setæ ; labial palpi black. Length 11.0–14.0 mm. ; width 4.4–5.8 mm.

California (Siskiyou Co.).

This very beautiful form may be recognized at once by its coloration, which appears to be quite constant, and also by its very short and transverse prothorax. The anterior tarsi of the male have the first three joints increasing in width, the third quite strongly dilated and much less than twice as long as wide ; in this structural character it differs noticeably from *purpurea*.

C. plutonica.—Form nearly as in *purpurea*, but more elongate and rather more convex ; body, legs and palpi intense black throughout ; labrum pale, with a fine dark apical margin ; mandibles with the usual white external dash. Head deeply concave between the eyes, the frontal convexity punctured and more densely pubescent. Prothorax nearly as wide as the head, fully ⅔ wider than long, nearly as in *purpurea* throughout. Elytra oblong, about ½ longer than wide, the intrahumeral impression at base very deep ; punctures rather coarse but shallow, becoming sparse at base, with the subsutural series of punctiform foveæ distinct. Length 13.5 mm. ; width 5.2 mm.

California (Placer Co.).

The anterior tarsi of the male have the first three joints quite strongly dilated and somewhat increasingly so from the base, the third joint distinctly less than twice as long as wide. The elytra are smooth along the lateral margins, but the only white maculation is a small subsutural remnant of the apical lunule ; the punc-

tures are, however, subeffaced in a transverse and feebly reflexed line at the usual position of the pale median band of *purpurea*.

The following species may be placed near *purpurea* for the present:

C. denverensis n. sp.—Smaller, narrower and more elongate than *purpurea;* body pale and vivid emerald green throughout, without trace of coppery reflection and with barely a trace of bluish tinge along the elytral margins. *Head* with erect white vestiture, especially dense as usual on the frontal declivity; labial palpi with the second joint pale; labrum tridentate. *Prothorax* less than ½ wider than long, distinctly narrower than the head; impressed lines deep; surface minutely and densely vermiculato-rugose; pubescence long and erect at the sides. *Elytra* oblong, ½ longer than wide, the sculpture and markings as in *purpurea*, except that the middle transverse dash is reduced to a small transverse spot near the lateral margin; apical lunule incomplete. Length 11.0 mm.; width 4.6 mm.

Colorado (Denver).

Abundantly distinct from the other forms which are more or less closely related to *purpurea*, by its elongate outline, pale second joint of the labial palpi and other characters. From *pusilla* it differs in its entirely dark tibiæ and complete absence of any form of humeral marking. The first three joints of the anterior male tarsi are narrowly and subequally dilated, the third joint more than twice as long as wide.

C. depressula n. sp.—Moderately stout, somewhat depressed, feebly shining, bright green, the head and prothorax in part with a feeble coppery reflection; humeral lunule generally wanting, sometimes represented by a small spot near the basal fourth, not extending to the margin; post-median transverse spot slender, feebly dilated at its extremities, strongly reflexed and attaining posterior third near the suture, not attaining the margin; apical lunule represented by two small detached spots. *Head* moderate in size, minutely strigato-rugose, the front not at all pubescent; labrum short and transverse, nearly 3 times as wide as long, imperfectly tridentate, the lateral teeth in the form of feeble arcuations, and sometimes virtually obsolete; antennæ slender, moderate in length; labial palpi pale, the apical joint black. *Prothorax* fully as wide as the head, ⅗ wider than long, minutely and densely rugose, the impressions deep and of a dark violet blue; pubescence sparse and only partially erect at the sides. *Elytra* oblong, gradually slightly wider behind, scarcely ½ longer than wide, the intrahumeral impression distinct; punctures coarse, deep, moderately close, nearly uniformly distributed, slightly asperate and tinged with a cobalt reflection. *Legs* metallic green, the trochanters black. Length 12.0–14.0 mm.; width 4.7–5.4 mm.

California (Placer Co.).

May be placed near *senilis*, differing in coloration, in its stronger

sculpture, smaller and more transverse prothorax, and in the form and position of the elytral markings, the transverse reflexed line being finer, less reflexed and more posterior in position.

C. echo n. sp.—Rather narrow and convex, dark coppery brown, the punctures of the elytra blue or greenish-blue; under surface and legs metallic bluish-green. *Head* moderate in size, deeply and finely strigato-rugose and bald; labrum imperfectly tridentate, the lateral teeth very short and rounded; labial palpi pale, the third joint black; antennæ slender. *Prothorax* not quite as wide as the head, $\frac{2}{5}$ to $\frac{1}{2}$ wider than long, almost cylindric and only slightly narrowed at base, the white pubescence abundant but subdecumbent on the flanks; impressions deep; surface minutely but deeply rugose. *Elytra* distinctly wider toward apex, $\frac{1}{2}$ longer than wide, coarsely, rather closely and almost uniformly punctured; intrahumeral impression narrow, rather deep and with coarser punctures; white maculations broad, consisting of a complete humeral lunule, which intrudes but little upon the disk behind, a transverse and strongly reflexed line, attaining the margin at the middle and almost attaining the suture behind apical third, and a complete apical lunule. Length 10.8–12.0 mm.; width 3.9–4.7 mm.

Utah (Great Salt Lake).

This species also belongs to the *senilis* group, and differs from that species in its narrower form, more cylindrical prothorax, more metallic coloring, form of the elytral markings and in the much less dilated basal joints of the anterior male tarsi. The male is much less stout than the female.

C. inquisitor n. sp.—Rather stout, moderately convex, feebly shining, coppery-brown in color; elytral markings as in *sperata*, except the median reflexed band which is more even, less angularly reflexed and situated at a greater distance from the end of the humeral lunule, the latter relatively much shorter and less oblique; under surface metallic greenish, the legs coppery green. *Head* broad with the eyes very prominent, feebly strigato-rugose, finely and sparsely punctured anteriorly, the pubescence white, sparse, decumbent and consisting of very short and stout hairs; labrum, mandibles, palpi and antennæ nearly as in *sperata*. *Prothorax* nearly $\frac{1}{3}$ wider than long, parallel, constricted at apex and more feebly near the base, the sides between the constriction and the base notably protuberant; impressions rather feeble; surface dull but almost smooth, minutely and feebly creased. *Elytra* oblong, $\frac{1}{2}$ longer than wide; sides parallel and almost evenly arcuate; apex oblique, the subapical angles prominent but obtusely rounded; surface evenly convex, the intrahumeral impression feeble, with the feveolæ small; punctures moderately coarse, finer toward the suture, nearly as in *sperata* and having a similar blue color. Under surface densely pubescent toward the sides, the legs very slender. Length 14.0 mm.; width 5.2 mm.

Texas (Austin).

The present species is allied closely to *sperata* but is stouter,

with a broader head, still more prominent eyes and more protuberant sides of the prothorax at the basal angles. The female has the external angulation near the apex of the elytra rounded, while in *sperata* this angle is acute, even inclining slightly backward at the extreme apex.

Of *dorsalis*, of which *saulcyi* is evidently more than a variety, I have before me a strongly marked subspecies from an unrecorded locality. This has the elytra in the male more elongate, with the punctures much coarser and denser and the dark markings fine and incomplete, the posterior arcuate dash not bent inward to the suture but fine, even, very feebly arcuate and ending at the middle of the width behind apical third; the middle longitudinal dash is much less broadly hooked anteriorly, and, anterior to this, there is only a small point of dark color in the intrahumeral impression. In size it is larger than the average *dorsalis*, being 14.0 × 5.3 mm. in measurement. It may be named **semipicta.**

Of *repanda*, also, I have before me representatives of a subspecies from El Paso, Texas, which may be called **unijuncta.** It is smaller and narrower than *repanda*, as compared male to male, with a relatively larger prothorax and smaller elytra, the white maculation of the latter nearly similar but broader, the median band broadly expanded at the margin, uniting with the humeral, but not with the apical, lunule; the punctuation of the elytra is coarser and stronger. The dimensions of the male are 10.0 × 3.8 mm. The species allied to *repanda* are very carelessly discriminated at present in our published lists; *hirticollis*, for example, is a quite distinct species, and has for a well marked geographic race *ponderosa; 12-guttata* is also distinct as a species from either *repanda* or *hirticollis.*

Willistoni is certainly distinct from *fulgida* and is not a variety as marked in the Henshaw list; it more nearly resembles *latesignata. Imperfecta* is a perfectly isolated species and not a variety of *cinctipennis.* Several other corrections should be made in the synonymy of Cicindela, which lack of time prohibits for the present.

CARABIDÆ.

OMOPHRON Latr.

The genus Omophron, although remarkably isolated among its nearest relatives of the Carabidæ, is composed of species

which are rather numerous, and, at the same time, comparatively feebly differentiated among themselves; this fact becomes still more notable when we consider the wide geographic range of the genus. To account for these conditions we must of course assume a very extensive extinction of intermediate types, requiring considerable geologic time. In a genus whose species enjoy wide range of environment, this lapse of time would, in nearly all cases, bring about marked structural divergence among its components, and the peculiar uniformity characterizing Omophron, can be accounted for only by the universal habit of burrowing in clean sand at the margin of water, which causes the environmental conditions to be practically identical throughout the territorial range. Heterocerus is another somewhat similar instance, the environment being more varied however in this case by ample and ready powers of flight.

Our species have been totally neglected since the revision of them by Dr. Horn twenty-six years ago (Tr. Am. Ent. Soc., 1870, p. 71), and, as several new forms have been since discovered, the suggestion of a new tabular arrangement would appear to be desirable; this is presented below:—

Form broadly and evenly elliptical, the sides of the elytra and prothorax forming a continuous arc; elytral striæ 15 in number.....2

Form less evenly elliptical, the sides of the elytra discontinuous in curvature with those of the prothorax.....3

2—Striæ punctured only toward base, the sublateral obsolescent and impunctate throughout; dark areas much predominating, blackish-brown in color and non-metallic.....**labiatum** Fabr.

Striæ punctured behind the middle, faint, the punctures strong throughout the width, widely separated; dark areas predominating, black, highly polished, with dark metallic-green reflection; body more convex.
nitidum Lec.

3—Elytral striæ 15 in number.....4

Elytral striæ 14 in number.....11

4—Dark areas of the elytra black and non-metallic, or with the feeblest recognizable greenish reflection; dark areas generally predominant.....5

Dark areas of the elytra, black with a strong metallic-green reflection; pale areas frequently predominant.....8

5—Body broadly oval, the elytra more obtuse at apex.....6

Body narrower and more elongate.....7

6—Elytra very deeply striato-sulcate toward base, the punctures coarse, deep and close-set throughout the width; intervals very convex.
americanum Dej.

Elytra much less deeply striate, the intervals feebly convex; punctures smaller and more widely separated particularly in the sublateral series.

Elytral punctures fine, not extending much behind the middle on the median line of each.....**lacustre** n. sp.

Elytral punctures stronger, extending well behind the middle on the median line.....**texanum** n. sp.

7—Elytra finely striate, the striæ rather finely and closely punctate with flat intervals.....**ovale** Horn

Elytra narrowly rounded at apex, more dilated at the sides near the base, strongly striate, the striæ closely and strongly punctured ; intervals convex ; size small.....**concinnum** n. sp.

8—Body broadly and almost evenly oval in form..... 9

Body narrower, oblong-oval, the sides parallel and much less arcuate.....10

9—Elytral punctures extending almost to the apex ; metallic-green spot of the pronotum occupying median half only.....**tesselatum** Say

Elytral punctures obliterated well before the apex ; pronotal metallic spot extending almost to the lateral margins.....**dentatum** Lec.

10—Large species, the green metallic areas darker and duller, distinctly predominating over the pale areas, that of the pronotum attaining the apex only in a narrow point on the median line.....**solidum** n. sp.

Small species, the dark areas less predominant, very bright and polished metallic-green throughout, that of the pronotum broadly attaining the apex at the middle.....**gemma** n. sp.

11—Striæ deep, rather coarsely and deeply punctured, dark areas predominant.

Strial punctures approximate, distinct almost to the apex, the striæ sulciform toward base. Sonora.....**sonoræ** n. sp.

Strial punctures widely separated, obliterated well before the apex, the striæ impressed but not sulciform. Arizona.....**obliteratum** Horn

Striæ deep, finely and closely punctured ; general color of the upper surface pale, the dark markings small. Arizona.....**gilæ** Lec.

Striæ fine and rather feeble with moderately large and somewhat widely separated punctures extending to the apex ; markings nearly as in *gilæ*. Utah.....**pallidum** n. sp.

Striæ faint, the punctures large and widely separated ; elytra relatively shorter ; markings nearly as in *gilæ* and *pallidum*. Nova Scotia..**robustum** Horn

The new species announced above are described as follows :

O. lacustre.—Form and coloration as in *americanum*, except that the surface is less convex and the subapical pale marginal spot extends forward very obliquely nearly to apical third, the elytra rather more pointed behind and the sides of the prothorax more divergent from apex to base. *Head* with the pale area evenly angulate ; surface impunctate except in the metallic-green basal area, which is rather strongly but not densely punctured. *Prothorax* much more than twice as wide as long, the sides rather strongly convergent and evenly, feebly arcuate from base to apex ; surface somewhat strongly but sparsely and unevenly punctate, the punctures fine and very sparse in a trans-

verse median area ; color piceous-black, without trace of metallic lustre, the sides paler, a little more broadly so and nubilate at base and apex ; median line fine but distinct. *Elytra* not quite as long as wide; striæ rather fine and feebly impressed, rather finely and not closely punctured ; intervals almost flat, the striæ and punctures coarser and deeper near the sides ; dark areas without trace of metallic lustre. Under surface blackish-brown, the abdomen paler ; legs, hypomera and epipleuræ pale. Length 6.5 mm. ; width 4.0 mm.

Lake Superior (Bayfield).

Readily separable from *americanum* by the nearly flat elytral intervals and finer and more widely separated punctures, as well as by the maculation of the posterior parts of the elytra and the outline of the prothorax. The description applies to the female.

O. texanum.—Broadly oval, strongly convex, rather shining, the maculation nearly as in *americanum*, except that the posterior pale spot of the elytra unites with the next anterior sinuous band ; dark areas with a faint metallic-green tinge, more pronounced on the head. *Head* sparsely but rather strongly punctured in the green basal area, the pale frontal spot evenly angulate and impunctate. *Prothorax* short and strongly transverse, almost 2½ times as wide as long, the sides strongly convergent from base to apex and evenly arcuate throughout ; coloration as in *americanum;* punctures sparse, irregular, rather strong but fine, remote and feeble in a transverse median line, wanting near the reflexed lateral margin as usual ; median line feebly impressed. *Elytra* short, distinctly shorter than wide, finely striate, the striæ moderately but rather broadly impressed, the punctures moderate in size and quite widely spaced ; intervals feebly convex, shining and only just visibly alutaceous. Under surface blackish-brown, the abdomen paler ; side margins and legs pale brown. Length 6.0 mm. ; width 4.1 mm.

Texas (Austin).

The single female before me represents one of the allies of *americanum*, but may be distinguished by its shorter and more broadly oval form, shorter prothorax with more strongly converging sides, by the finer and more widely separated punctures, feebler striæ and flatter intervals, and by some differences in the maculation near the elytral apices. It was taken on the sandy banks of the Colorado River in June.

O. concinnum.—Narrowly oval, the elytra quite inflated near the base, the sides thence rather strongly convergent and evenly arcuate to the apex, which is somewhat narrowly rounded ; dark areas predominant, with a green metallic lustre anteriorly, but almost completely non-metallic on the elytra. *Head* with a small and acutely angulate pale frontal area, the green basal area very finely, feebly and sparsely punctured. *Prothorax* but slightly more than twice as wide as long, the sides feebly arcuate, moderately convergent anteriorly, but becoming parallel in about basal half; disk finely and rather closely

punctate near the base and apex, but elsewhere almost impunctate, the dark median band not quite attaining the sides and extending broadly to base and apex, with its confines rather nubilate ; median impressed line rather strong. *Elytra* not quite as long as wide, behind the base much wider than the prothorax, the subbasal and post-median irregular pale bands united longitudinally near the middle of each, isolating a rather large ante-median black area near the margin; dark sutural area feebly dilated and rhombiform near the apex ; striæ not very coarse, but broadly and deeply impressed, perfectly even and regular, the punctures rather large, deep and very close-set, extending almost to the apex ; intervals moderately convex. Under surface piceous-brown throughout, the sides slightly more flavate ; legs pale brown. Length 4.8 mm. ; width 3.0 mm.

California (Siskiyou Co.).

The description is taken from the male type, which is the only example known to me. The species somewhat resembles *gemma*, but differs in outline, in its sombre coloring, finer pronotal, but much coarser and more regular elytral punctures, more narrowly rounded elytral apex, and in numerous other characters.

O. solidum.—Oblong-oval, only very moderately convex, the lustre generally rather strongly alutaceous ; dark markings with a strong but somewhat dark metallic-green reflection. *Head* with a large frontal pale impunctate area which is broadly angulate posteriorly, the green basal area with numerous moderate punctures. *Prothorax* slightly more than twice as wide as long, the sides quite strongly arcuate, convergent anteriorly, becoming parallel behind the middle ; punctures moderate in size, deep, rather close-set, extending to the basal angles but almost obsolete in the green transverse band, the latter not quite attaining the side margins and only narrowly attaining the apex on the median line, broadly attaining the base, with two approximate pale spots at the middle, the dark areas everywhere sharply defined ; median line fine. *Elytra* as long as wide, the sides subparallel and but feebly arcuate, very broadly rounded in apical third ; striæ rather fine but strongly impressed, somewhat irregular, and, to some extent, unevenly spaced, the punctures fine but rather strong and close-set, obliterated near the apex ; sinuous pale bands narrow and very irregularly zig-zag, the post-median much broken up ; subapical pale spot finely bifurcate anteriorly ; sutural rhombus near the apex broad. Under surface blackish throughout, the abdomen not paler, except a fine marginal line ; hypomera, epipleuræ and legs pale flavate-brown. Length 6.2–7.0 mm. ; width 3.6–4.5 mm.

California (Marin to Humboldt Cos.).

This species is common in the coast regions of California, north of San Francisco, and exists in most cabinets, but commonly confused with *dentatum*, which it resembles in coloration. The pale spots of the elytra are always narrower and more disintegrated, however, than in that species, and the form of the body is more oblong and parallel ; the pale frontal area of the head is limited pos-

teriorly by a nearly transverse line in *dentatum*, and the striæ are more distantly punctured. *Dentatum* is more southern in its range, San Francisco being about its northern limit.

O. gemma.—Rather convex and narrowly oblong-oval, very highly polished ; dark maculation black with bright green metallic reflection, becoming bluish or violet on the head, exceeding the pale areas in extent. *Head* with the pale frontal area limited behind by a line which has a deep rounded median sinus, the metallic basal area rather strongly punctate, densely so toward the sides. *Prothorax* slightly more than twice as wide as long, the sides strongly arcuate, convergent anteriorly but becoming parallel behind the middle ; punctures distinct over the entire surface to the extreme lateral edges, but less obvious in a small transverse area at the middle of the disk ; lateral acute edges very fine ; dark metallic area extending almost to the sides, broadly attaining the apex at the middle and still more broadly the base; median line fine but strong. *Elytra* almost evenly oval, as long as wide, slightly wider than the prothorax, the striæ fine and only moderately and narrowly impressed, the intervals but feebly convex ; striæ somewhat uneven, the tenth and twelfth convergent basally, the eleventh not attaining the base ; punctures fine and approximate, not attaining the apex. Under surface pale red-brown throughout, the sides and legs pale luteo-flavate. Length 4.75–5.0 mm. width 2.8–3.0 mm.

California (Humboldt Co.).

The irregularity described above in the elytral striation, which also characterizes *solidum* and *dentatum* to some extent, together with the small size, oblong form, highly polished integuments and bright green metallic reflection, will render the identification of this species at all times easy. I obtained a considerable series on the sandy banks of the Eel river, near its entrance into Humboldt Bay. It varies surprisingly little in size, while *solidum* varies much in this respect.

O. sonoræ.—Broadly oval and strongly convex, polished; dark areas predominating and black with a feeble greenish-metallic lustre; pale areas disposed nearly as in *obliteratum*, the head with a triangular frontal pale area; pronotum black, with a narrow pale lateral margin, broadly extending inward anteriorly and narrowly and more briefly posteriorly, the median apical extension of the black area rather narrow and becoming piceous in color; pale areas of the elytra sharply defined, disposed nearly as in *obliteratum*. *Head* coarsely but rather sparsely punctured in the basal metallic area; impunctate anteriorly, the labrum more flavate. *Prothorax* slightly more than twice as wide as long, the sides but feebly convergent from base to apex and feebly arcuate; median line distinct; punctures coarse but rather sparse, extending over the entire surface to the basal angles but wanting in an impressed marginal area in apical half or more, and finer near the centre of the disk. *Elytra* not as long as wide, much wider than the prothorax, the humeral curvature to the basal line being

pronounced; striæ coarse and deep, becoming sulciform toward base, the punctures coarse and rather close-set as a rule but somewhat variable in spacing. Under surface blackish, the abdomen dark piceo-rufous throughout; sides and legs pale brownish-flavate. Length 6.5 mm.; width 4.0–4.2 mm.

Mexico (Sonora, probably near Hermosillo). Mr. Dunn.

Differs from *obliteratum* in its much stronger striation, coarser and less widely spaced punctures, less nubilate pale markings of the elytra and rather shorter and stouter form. It does not appear to have been represented in the material elaborated by Mr. Bates for the "Biologia Centrali-Americana." Five specimens, very uniform in size.

O. pallidum.—Broadly oval, moderately convex, very dull and alutaceous in lustre, the upper surface pale brownish-flavate in color, the head piceous at base, slightly metallic laterally, the pale frontal spot extending posteriorly near the eyes to their posterior limit, the intermediate dark area bifurcate; pronotum with a transverse submetallic spot occupying median half, with a large pale brown spot in continuation laterally nearly to the side margins; elytra pale, with the suture and a transverse median basal spot blackish and feebly metallic, the other dark areas brown and non-metallic, consisting of a short basal line on the eighth and ninth and another on the eleventh interval, a small triangular subsutural spot at basal third, another still smaller double spot at outer third and basal $\frac{2}{5}$, and a very uneven zig-zag band at apical third more expanded near, but not attaining, the sutural dark line. *Head* rather strongly but very remotely punctate in the basal dark area. *Prothorax* sparsely punctured throughout, the punctures becoming quite coarse near the margins, much more than twice as wide as long, the sides rather strongly convergent from base to apex and only just visibly arcuate; median line moderately distinct. *Elytra* not quite as long as wide, distinctly wider than the prothorax, moderately rounded externally at base, finely and feebly striate, finely and remotely punctate, the punctures much coarser, stronger and more close-set and the striæ coarser and deeper toward the sides. Under surface dark piceous-brown, the abdomen paler; sides flavate; legs pale brown. Length 5.3–6.4 mm.; width 3.7–4.1 mm.

Utah (southwestern). Mr. C. J. Weidt.

This species is evidently allied to *gilæ* and *robustum*, differing in the characters previously stated. Two specimens.

The eleventh interval is rather more conspicuous than the others in width and paleness of color; it partially separates the small double spot before the middle, alluded to in the description.

BRENNUS Motsch.

In this genus or subgenus of the Cychrini, the anterior tarsi of the male are slightly broader than in the female, with the first

two or three joints densely clothed beneath in part with short and rather coarse papilliform pubescence. The dilatation is always feeble, and, in *cordatus*, becomes barely appreciable, but the pubescent pads beneath are still evident though narrow.

The species are abundant but sometimes very closely allied among themselves, and the systematic treatment of them offers many obstacles to the reviewer. This has been essayed thus far only by Dr. Horn (Trans. Am. Ent. Soc., VII), but the author in that article assuredly exercised an undue amount of caution in discriminating species, placing together such forms as *elevatus* and *unicolor*, *angusticollis* and *velutinus*, and distributing a considerable number of what seem to be valid species as varieties and races of a few more salient types in Brennus. Besides this, quite a number of hitherto unknown forms have come to light in recent years, so that another revision of Brennus and Pemphus has become desirable. This is my only excuse for the present attempt, which will undoubtedly be severely criticised in certain quarters, because of the numerous species proposed. I would gladly have the number less, for several reasons which it is not necessary to dwell upon, but I cannot smooth or otherwise modify the complexity of nature, and can merely portray it imperfectly; to lump the various forms together in composite descriptions would not be simplification, but rather mystification for future reviewers. That a considerable number of species are none the less valid in this genus, which may be compared in this respect with Coniontis, for being mutually distinguishable only by a number of points not involving special disparity of structure, but constituting marked divergence in habitus, is evidently proved in many cases by ample series of examples.

Brennus is confined in geographic range to the true Pacific coast faunal province, but is exceedingly abundant and wide-ranging within those limits, constituting one of the most characteristic carabid elements of the region.

The forms which I have deemed worthy of distinctive names are briefly diagnosed in the following table. In this table the groups based upon the number of elytral striæ are, in all probability, natural aggregates, but in many species it is difficult or impossible to count the striæ correctly, and experience will be necessary before deciding upon the proper group in some cases. The species with 16 striæ have the side margin of the elytra

bluish or violaceous in lustre, which character is never, as far as known to me, observable in the species having 18 striæ.

Basal joint of the antennæ large and stout; vertex unevenly carinate and rugose.. 2

Basal joint more slender and moderate in length, though longer than the next two together in *cordatus;* vertex smooth, becoming feebly and transversely wrinkled or rugulose in some species 5

2—Transverse nuchal constriction very deep and pronounced across the dorsal surface.....3

Transverse constriction obsolete, the carina of the vertex becoming feeble and irregularly rugose.....4

3—Cephalic carina not dilated, the tubercle behind the interantennal depression single; elytra with finer striæ. .....1 **cristatus**

Cephalic carina with a double tubercle.

Basal joint of the antennæ very large and conspicuous; elytral sculpture moderately coarse. .....2 **basalis**

Basal joint less enlarged, nearly as in *cristatus;* elytral sculpture strong, the striæ deeply impressed and apparently more approximate.

3 **duplicatus**

4—Prothorax moderately narrowed behind, the sides sinuate; basal angles rectangular.....4 **rugiceps**

Prothorax very strongly, obliquely narrowed behind and feebly sinuate near the base, the basal angles more than right.....5 **incipiens**

5—Anterior tarsi of the male with the two basal joints spongy-pubescent or papillose beneath, the third and fourth simply spinulose; elytra 18-striate, but with the sculpture usually much confused toward the sides, the margins never violaceous 6

Anterior tarsi of the male with the first three joints densely pubescent or papillose beneath, the fourth also having occasionally a few papillæ [fide Horn], but generally having merely a brush of long subspiniform setæ..9

6—Elytra shining, the punctures moderate in size and not much wider than the striæ, the latter generally fine..... 7

Elytra dull or opaque, the punctures much coarser than the striæ.....8

7—Larger, 17–22 mm. in length, the elytra oval and much elongated; prothorax relatively large, much dilated anteriorly and unusually broad at base .....6 **striatopunctatus**

Similar to the preceding in size, the elytra less elongate and more broadly oblong-oval, fuller at the humeri; prothorax much narrower, as long as wide .....7 **ovalis**

Smaller, 16–18 mm. in length, the prothorax relatively much smaller and shorter, much wider than long, the elytra less elongate-oval.

8 **decipiens**

8—Prothorax longer than wide, feebly sinuate behind, the basal angles subrectangular; elytral striæ very fine, with deep and coarse punctures.

9 **punctatus**

Prothorax as wide as long.

The sides strongly sinuate behind, becoming parallel for a considerable distance before the base, the angles right; elytra very convex, the striæ distinct, abruptly much confused in about lateral third, the punctures coarse. 10 **gravidus**

The sides oblique behind and feebly sinuate ; elytra with series of moderate punctures, but not distinctly striate .....11 **subtilis**

9—Elytra 18–striate, the striæ sometimes much confused near the sides ; concave elytral margin never violaceous.....10

Elytra 16–striate ; intervals frequently interrupted ; reflexed margin nearly always distinctly violaceo-metallic in lustre.....13

Elytra 14–striate ; reflexed margin of the elytra with metallic reflection, except in *cordatus*.....14

10—Elytral striæ feeble, rather feebly and indistinctly punctate, the second, third, sixth and seventh irregular ; elytra quite depressed, evenly elliptical and subopaque.....12 **symmetricus**

Elytral striæ even except near the sides, the intervals even and not interrupted, at least internally.....11

Elytral striæ more uneven, the intervals more or less interrupted throughout the width, much broken up in a broad lateral area ; elytral margins more narrowly reflexed, the general sculpture very deep and rugose.....12

11—Prothorax narrow, longer than wide, the reflexed side margin very narrow ; elytra deeply and evenly striato-punctate.....13 **striatus**

Prothorax wider than long except in *mimus* and *catenulatus*.

Sides of the prothorax deeply sinuate posteriorly and parallel before the base, the angles right.

Elytra oblong-oval, strongly convex, the sculpture greatly confused in a broad area toward the sides ; large species.

Striæ unevenly spaced, the wider intervals each with an uneven supplementary series of punctures ; margins of the prothorax more strongly reflexed.....14 **fuchsianus**

Striæ evenly spaced ; intervals more convex, generally, or in the female at least, with feebly marked supplementary series of punctures which are more obvious on the alternate intervals (*alternatus* Mots?).....15 **ventricosus**

Elytra elongate-oval, narrower and much less full at the humeri, the striæ even, deep and distinctly punctured almost to the side margins, the intervals even, rather convex and smooth throughout ; surface with a faint blue-black lustre.....16 **gentilis**

Sides of the prothorax constricted before the base, thence diverging to the basal margin ; elytra nearly as in *gentilis*, the prothorax larger, wider than long, with the side margins much more broadly reflexed ; surface deep black without trace of bluish lustre.....17 **strictus**

Sides of the prothorax finely margined, only moderately sinuate toward base, the disk narrower, as wide as long ; basal angles rectangular as usual ; elytral punctures very coarse and deep, evenly arranged along rather fine striæ.

Elytral striæ not impressed ; disk of the pronotum flat.....18 **mimus**

Elytral striæ deeply impressed ; disk of the pronotum noticeably convex. 19 **catenulatus**

Sides of the prothorax oblique and very broadly, feebly sinuate posteriorly, the basal angles much more than right, the disk wider than long, the base narrow, not as wide as the head ; elytral punctures coarser than the striæ.....20 **oreophilus**

12—Sides of the prothorax oblique toward base and not or only feebly sinuate, the angles distinctly more than right.

Prothorax wider than long, at base rather wider than the head ; elytra short, strongly dilated and only a little longer than wide.....21 **obliquus**

Prothorax apparently as long as wide, at base evidently narrower than the head.

Posterior apex of the intercoxal plate of the mesosternum narrowly and deeply emarginate as a rule, though somewhat variable ; elytra narrowly oval.....22 **convergens**

Posterior apex broadly emarginate ; elytra more broadly oval and fuller at the humeri ; prothorax relatively distinctly larger.

Genæ usually minutely and acutely incised ; pronotum very finely and densely granulato-reticulate and velvety blue-black. 23 **opacicollis**

Genæ more coarsely and obtusely emarginate as a rule ; pronotum less opaque, the sides more evidently sinuate toward base ; body less elongate .....24 **sculptipennis**

Sides of the prothorax strongly sinuate near the base, the angles right ; genæ deeply and angularly incised ; mesosternal plate strongly and angularly emarginate behind ; head transversely rugulose.....25 **porcatus**

13—Prothorax strongly sinuate posteriorly, the sides parallel or nearly so and straight for a short distance from the basal margin, the angles generally right.

Base of the prothorax very narrow, not as wide as the head, the surface shining.

Prothorax similar in general form in the two sexes ; elytra longer, elongate-oval.

Elytral striæ rather fine toward the suture ; prothorax in the male ½ as wide as the elytra.....26 **dissolutus**

Elytral striæ coarse and deep throughout ; prothorax smaller, very much less than ½ as wide as the elytra in the male.

Larger species, the prothorax strongly narrowed behind from the middle.....27 **sinuatus**

Smaller, the elytra more narrowly oval ; prothorax more gradually narrowed behind from before the middle.....28 **politus**

Prothorax dissimilar in the sexes, greatly inflated anteriorly in the male, small in the female ; elytral shorter and more broadly oval. 29 **corpulentus**

Base of the prothorax broad, wider than the head, the surface dull and not bluish ; elytral striæ very deep.....30 **compositus**

Prothorax oblique and only very feebly sinuate at the sides toward base. 31 **fulleri**

14—Elytra convex, black with violaceous concave margin, the intervals interrupted toward the sides and apex.....32 **interruptus**

Elytra convex, rubro- or æneo-cupreous in color, with metallic-green or golden side margins.....15

Elytra much depressed and more gradually pointed behind, without metallic side margins.....16

15—Anterior tarsi of the male quite strongly dilated, the second joint only very little longer than wide ; femora stouter.....33 **cupripennis**

Anterior male tarsi feebly dilated as usual, the second joint narrow and much elongated ; femora normally slender.

Elytral striæ more even and much deeper.

Larger, the side margins of the elytra greenish or coppery-golden. 34 **insularis**

Smaller, the side margins vivid metallic-green in color...35 **marginatus**

Elytral striæ feeble and very irregular ; margins greenish-golden in color ; prosternal process much less impressed along the coxæ ; body rufo-piceous beneath.....36 **confusus**

16—Body black and highly polished throughout, sometimes with a faint violaceous lustre.....37 **cordatus**

Of the species above enumerated several are still unknown to me in nature, and a complete solution of the question of specific rank of some others must be left for future investigation, when the criteria for estimating introspecific variability can be determined with some slight degree of certainty, these remarks applying more especially to the forms in the neighborhood of *sculptipennis* and *dissolutus*.*

1. **B. cristatus** Harr.—Boston Journ., II, p. 200; Horn: Trans. Am. Ent. Soc., VII, 1878, p. 176; *reticulatus* Mots.: Käfer Russ., p. 90; Mann.: Bull. Mosc., 1852, ii, p. 292; l. c.: 1853, iii, p. 121.

Moderately stout and ventricose, shining, the elytra minutely reticulate and somewhat alutaceous. Head elongate, rather broad, the upper surface strongly and longitudinally carinate, with a simple tuberculiform prominence behind the frontal margin, another just in advance of the anterior line of the eyes and another at the base of the vertex, overhanging the deep nuchal constriction ; posterior margin of the latter emarginate opposite the tubercle ; supra-orbital ridge strong, the antennal tubercles large ;

*The bibliographic quotations in this revision are taken from the paper of Dr. Horn above referred to, and no attempt has been made to verify them in most cases.

genæ prominent, obtusely and deeply emarginate; antennæ $\frac{2}{3}$ as long as the body, slender, the basal joint stout, obconic, as long as the next two, the seta nearly at the apex. Prothorax as long as wide, inflated and broadly rounded anteriorly, constricted at basal sixth, the sides thence slightly divergent to the basal margin, the latter as wide as the head, the angles less than right but blunt; reflexed margin fine; impressions strong; anterior margin double. Elytra strongly convex, $\frac{1}{3}$ longer than wide, nearly 3 times as long as the prothorax and $2\frac{2}{5}$ times as wide, oval, feebly shouldered; striæ fine, with moderate, rather shallow and uneven punctures, broadly confused toward the sides. Length 15.0–17.0 mm.; width 6.7–7.4 mm.

California (near San Francisco). The male has the second and third joints of the anterior tarsi coarsely and not very densely squamulose beneath throughout, the first with a small terminal pad and the fourth spinose with some longer hairs in addition. The intercoxal plate of the mesosternum is deeply and almost evenly concave throughout, emarginate behind. The original description of Harris, founded upon Oregon specimens, states that the elytra have a narrow blue margin; this is not recognizable in any individual of the present group which I have seen.

I have before me a variety of this species in which the elytral striæ, instead of being uniform, are alternately more approximate, the broader intervals with subdisconnected series of punctures.

2. **B. basalis** n. sp.—Moderately ventricose, shining. *Head* stout, moderately elongate, the longitudinal crest irregular, tuberculiform anteriorly, then depressed, finer and more acute, finely interrupted by a V-shaped sulcus just before the eyes, immediately behind which it assumes the form of a strongly elevated double tubercle, the basal tubercle pronounced and overhanging the deep nuchal sulcus, the posterior margin of the latter indented at the middle; supra-orbital ridges strong, the antennal prominences very pronounced and separated from the crest by a profound excavation; antennæ $\frac{2}{3}$ as long as the body, slender, the basal joint very stout, obconic and unusually long; genæ very prominent, with a large oblique incisure. *Prothorax* tumid, a little wider than long, inflated and rounded anteriorly, constricted at basal fifth, the sides thence straight and divergent to the basal margin, which is as wide as the head; reflexed margins fine; impressions deep; apical margin very strongly and broadly double, with longitudinally ruguliform polished sculpture. *Elytra* elliptical, slightly full toward base, $\frac{2}{5}$ longer than wide, nearly 3 times as long as the prothorax and $2\frac{1}{4}$ times as wide; disk strongly convex, with rather fine but impressed and moderately strongly punctured striæ, which are alternately more approximate, the striæ of the broader intervals interrupted;

sculpture stronger but not much more confused toward the sides. Length 16.0–21.0 mm. ; width 6.8–8.7 mm.

California (Sta. Cruz Co.).

This fine species can be distinguished at once from all others of the *cristatus* group, by the unusually developed basal joint of the antennæ and peculiarities of cephalic sculpture; the papillose tarsal pads of the male are rather dense, the fourth joint equilaterotriangular, with the spiniform hairs long toward tip. The intercoxal plate of the mesosternum is flat at the bottom, with the sides broadly reflexed. The female is more elongate than the male, the elytra relatively wider and longer, with feebler sculpture, this being however more confused broadly toward the sides. Numerous specimens.

3. **B. duplicatus** n. sp.—Moderately stout and ventricose, shining, deep black, without metallic reflection. *Head* rather wide, only moderately elongate, the longitudinal crest beginning anteriorly in a large simple subfrontal tubercle, expanded at the middle in a large and strongly elevated double tubercle, and ending at the nuchal constriction in a strong and narrowly rounded overhanging tubercle ; nuchal constriction very deep, its posterior wall scarcely indented at the middle ; supra-orbital ridges strong, the antennal tubercles large ; genæ prominent, deeply and narrowly sinuate ; antennæ scarcely $\frac{2}{3}$ as long as the body, slender, the basal joint stout and obconic but rather short, not as long as the next two. *Prothorax* barely as long as wide, inflated and rounded anteriorly, deeply sinuate behind, the sides straight and subparallel in almost basal fourth, the base scarcely as wide as the head, the angles right and only slightly blunt ; reflexed margins fine ; surface rather convex, the impressions deep ; anterior margin only feebly double but convex. *Elytra* strongly convex, almost evenly elliptical, not at all full at base, $\frac{2}{5}$ longer than wide, nearly 3 times as long as the prothorax and $2\frac{1}{3}$ times as wide ; margins very narrowly reflexed ; disk coarsely and unevenly sculptured, the striæ deep, with coarse and uneven punctures, alternately more widely separated, the striæ of the wider intervals partially interrupted ; sculpture not much more confused toward the sides, the striæ easily traceable throughout. Length 14.0–17.0 mm.; width 6.2–8.0 mm.

California (Lake Co.).

The anterior tarsi of the male are densely papillose beneath, the pads of the first and third joints small and oval, the fourth without pubescence but with the spines longer toward tip. The intercoxal plate of the mesosternum is flat, with abruptly and narrowly reflexed side margins and the usual deep posterior emargination. The female is much larger and more ventricose than the male, and has the prothorax a little more obviously constricted near the base.

This species may be readily known among the allies of *cristatus* by the rather coarse, close, deep and uneven sculpture of the elytra, scarcely constricted prothorax with the sides subparallel near the base and not strongly divergent, and by the rather shorter basal joint of the antennæ. Three specimens.

4. **B. rugiceps** Horn—Trans. Am. Ent. Soc., IV, 1872, p. 143; l. c.: VII, 1878, p. 177.

Form moderately elongate, black, feebly shining. Head moderately elongate; vertex elevated into an irregular obtuse crest; supra-orbital ridges well defined; front transversely impressed between the bases of the antennæ; occiput not impressed; genæ moderately dilated, incised beneath the eyes; antennæ slender, basal joint large and stout. Prothorax cordate, moderately constricted posteriorly; sides in front arcuate, posteriorly sinuate; hind angles rectangular; margin with a slightly thickened bead; disk feebly convex, anterior, median and basal lines not deeply impressed. Elytra regularly oval; margin narrowly reflexed; disk moderately convex; surface with about eighteen moderately deeply impressed striæ in which the punctures are coarse but not approximate; intervals convex; inflexed portion nearly smooth. Body beneath and legs smooth. Length 14–17 mm.

Oregon. The sculpture of the head is said to recall that of certain species of Clivina, but with a more elevated carina, and the prothorax, by its more feebly impressed lines, recedes from the other cristate species and approaches *punctatus*. The male characters are as in *cristatus*. I have seen no example of this species and simply transcribe the diagnosis of Dr. Horn.

5. **B. incipiens** n. sp.—Rather strongly ventricose, shining *Head* somewhat small and unusually abbreviated, without trace of transverse nuchal constriction, the median parts of the vertex thrown up in a very irregular and feeble longitudinal elevation, the posterior limit of which—between the hind margins of the eyes—being more definitely tuberculiform; supra-orbital ridges very strong but unusually short, the antennal prominences large; labrum wider than long; antennæ slender, but slightly more than ½ as long as the body, the basal joint obconic though only moderately thickened and not as long as the next two, the seta very near the apex as usual in this genus; genæ rather prominent, angularly incised. *Prothorax* fully as long as wide, widest just before the middle, where the sides are somewhat prominently rounded, thence convergent and broadly arcuate to the apex and strongly convergent to the base, near which they become feebly sinuate; base very narrow, scarcely more than ¾ as wide as the head; angles obtuse and blunt; double

edge of the apex obliterated toward the middle, narrow; reflexed margins fine; surface moderately convex, the median, subapical and subbasal lines rather deep, also with the sublateral diverging impressions well marked. *Elytra* oval, strongly convex, pointed at apex, rather full toward base, $\frac{2}{5}$ longer than wide, $2\frac{3}{4}$ times as long and $2\frac{1}{2}$ times as wide as the prothorax; reflexed margins narrow; striæ rather coarsely and deeply impressed, irregular toward the sides, almost evenly spaced toward the suture, the punctures rather fine and widely separated; intervals convex. Length 14.5 mm.; width 7.0 mm.

Northern California?

A remarkably distinct species in the very strongly oblique and feebly sinuate sides of the prothorax posteriorly and unusually narrow base of the latter, rather abbreviated head, and complete lack of any trace of the nuchal constriction which is such a prominent feature of *cristatus*, *basalis* and *duplicatus*. The intercoxal plate of the mesosternum is perfectly flat, with the edges abruptly but narrowly reflexed. It should probably be placed near *rugiceps*, and is represented by a single very immature female specimen, without locality label but possibly from the region indicated above.

6. **B. striatopunctatus** Chaud.—Bull. Mosc., 1844, iii, p. 476; Horn: Trans. Am. Ent. Soc., VII, p. 185.

Elongate-oval, rather strongly ventricose, shining, the pronotum alutaceous; head alutaceous, the frontal portions polished. Head stout, the genæ generally with a small angular nick; a transverse impression behind the eyes vaguely suggested; antennæ not quite $\frac{2}{3}$ as long as the body, slender and with the basal joint somewhat stout, obconic and much shorter than the two following combined. Prothorax relatively large, much dilated and rounded anteriorly, strongly sinuate before the base, the sides parallel and straight in less than basal fifth, the base broad, rather wider than the head, the apex broadly sinuate; disk much wider than long, longitudinally quite convex, the impressions rather feeble; side margins moderately reflexed. Elytra elongate, evenly elliptical, widest at the middle, $\frac{1}{2}$ longer than wide, $3\frac{1}{2}$ times as long as the prothorax and a little more than twice as wide; margins moderately reflexed; disk moderately convex, finely striate, the striæ not coarsely but distinctly punctured, much confused broadly near the sides; intervals flat, each with a supplementary series of punctures especially behind the middle. Length 17.0–22.0 mm.; width 8.5–10.0 mm.

California (near San Francisco and Sta. Cruz). The intercoxal plate of the mesosternum is large and irregular, transversely impressed and with discontinuous side margin anteriorly, broadly impressed along the middle and narrowly along each side posteriorly, emarginate behind; there is some variation however in this plate. Anterior tarsi of the male densely spongy-pubescent beneath, the pad of the first joint occupying apical half. The types of the above outline are three males from Oakland, immediately opposite San Francisco, and the two accompanying females are almost similar but larger and a little more ventricose. Female examples are before me from the peninsula of San Francisco, which are larger, with the elytra much more elongate and narrowed more toward base and having the prothorax relatively smaller and scarcely visibly wider than long. The Sta. Cruz example also has a slightly different aspect, and I have but little doubt that there are some closely allied species involved in the general material which we denominate *striatopunctatus*. The strial punctures of the male are stronger than in the female as is frequently the case. It is a common species, and large series from carefully recorded localities would be valuable.

7. **B. ovalis** Mots.—Bull. Mosc., 1859, iii, p. 162, pl. 3, fig. 11.

Strongly ventricose, shining, the head and pronotum alutaceous; frontal regions polished. Head stout, moderately elongate, with a subobsolete transverse impression behind the eyes; genæ feebly developed but with a rather large triangular nick; supra-orbital ridges fine and strongly elevated, deeper but not transversely dilated above the antennæ, the latter slender, $\frac{3}{5}$ as long as the body, gradually more slender and paler toward tip, the basal joint moderate. Prothorax as long as wide and apparently a little longer, feebly inflated with the sides broadly arcuate anteriorly, sinuate posteriorly, the sides parallel and straight in more than basal sixth; angles right; base broad, more than $\frac{1}{2}$ the maximum width but barely as wide as the head; disk but very feebly convex, the impressions all feeble; lateral reflexed margin moderate. Elytra much inflated, strongly declivous near the sides, much less convex broadly toward the middle, less than $\frac{1}{2}$ longer than wide, more than 3 times as long as the prothorax and $2\frac{2}{3}$ times as wide, broadly elliptical, rather full at the humeri, the reflexed margins moderate; striæ very

fine and feebly impressed, deeper sublaterally, much confused only very near the sides, finely and remotely punctate; intervals flat, alternately with a few supplementary punctures. Length 21.5 mm.; width 10.3 mm.

California (exact locality not recorded). The single female representing this species in my cabinet cannot by any possibility be united with *striatopunctatus*, and, as it corresponds exactly with the figure of Motschulsky, especially in the form of the prothorax, I regard it as a very satisfactory provisional exponent of *ovalis*. The sides of the mesosternal plate between the coxæ are only very feebly elevated.

8. **B. decipiens** n. sp.—Rather strongly ventricose, shining, the pronotum strongly alutaceous, the head dull but polished anteriorly. *Head* stout, moderately elongate, very feebly, transversely rugulose toward the middle of the vertex; genæ but slightly developed and having a minute angulate notch beneath the eyes; supra-orbital ridges narrow, long, strong, deeper above the antennæ but not swollen; antennæ barely ⅔ as long as the body, gradually more slender from the second joint, the first moderately thick and claviform, much shorter than the next two. *Prothorax* relatively rather small though distinctly wider than long, rounded anteriorly, deeply sinuate toward base, the sides parallel and straight in basal fifth or sixth; angles right and blunt; base broad, fully as wide as the head; disk somewhat longitudinally convex, the impressions all very feeble; lateral reflexed margin moderate; apex broadly sinuate. *Elytra* distinctly less than ½ longer than wide, 3 times as long and 2⅖ times as wide as the prothorax, almost evenly elliptical, rather full toward base, moderately convex, the reflexed margin distinct, especially toward base; striæ rather fine but well impressed, the punctures not coarse but distinct, well separated; intervals feebly convex, generally without supplementary punctures in the male, but with the alternate intervals serially punctate behind the middle in the female, abruptly much confused in lateral fourth. Length 16.0–18.0 mm.; width 7.5–9.0 mm.

California (near Monterey).

The anterior tarsi of the male are moderately dilated, with the dense spongy-pubescent pad of the first joint occupying fully apical half. This species differs from *striatopunctatus* in its shorter elytra, smaller and less dilated prothorax, rather more impressed striæ and somewhat fuller humeral regions of the elytra; it is represented by six males and two females taken by Mr. Dunn.

Var. **A**.—Similar to *decipiens* but with the elytra more elongate, the prothorax broader and more inflated anteriorly, much wider than long and more narrowed at base, the latter being distinctly narrower than the head; elytra strongly depressed toward base. Length 17.5 mm.; width 8.0 mm. Monterey.

A single male, taken in the same locality as *decipiens*, which I have attached to that species as a variety, is remarkably different in facies because of its wider prothorax and depressed elytra, but so similar in other respects that it is evidently inadvisable to announce it specifically distinct until more examples can be examined.

9. **B. punctatus** Lec.—Proc. Acad. Nat. Sci., Phila., 1859, p. 69; Mots.: Käfer Russ., p. 90; Horn: Trans. Amer. Ent. Soc., VII, 1879, p. 182.

Moderately robust, black, feebly shining. Head moderately elongate, subopaque; genæ incised. Prothorax cordate, a little longer than wide; sides in front moderately arcuate, posteriorly feebly sinuate; hind angles subrectangular; disk subopaque, feebly convex; basal impression deeper than the others; margin very narrow. Elytra oval, ventricose, with very fine, scarcely impressed striæ which have deep and rather large punctures moderately closely placed; lateral intervals confused; inflexed portion of elytra very obsoletely punctate. Body beneath black, shining. Length 13–18 mm. [Horn].

California (Tejon). As an illustration of the fact, alluded to in the introduction to the present paper, that species in the Coleoptera which superficially resemble each other to an extreme degree may in reality be profoundly different, the following remark of Dr. Horn may be quoted: "This species, and *mimus* of the preceding group, resemble each other so closely that it is hardly possible to distinguish them. In this species the hind angles of the thorax are less decidedly rectangular, in *mimus* very distinctly so."*

10. **B. gravidus** n. sp.—Strongly ventricose, dull, the elytra feebly alutaceous with the minute reticulations very evident, deep black throughout. *Head* much elongated, moderate in width, the genæ feebly developed but with a distinct subangulate emargination; vertex smooth, the supra-orbital ridges fine and strong, more elevated at the antennæ, the latter setaceous, $\frac{3}{5}$ as long

* There are hundreds of cases where really distinct species are unscientifically bunched together in our cabinets, merely because there is no superficial structural character apparent to distinguish them. Under patient research the character can generally be found, and in many cases will be internal, either affecting the genitalia or perchance the alimentary canal or other unexpected tract, but always evincing itself by an outward peculiarity of habitus, the force and weight of which can only be appreciated after the reviewer has made himself intimately familiar with the subject by prolonged and attentive study.

as the body, the basal joint but slightly stouter and short, very much shorter than the next two, with the seta distinctly ante-apical. *Prothorax* fully as wide as long, moderately inflated with the sides circularly arcuate anteriorly, moderately sinuate posteriorly, the sides becoming straight and parallel for a considerable distance from the base, the latter much more than ½ the maximum width and rather wider than the head; angles right; disk longitudinally convex anteriorly, with the impressions very feeble; reflexed side-margins quite strong. *Elytra* very convex, oblong-oval, about ⅓ longer than wide, barely 3 times as long as the prothorax and 2½ times as wide, the sides very feebly arcuate except toward base and apex; disk full at the humeri, vertical at apex in profile, having fine striæ which are deeply and coarsely impressed laterally but extremely feebly so toward the suture, the punctures relatively coarse, somewhat uneven in size and unevenly spaced; intervals feebly convex laterally, wholly confused and broken up abruptly in less than lateral fourth. Length 14.0 mm.; width 7.0 mm.

California (southern).

The densely pubescent pad of the basal joint of the anterior male tarsus is acutely triangular and occupies rather less than apical half. The intercoxal plate of the mesosternum is very deeply emarginate behind and rather feebly margined along the sides. This species is allied to *punctatus*, but differs in its broader prothorax, with the sides parallel at base and the hind angles right.

A female from Monterey is associated with *gravidus* for the present, though without doubt representing a species which may or may not be closely allied. It has the prothorax similarly shaped but smaller, the elytra still shorter and more evenly oval, the striæ stronger, the intervals more convex and with some supplementary punctures toward tip. In the absence of the male, it is impossible to say whether it should be placed near *gravidus* or *mimus*.

11. **B. subtilis** Schaum.—Berl. Zeitsch., 1863, p. 72, pl. 3, fig. 7; Horn: Trans. Am. Ent. Soc., VII, 1879, p. 183.

Moderately elongate, black, subopaque. Head moderately elongate, smooth; genæ acutely incised. Prothorax cordate, as broad as long; sides in front arcuate, posteriorly oblique with feeble sinuation; margin moderately reflexed; disk nearly flat; impressions feeble. Elytra oval, moderately ventricose, not striate but with series of rather finely impressed punctures not closely placed, which are somewhat confused at the sides; inflexed portion sparsely punctate. Body beneath black, shining. Length 17–20 mm.

California (Los Angeles), also said to occur in Mariposa Co. There is no representative of this species in the material before me, and I have simply transcribed the description of Dr. Horn. It is very distinct among the associates of *striatopunctatus*, in the oblique sides of the prothorax, but seems to approach *punctatus* in this respect as well as in its dull lustre.

12. **B. symmetricus** n. sp.—Moderately ventricose, feebly shining, black, the elytra with a slightly piceous tinge. *Head* elongate, subtriangular, the vertex smooth; genæ feebly developed, having the usual small angular notch; supra-orbital ridges well developed, the depression within the supra-antennal portion deep; antennæ rather long, fully $\frac{2}{3}$ as long as the body, very slender, filiform and only just visibly thinner toward apex than at the second joint, the first feebly thickened, much shorter than the next two, the seta at apical fifth. *Prothorax* rather small, fully as long as wide, only moderately dilated and very broadly arcuate at the sides anteriorly, rapidly narrowed posteriorly and sinuate, the sides straight and parallel in scarcely basal sixth; base rather more than $\frac{1}{2}$ the maximum width but barely as wide as the head; angles right and blunt; disk but very feebly convex, the impressions slight; side margins fine and shallow. *Elytra* elongate and perfectly elliptical, nearly $\frac{1}{2}$ longer than wide, $2\frac{2}{5}$ times as long and $2\frac{2}{5}$ times as wide as the prothorax, the reflexed margins somewhat narrow; disk very moderately convex, rather abruptly declivous at the sides, more flattened broadly above; striæ rather fine but well impressed, finely and obsoletely punctate, the first and second, and sixth and seventh very irregular, the others even; intervals moderately convex, abruptly much confused in lateral fifth. Length 17.0 mm.; width 7.0 mm.

California (exact locality not recorded).

The intercoxal plate of the mesosternum in the type is rather abnormal, its thickened and elevated side margins posteriorly being continuous with the bead of the acetabula, the anterior portion, which is transversely excavated, being detached; posteriorly it is deeply sinuate as usual. In the unique male type the dense pad of the first anterior tarsal joint occupies distinctly less than apical half.

This species is quite distinct from any other in elytral form and sculpture.

13. **B. striatus** Lec.—Proc. Acad. Nat. Sci., Phila., 1859, p. 69; Horn: Trans. Am. Ent. Soc., VII, 1878, p. 181; *crenatus* Mots.: Bull. Mosc., 1859, iii, p. 161, pl. 3, fig. 8.

Moderately elongate, black, shining. Head elongate, smooth; genæ deeply incised. Prothorax somewhat variable in form, usually elongate, cordate; sides in front arcuate, posteriorly moderately sinuate; hind angles rectangular; margin very narrow;

disk feebly convex; impressions moderately deep. Elytra oval, moderately ventricose; surface deeply striate; striæ rather closely but not coarsely punctured; intervals convex, feebly interrupted at the sides and near the tip; inflexed portion obsoletely punctate. Body beneath smooth, shining. Length 15–21 mm. [Horn].

California (Sta. Barbara and Tejon). An inspection of the type of LeConte, shows that this is a very remarkable species in its small narrow and elongate prothorax, with unusually fine reflexed margins, and I have no example in my cabinet which at all approaches it. There is a decided probability that several species were confused by Dr. Horn in drawing up the above diagnosis.

The figure and words of Motschulsky appear to prove beyond reasonable doubt, that he had before him this aberrant and local species in drawing up his description of *crenatus*, which may be regarded as a singular coincidence, in view of the multiplicity of species and the apparent rarity of the one under consideration.

14. **B. fuchsianus** Rivers—Entomologica Americana, VI, 1890, p. 71.

Extremely ventricose, shining, the pronotum and head alutaceous, the latter more shining anteriorly; color deep black throughout. Head stout, moderately elongate, the vertex feebly rugulose; genæ feebly developed, triangularly notched; maxillary palpi very long, the second joint as long as the last two together; antennæ well developed, slender, the basal joint slightly thickened but much shorter than the next two, the seta subapical. Prothorax relatively quite moderate in size, as wide as long, moderately inflated and broadly arcuate at the sides anteriorly, sinuate posteriorly, the sides straight and parallel in basal sixth, the angles right; base $\frac{1}{2}$ the maximum width and but slightly narrower than the head; disk feebly convex; impressions feeble; side margins unusually deep and strongly reflexed. Elytra extremely inflated, subquadrate, very full at base, the sides very feebly arcuate thence to the very oblique apex, $\frac{1}{3}$ longer than wide, $3\frac{1}{2}$ times as long as the prothorax and $2\frac{3}{4}$ times as wide, strongly convex, more declivous near the sides, strongly striate, the striæ feebly and not closely punctate, alternately more widely separated, the intervals very feebly convex, the wider each with a supplementary series of rather strong disconnected punctures

throughout the length, much confused in more than lateral fourth. Length 25.0 mm.; width 11.7 mm.

California (El Dorado and Sonoma Cos.). The description refers to a single mutilated female specimen recently purchased from Mr. Rivers. The species is remarkably distinct in its very broad and peculiarly sculptured elytra and deeper reflexed margins of the pronotum; it is one of the largest of the genus. The elytra are more inflated but rather less convex and more oblong than in *ventricosus*.

15. **B. ventricosus** Dej.—Spec., V, 1831, p. 527; Esch.: Zool. Atl., 1833, p. 21, pl. 25, fig. 1; Horn: Trans. Am. Ent. Soc., VII, 1878, p. 181; *alternatus* Mots.: Bull. Mosc., 1859, iii, p. 162, pl. 3, fig. 12.

Strongly ventricose, shining, the pronotum and posterior parts of the head alutaceous; color deep black throughout. Head stout but much elongated, very feebly wrinkled throughout, except behind the faint transverse nuchal impression just behind the eyes; genæ with a distinct and acutely angulate incision; antennæ $\frac{3}{5}$ as long as the body, gradually narrowed from the second joint, the first moderately dilated and but little longer than the third. Prothorax relatively rather small, as wide as long, moderately inflated and rather strongly arcuate anteriorly, widest at apical third, broadly sinuate behind, the sides becoming parallel for only a very short distance before the basal margin, the latter a little more than $\frac{1}{2}$ the maximum width but barely as wide as the head; disk feebly convex, the impressions slight and superficial; reflexed lateral margins distinct though moderate in depth. Elytra broadly inflated and very convex throughout the width, oval, very full at the humeri, $\frac{2}{5}$ longer than wide, $3\frac{1}{2}$ times as long as the prothorax and $2\frac{1}{2}$ times as wide; reflexed margin moderate; striæ rather fine but deeply impressed, finely and obsoletely punctured, more distinctly so sublaterally; intervals broadly convex, equal though alternately with imperfect supplementary series of punctures, abruptly much confused in nearly lateral third. Length 19.7–21.4 mm.; width 9.5–10.2 mm.

California (Sta. Cruz Co.). The description is taken from two female examples, which are the only representatives included in my cabinet at present. *Alternatus* was referred by Dr. Horn to *striatopunctatus* as a synonym, but the figure of Motschulsky indicates a species with very much fuller humeri than is ever the case in that species, and with a less anteriorly inflated

prothorax. As the figure corresponds exactly with the examples which are referred above to *ventricosus*, and, as supplementary series of punctures are quite as evident here as in *striatopunctatus*, I think that the synonymy now proposed may be somewhat more appropriate, although it is of course impossible to be absolutely sure in the absence of types.

16. **B. gentilis** n. sp.—Moderately ventricose, shining, the pronotum slightly alutaceous, deep black throughout. *Head* elongate, moderate in width, the vertex feebly and transversely wrinkled anteriorly, the genæ not greatly developed and having a small angulate notch ; supra-orbital ridges fine, strongly elevated at the antennæ and there separated from the median parts of the front by a deep depression ; antennæ fully $\frac{3}{5}$ as long as the body, slender, only slightly thicker toward base, the first joint slightly stouter, much shorter than the next two. *Prothorax* relatively rather small, as wide as long, moderately dilated and broadly rounded anteriorly, the sides sinuate behind, becoming straight and parallel in about basal sixth ; base $\frac{1}{2}$ the maximum width or a little more, about as wide as the head ; angles right ; disk only feebly convex, the impressions superficial, the median line fine but distinct ; reflexed sides moderately deep and strong. *Elytra* almost evenly elliptical, almost evenly and moderately convex, $\frac{2}{3}$ longer than wide, more than 3 times as long as the prothorax and barely $2\frac{1}{2}$ times as wide, not very full at the humeri ; rather finely but deeply and very evenly striate, the striæ finely punctured, much more coarsely so sublaterally ; intervals convex, confused only in a very narrow area along the sides and distinctly traceable throughout. Length 14.0–18.0 mm. ; width 6.5–8.8 mm.

California (near Monterey).

The ample series of ten specimens before me, represents a species allied somewhat to *striatus* but differing in its broader and much shorter prothorax, with more strongly reflexed side margins. The intercoxal plate of the mesosternum is generally flat, with fine raised side margins which are interrupted at the middle and with the usual deep posterior sinus. The female is but little more ventricose than the above described male and has the prothorax relatively a little smaller, but scarcely differs otherwise. The pubescent pad of the first anterior tarsal joint of the male extends through a little more than apical half.

The emargination of the genæ is a very variable character, and, in some specimens, the nick when small may be evident on one side of the head and obliterated on the other.

17. **B. strictus** n. sp.—Moderately ventricose, the head and pronotum strongly alutaceous, the elytra somewhat shining, deep black throughout. *Head* quite stout and only moderately elongate, almost smooth, the genæ with

the usual moderate angular nick ; supra-orbital ridges fine, stronger at the antennæ but not tuberculiform ; antennæ ⅗ as long as the body, slender, feebly thickened basally, the first joint elongate, obconic, much shorter than the next two and distinctly stouter, the seta between apical fifth and sixth. *Prothorax* relatively rather large and well developed, a little wider than long, strongly dilated and broadly, circularly arcuate anteriorly, constricted at basal sixth, the sides thence straight and slightly divergent to the base, the latter fully ½ the maximum width but not as wide as the head ; angles a little less than right and quite blunt ; disk feebly convex, the impressions slight ; reflexed side margins quite strong and deep. *Elytra* evenly elliptical, evenly and moderately convex, fully ⅖ longer than wide, 3 times as long as the prothorax and about 2⅓ times as wide, moderately full at the humeri, the reflexed side margins distinct ; disk rather finely and evenly striate, the striæ deeply impressed and quite coarsely and closely punctured, distinctly crenulating the intervals, which are convex, without trace of supplementary punctures and perfectly even almost to the side margins. Length 18.0 mm. ; width 8.2 mm.

California (exact locality not recorded).

This species is allied to the preceding, differing in its relatively larger, more inflated and constricted prothorax and more coarsely but equally evenly sculptured elytra. The pubescent pad of the first anterior tarsal joint of the male occupies barely apical half.

The acarids infesting this genus are extremely minute, if the numerous examples which I have seen are fully matured. One noted on the present species is narrowly oval and barely a fourth as long as the second anterior tarsal joint. The same species infests several other widely different species of Brennus, and the acarid is probably peculiar to this genus.

18. **B. mimus** Horn—Trans. Am. Ent. Soc., 1874, p. 20; l. c.: 1878, p. 182.

Moderately elongate, black, shining. Head moderately elongate, subopaque ; genæ feebly notched. Prothorax cordiform, as wide as long ; sides in front moderately arcuate, posteriorly slightly sinuate ; hind angles rectangular ; margin very narrow ; disk flat, opaque ; impressions feeble. Elytra oval, moderately ventricose ; surface finely striate ; striæ not impressed but with large, moderately closely placed punctures ; intervals irregular at the sides ; inflexed portion obsoletely punctate. Body beneath smooth, shining. Length 14.5–16 mm. [Horn.]

California (San Bernardino). This species is said to be very similar to *punctatus* in general appearance, but with the elytra rather less ventricose and differing in male sexual characters, as indicated in the table. It is unknown to me in nature.

19. **B. catenulatus** n. sp.—Feebly ventricose, rather dull and alutaceous, the elytra more shining, deep black throughout. *Head* rather narrow, moderately elongate, evenly, transversely convex and smooth along the middle, the genæ feebly developed and very minutely but acutely incised ; supra-orbital ridges narrowly cariniform as usual, moderate in elevation even at the antennæ, the latter slender, only just visibly thicker basally, about $\frac{2}{3}$ as long as the body, the basal joint only very slightly thicker and barely longer than the third. *Prothorax* relatively small, apparently not quite as wide as long, moderately dilated and broadly rounded anteriorly, only moderately sinuate posteriorly, the sides however becoming straight and subparallel for some distance from the base, the latter distinctly more than $\frac{1}{2}$ the maximum width and somewhat wider than the head ; angles right but blunt ; disk distinctly longitudinally convex anteriorly, the impressions very feeble ; reflexed side margins fine and rather feebly elevated. *Elytra* narrow, suboval, widest rather behind the middle, not very full at base, the humeri obliquely rounded, fully $\frac{2}{5}$ longer than wide, 3 times as long as the prothorax and $2\frac{2}{5}$ times as wide, the reflexed margins fine ; disk evenly and moderately convex, rather finely and evenly striate, the striæ very strongly impressed and with very coarse deep punctures penetrating half through the intervals, the latter strongly convex, only slightly discontinuous even near the sides. Length 14.0–15.0 mm.; width 6.2–7.2 mm.

California (southern). Mr. Dunn.

The female differs considerably from the male above described in the relatively larger, much more inflated elytra, which are notably fuller at the humeri, only a third wider than long, with the sculpture less coarse and more confused at the sides ; the prothorax is actually slightly, and relatively very much, smaller, but similar in form. The anterior tarsi of the male are only moderately dilated, with the dense pad of the first joint occupying more than apical half.

This is a remarkably distinct species, but appears to be allied to *mimus*, differing in its somewhat smaller size, much more deeply impressed elytral striæ, narrower prothorax and other characters.

20. **B. oreophilus** Rivers—Entomologica Americana, VI, 1890, p. 111.

Strongly ventricose, rather dull, the elytra more shining especially in the female, deep black throughout. Head very moderately elongate, somewhat stout, slightly rugulose near the middle of the vertex, the supra-orbital ridges narrowly cariniform ; genæ very feebly developed and having a small angulate incisure ; antennæ slender, nearly $\frac{2}{3}$ as long as the body, very feebly thickened toward base, the first joint only slightly dilated, but little longer than the third with the usual subapical seta very long. Prothorax rela-

tively moderate in size, fully as wide as long, broadly rounded laterally, the sides strongly oblique and just visibly sinuate behind the middle, the base narrow, much less than $\frac{1}{2}$ the maximum width and narrower than the head; basal angles much more than right, not very blunt; disk nearly flat, the impressions feeble, the reflexed margins moderately deep and strong. Elytra suboblong-oval, evenly and moderately convex, very full at the humeri, the latter subtransversely rounded to the prothorax, $\frac{1}{3}$ longer than wide, 3 times as long as the prothorax and $2\frac{1}{2}$ times as wide; striæ rather fine, equal, broadly and deeply impressed, coarsely and crenately punctate, the intervals narrow and convex, confused near the sides. Length 14.5–17.0 mm.; width 6.7–7.6 mm.

California (El Dorado Co.). The female is larger but almost exactly resembles the male, having the elytra not at all more inflated but longer, with the strial punctures less coarse, and the intervals a little wider, less convex and more broadly and completely confused near the sides. I have before me a male and three females recently forwarded by Mr. Rivers.

21. **B. obliquus** Lec.—Trans. Am. Ent. Soc., 1868, p. 61; Horn: l. c., 1878, p. 180.

Rather stout and strongly ventricose, alutaceous, the elytra shining, deep black in color. Head rather narrow and elongate, the vertex nearly smooth; supra-orbital ridges fine and rather feeble, the inner slope of the portion above the antennæ unusually gradual; genæ with a small angulate notch; antennæ only moderately slender and just visibly thicker basally, nearly $\frac{2}{3}$ as long as the body, the basal joint distinctly thicker, obconic, much shorter than the next two. Prothorax relatively well developed, a little wider than long, inflated and rounded anteriorly, the sides feebly subangulate just before the middle, thence oblique to the base, near which they are generally just visibly sinuate; angles much more than right though scarcely at all blunt; base $\frac{1}{2}$ the maximum width and as wide as the head; disk feebly convex, the impressions feeble, the fine median line distinct; reflexed margins moderately strong. Elytra broadly oval, strongly convex, very full at the humeri, scarcely $\frac{1}{3}$ longer than wide, 3 times as long as the prothorax but only $2\frac{1}{3}$ times as wide, the reflexed margin rather fine; disk coarsely, closely and deeply striate, the striæ finely, feebly, scarcely obviously and distantly punctate, the intervals strongly convex, partially interrupted even toward

the suture and abruptly more confused in outer half, though easily traceable throughout the width. Length 13.5 mm.; width 6.8 mm.

California. The specimen described above is a male and the only representative which I have seen. The basal joint of the anterior tarsi is pubescent beneath only in a small oval area occupying apical third of the length. The female is undoubtedly larger, with broader and less convex strial intervals and generally less deeply sculptured elytra. The pronotum has a dull blue-black lustre.

In the above type the left gena has a rather large angulate incisure, while the right has merely an extremely minute cleft.

22. **B. convergens** n. sp.—Feebly ventricose, alutaceous, the elytra shining, deep black throughout, the pronotum without decided bluish lustre. *Head* rather narrow and elongate, the vertex generally feebly and transversely wrinkled along the middle anteriorly; genæ feebly developed, with a small angulate nick; supra-orbital ridges moderate, gradually sloping inwardly above the antennæ, the latter decidedly short, slender but quite distinctly thicker basally, $\frac{3}{5}$ as long as the body, the basal joint moderately thick, obconic, shorter than the next two but longer than the third, the seta very near the apex. *Prothorax* relatively quite small, as long as wide, moderately dilated and rounded anteriorly, the sides only faintly subangulate well before the middle, thence strongly oblique to the basal margin, just before which they are very feebly sinuate, base narrow, less than $\frac{1}{2}$ the maximum width and distinctly narrower than the head; angles more than right and slightly blunt; disk distinctly longitudinally convex anteriorly, the impressions feeble, the fine median line, however, quite distinct; lateral margins moderately reflexed. *Elytra* almost evenly elliptical, very convex, $\frac{2}{5}$ longer than wide, 3 times as long as the prothorax but scarcely $2\frac{1}{3}$ times as wide, not full but obliquely rounded at the humeri; margins narrowly reflexed; disk with very broadly and deeply impressed, but generally rather finely punctate striæ, the intervals strongly convex, interrupted at rather long intervals internally, but much broken up, though readily traceable, in lateral third, the general sculpture very coarse. Length 13.5–15.0 mm.; width 5.9–7.0 mm.

California (Siskiyou Co.).

The female differs considerably from the male, described above, in having the elytra strongly swollen and distinctly fuller and less obliquely rounded at the humeri, more than three times as long as the prothorax and $2\frac{1}{2}$ times as wide, the intervals wider and less convex, but more thoroughly broken up in an abruptly delimited area, occupying fully lateral third of the width. In the male the basal joint of the anterior tarsi is densely pubescent in a rounded patch occupying but little more than apical third.

This species is allied to *obliquus*, differing in the smaller and less dilated prothorax with very much narrower base, and in the much less ventricose male, the differences between the sexes being apparently more pronounced than in that species. Four specimens.

23. **B. opacicollis** n. sp.—Rather strongly ventricose, dull, the frontal regions and elytra more shining, deep black, the pronotum with a decided bluish lustre. *Head* moderately stout and elongate, the vertex feebly, transversely wrinkled anteriorly; genæ feebly developed, with a minute angular notch; supra-orbital ridges moderate, declivous internally; antennæ slender, $\frac{3}{5}$ as long as the body, slightly stouter toward base, the first joint thickened but much shorter than the next two. *Prothorax* relatively moderate in size, as long as wide, inflated and evenly and rather strongly rounded anteriorly, not at all subangulate before the middle, the sides oblique posteriorly and only just visibly sinuate near the base ; angles much more than right and not blunt; base rather narrow, $\frac{1}{2}$ the maximum width and barely as wide as the head; disk nearly flat, the impressions all feeble; reflexed side margins moderate. *Elytra* almost evenly but broadly elliptical, $\frac{1}{3}$ longer than wide, barely 3 times as long as the prothorax and $2\frac{2}{5}$ times as wide, strongly convex, somewhat full at the humeri, the reflexed margins narrow; disk coarsely and deeply striate, the punctures fine and widely separated; intervals strongly convex, frequently interrupted even toward the suture and very much broken up broadly toward the sides, but with the striæ distinctly traceable throughout. Length 15.5 mm.; width 6.7–7.0 mm.

Oregon.

The male described above has the pubescent pad of the first anterior tarsal joint extending through somewhat more than apical third. The female has the elytra almost precisely similar throughout to those of the male and equally inflated, but a little more elongate-elliptical and rather less full at the humeri, the prothorax similar in form but distinctly smaller both actually and relatively. The species may be known from the preceding not only by the similarity of elytral inflation of male and female, but by the flatter and more opaque disk of the pronotum, the latter being relatively much larger in the male and with the median line less impressed. A single pair.

24. **B. sculptipennis** n. sp.—Rather strongly ventricose, alutaceous, the elytra shining, the pronotum with scarcely a trace of bluish lustre; body deep black throughout. *Head* moderately stout and elongate, the vertex feebly, transversely rugulose anteriorly; supra-orbital ridges fine and rather feeble but becoming strong, subangulate and moderately sloping internally at the antennæ; genæ with a distinct obtusely angulate notch; antennæ $\frac{3}{5}$ as long as the body, slightly thickened toward base, the first joint shorter than the next

two but very much longer than the third, slightly thickened. *Prothorax* relatively moderate in size, as long as wide, rather strongly inflated and rounded anteriorly, with only feeble trace of angulation before the middle; sides strongly oblique posteriorly and broadly, feebly sinuate toward base, the angles slightly more than right; base narrow, much less than ½ the maximum width and narrower than the head; disk feebly, longitudinally convex anteriorly, the impressions all very feeble; side margins moderately reflexed. *Elytra* almost evenly but rather broadly elliptical, quite full at the humeri, ⅖ longer than wide, 3 times as long as the prothorax and 2⅖ times as wide, strongly convex, the margin narrow; striæ coarse and deeply impressed, with rather coarse, uneven and widely separated punctures, the intervals convex, much interrupted even toward the suture and greatly broken up broadly toward the sides, but with the striæ distinctly traceable throughout as usual in this group. Length 14.0–16.5 mm.; width 6.5–8.3 mm.

California (exact locality not recorded).

In the male, which is the sex described above, the pubescent pad of the first anterior tarsal joint is very small and dense, broadly rounded and occupies fully apical third. The female is larger in the body and with the elytra relatively distinctly more inflated but with the prothorax not at all smaller, even relatively, This species is closely related to *convergens*, but differs in its relatively larger prothorax, with the oblique sides more broadly and distinctly sinuate toward base, in the larger size of the body, less sexual difference in the form of the hind body and several other features. Three specimens.

25. **B. porcatus** n. sp.—Rather narrow and elongate, moderately ventricose, alutaceous, without trace of bluish lustre, the elytra rather shining; body deep black throughout. *Head* somewhat stout and only moderately elongate, distinctly rugose, the genæ feebly developed, deeply incised; supra-orbital ridges strong but shorter than usual; antennæ scarcely ⅗ as long as the body, just visibly thicker toward base, the first joint distinctly thicker, obconic and only slightly shorter than the next two, the seta very nearly at the apex. *Prothorax* relatively well developed, dilated and rounded anteriorly, feebly subangulate before the middle, the sides becoming deeply sinuate posteriorly, parallel and straight in basal fifth or sixth, the angles right and bluntly rounded; base fully ½ the maximum width and about as wide as the head; disk feebly convex, the impressions slight; reflexed margins moderate. *Elytra* almost evenly elongate-elliptical, not very full at the humeri, the latter obliquely rounded, 2¾ times as long as the prothorax and barely 2¼ times as wide, ⅖ longer than wide, the reflexed margins fine; disk strongly convex and rugose, the striæ coarse and deeply impressed, the punctures rather large but widely separated and not very distinct; intervals convex, irregular and much interrupted throughout, gradually more frequently toward the sides but with the striæ readily traceable throughout the width. Length 15.0 mm.; width 6.4 mm.

California (locality not known).

This species is distinct, among those of the present group, in having the sides of the prothorax sinuate deeply behind and parallel for a considerable distance before the base as in *ventricosus* and many other forms not closely related. It is allied to *sculptipennis*, but the single male before me differs from the corresponding sex of that species in its more elongate and less ventricose form and very much larger prothorax; the sexual characters are similar.

26. **B. dissolutus** Schaum—Berl. Zeitschr., 1863, p. 72, pl. 3, fig. 6; Horn: Trans. Am. Ent. Soc., VII, 1878, p. 179.

Rather elongate and moderately ventricose, polished, the pronotum feebly alutaceous; body deep black throughout, with very feeble bluish lustre, the elytral margins with blue or violaceous metallic reflection. Head stout, only moderately elongate, the vertex feebly, transversely wrinkled near the middle; genæ feebly developed and having a minute cleft-like incisure; supra-orbital ridges fine posteriorly, strong at the antennæ, the latter not $\frac{3}{5}$ as long as the body, slender, only slightly thicker basally, the first joint thicker, not quite as long as the next two but much longer than the third. Prothorax relatively large, slightly wider than long, strongly dilated and rounded anteriorly, strongly rounded just before the middle, the sides thence strongly oblique and straight to the subbasal sinuation, thence almost parallel and straight to the base, the angles very slightly more than right; base not quite $\frac{1}{2}$ the maximum width and subequal in width to the head; disk feebly convex, the impressions rather distinct; margins moderately deep and almost vertically reflexed. Elytra almost evenly elliptical, $\frac{2}{5}$ longer than wide, $2\frac{3}{4}$ times as long as the prothorax and not more than twice as wide, rather full and strongly rounded at the humeri; reflexed margins moderate and having coarser, widely separated punctures; disk moderately convex, with rather fine but broadly and deeply impressed striæ bearing moderate and somewhat distant punctures, the intervals relatively wide and only moderately convex, frequently interrupted near the sides and apex but only occasionally and partially toward the middle. Length 15.5–17.0 mm.; width 6.4–7.3 mm.

California (near Monterey). The pubescent pad of the first anterior tarsal joint of the male above described, occupies much less than apical half. There do not seem to be any papillæ on the

under surface of the fourth joint, but the spiniform setæ are longer and denser. The intercoxal plate of the mesosternum is abruptly narrowed and elevated anteriorly and with the usual deep posterior emargination. The female is larger but differs extremely little in general form, the elytra being but slightly more inflated, though relatively much larger when compared with the prothorax in every dimension.

I am not certain that this is the true *dissolutus* of Schaum, but it answers the description somewhat better than any other species before me.

27. **B. sinuatus** n. sp.—Rather strongly ventricose and only moderately elongate, polished ; head and prothorax very feebly alutaceous, the convex portions of the latter polished ; body deep black, the pronotum near the sides and concave elytral margins distinctly violaceous. *Head* moderately stout and elongate, the vertex virtually smooth ; genæ feebly developed, with the nick small and angulate ; supra-orbital ridges fine, strong anteriorly where the inner slope is quite gradual ; antennæ scarcely $\frac{3}{5}$ as long as the body, slender, scarcely thicker basally, the first joint only slightly stouter, obviously shorter than the next two, the seta fully at apical sixth. *Prothorax* relatively moderate in size, as long as wide, strongly inflated, with the sides rounded anteriorly, strongly oblique and nearly straight thence to the subbasal sinuation, becoming parallel and straight in basal fifth or sixth ; angles right ; base $\frac{1}{2}$ the maximum width but scarcely as wide as the head ; disk feebly but distinctly convex, the impressions fine though distinct ; reflexed margins moderate. *Elytra* subelliptical, notably full at the strongly rounded humeri and quite pointed at apex, slightly more than $\frac{1}{3}$ longer than wide, about 3 times as long as the prothorax and $2\frac{2}{5}$ times as wide, the reflexed margin moderate, with coarse and widely spaced punctures ; disk rather strongly convex, with deep and widely impressed striæ which are rather coarsely but unevenly punctured ; intervals convex, frequently more or less completely interrupted toward the suture and very much broken up laterally, the striæ readily traceable, however, throughout. Length 16.5–18.0 mm. ; width 6.8–8.0 mm.

California (locality unknown).

The male here described represents a species closely allied to *dissolutus*, but differing in its more inflated hind body and relatively much smaller and less anteriorly dilated prothorax, this not differing so much in relative size in the male and female ; it also differs in having the elytral striæ deeper and the intervals more frequently interrupted throughout. The sexual characters and mesosternal plate are nearly similar. The female is larger, but only slightly more ventricose than the male. Three specimens.

28. **B. politus** n. sp.—Very nearly similar to *sinuatus* but smaller, with less ventricose and less rugose elytra, and differing in the form of the pro-

thorax, which is here as long as wide and apparently a little longer, dilated and rounded anteriorly, distinctly angulate before the middle, the sides thence strongly oblique and sinuate to the base but not becoming parallel, the angles a little more than right and rather blunt; base narrow, barely ½ the maximum width and about as wide as the head. *Elytra* elliptical, nearly ⅔ longer than wide, not quite 3 times as long as the prothorax and 2⅓ times as wide, rather full at the humeri, the sides becoming very feebly arcuate thence to the apical obliquity; disk sculptured nearly as in *sinuatus* but rather less convex, especially toward base, the intervals more even and much less interrupted toward the suture. Length 13.5 mm.; width 5.8 mm.

California (Hoopa Valley, Humboldt Co.).

The papillæ on the under surface of the anterior tarsi in the single male before me are very coarse, and the pad of the first joint scarcely occupies more than apical third; there do not seem to be any papillæ on the fourth joint, but, as usual, the stiff setæ are longer and more numerous.

This species is differentiated from *sinuatus* by a number of characters relating to general habitus, such as smaller size, less ventricose form, more flattened and less strongly sculptured elytra and somewhat differently shaped prothorax; extended series would probably prove them mutually distinct at a glance, but having a single specimen only, I have hesitated some time before separating *politus* and giving it a specific status.

29. **B. corpulentus** n. sp.—Short, stout and strongly ventricose, black, strongly shining, the pronotum only very slightly alutaceous, faintly violaceous toward the sides, the elytra also violaceous in the reflexed lateral margin. *Head* only slightly elongated, the vertex very feebly, transversely wrinkled; genæ feebly developed, with a moderately large angular notch; supra-orbital ridges fine posteriorly; antennæ slender, scarcely ⅗ as long as the body, slightly thickened toward base, the first joint dilated as usual, much shorter than the next two but longer than the third. *Prothorax* relatively well developed, short, much dilated and rounded anteriorly, distinctly wider than long, the sides very strongly oblique and feebly arcuate behind the middle to the sinuation, which is strong and abrupt, becoming straight and parallel in a little more than basal sixth; angles right; base narrow, less than ½ the maximum width and slightly narrower than the head; disk quite distinctly longitudinally convex, the impressions distinct; lateral margins rather deep and strongly reflexed. *Elytra* short and broadly elliptical, rather full at the humeri, less than ⅓ longer than wide, not quite 3 times as long as the prothorax and but little more than twice as wide; margins rather widely reflexed toward base and with coarser punctures; disk moderately convex, with rather coarse and impressed striæ, becoming very coarse and irregular laterally, the striæ not very coarsely but distinctly punctured, the intervals convex, remotely subinterrupted, becoming narrow, irregular and more broken up laterally. Length 12.7–14.7 mm.; width 6.0–7.0 mm.

California (Oakland, Alameda Co.).

The description given above refers to the male, and the female is so different that it might readily be regarded as specifically distinct; the elytra are not much broader than in the male, but are very strongly convex, with the striæ finer and more uneven and the intervals flatter, but the prothorax is relatively very much smaller, feebly dilated anteriorly and fully as long as wide. The sexual characters are nearly as in the preceding species, from which this can be readily distinguished by its short inflated hind body.

30. **B. compositus** n. sp.—Rather elongate, moderately ventricose, black, the head and pronotum very dull, the latter without trace of bluish lustre; elytra polished, the concave side margins with a faint tinge of bluish; body deep black throughout. *Head* stout and only slightly elongate, the genæ moderately developed, with a small angular notch; supra-orbital ridges strong; eyes rather large; vertex transversely wrinkled; antennæ nearly $\frac{3}{5}$ as long as the body, slender, the basal joint thicker as usual, not as long as the next two, but very much larger than the third. *Prothorax* relatively rather well developed, very slightly wider than long, dilated and broadly rounded anteriorly, subangularly rounded at the middle; sides strongly sinuate posteriorly, becoming parallel and straight in basal sixth; angles right; base broad, somewhat exceeding $\frac{1}{2}$ the maximum width and wider than the head; disk feebly convex, finely, unevenly rugulose in a generally transverse direction, the impressions distinct, the reflexed margins rather strong. *Elytra* evenly elliptical, not very full and broadly, obliquely rounded at the humeri, $\frac{2}{5}$ longer than wide, 3 times as long as the prothorax and about $2\frac{2}{5}$ times as wide; reflexed margins distinct and more coarsely punctured; disk moderately convex, strongly striate, the striæ broadly impressed and rather coarsely but somewhat unevenly punctured, the intervals convex, occasionally subinterrupted internally and much broken up broadly toward the sides. Length 17.0 mm.; width 7.6 mm.

California (locality not recorded).

This species is quite distinct from any of the preceding in the more opaque and rugulose and duller pronotum, with the base relatively much wider, and in having the spongy-pubescent sole of the first tarsal joint in the male more extended, occupying nearly apical half. The intercoxal plate of the mesosternum is deeply concave anteriorly, near the narrowed anterior prolongation. A single specimen.

31. **B. fulleri** Horn—Trans. Am. Ent. Soc., VII, 1878, p. 179.

This species is said to resemble *marginatus* somewhat in form and in the obliquity of the sides of the prothorax posteriorly, but

to be larger and of rather more robust outline. It is black, with a feeble violaceous tinge, the concave margins of the elytra more strongly violaceous. The sides of the prothorax are oblique behind and very feebly sinuate. Length 15–16 mm.

Oregon. I have assumed that *fulleri*, which was attached to *marginatus* as a variety, is in reality a distinct species with sixteen elytral striæ, and not fourteen, which is the condition in *marginatus* and allied metallic species. It is, of course, quite possible that my assumption in regard to the number of elytral striæ may be wrong, as Dr. Horn states that the striæ in his group "II A" do not exceed fourteen in number. In any event, whether classed with *marginatus* or *dissolutus*, there can be very little doubt of the specific validity of the form under consideration.

32. **B. interruptus** Menét.—Bull. Acad. Petrop., 1844, ii, p. 54; Motsch.: Bull. Mosc., 1859, iii, p. 162, pl. 3, fig. 10; Horn: Trans. Am. Ent. Soc., VII, 1878, p. 180; *constrictus* Lec.: Trans. Am. Phil. Soc., 1853, p. 398.

Strongly ventricose, polished, the head and pronotum not alutaceous; body deep black, the pronotum with a feeble bluish reflection, the reflexed side margins of the elytra violaceo-metallic in lustre. Head moderately stout and elongate, nearly smooth, the supra-orbital ridges fine posteriorly; genæ feebly developed, the notch minute and angulate; antennæ fully $\frac{3}{5}$ as long as the body, slender, the basal joint but slightly stout and much shorter than the next two. Prothorax slightly wider than long, strongly dilated and rounded anteriorly, more narrowly rounded at the middle, the posterior sinuation deep; sides becoming straight and parallel in basal sixth; angles right but bluntly rounded; base narrow, not quite $\frac{1}{2}$ the maximum width and much narrower than the head; disk feebly convex, the median line rather distinct; sublateral impressions short and feeble; lateral margins rather deep and strongly reflexed. Elytra short and inflated, $\frac{1}{3}$ longer than wide, 3 times as long as the prothorax and nearly $2\frac{1}{2}$ times as wide, rather full and strongly rounded at the humeri; reflexed margins moderate, coarsely punctured; disk strongly and evenly convex, the fourteen striæ rather broadly and deeply impressed and almost perfectly even throughout the entire width, the punctures moderately coarse; intervals convex, feebly subinterrupted, more obviously toward tip. Length 12.5 mm.; width 6.0 mm.

California (Sta. Cruz). The male above described has the an-

terior tarsi even more feebly dilated than usual, with the papillæ of the under surface rather coarse and only moderately dense, the pad of the first joint small and apical. It agrees quite well with the figure of Motschulsky, but is probably not a very characteristic specimen, as the elytral intervals are almost entire. The form figured by Motschulsky under the name *ventricosus*, which is referred to this species by Dr. Horn, is certainly quite different, but it is probable also that it does not represent *ventricosus*; it is wholly indeterminate from the figure.

33. **B. cupripennis** n. sp.—Elongate, feebly ventricose, shining throughout, black, the elytra bright metallic cupreous-red, with a brilliant green margin; legs and under surface piceous. *Head* moderately stout and elongate, triangular, the genæ very feebly developed and having an exceedingly small angular nick; supra-orbital ridges very fine posteriorly, moderately strong at the antennæ, the latter slender, scarcely $\frac{3}{5}$ as long as the body, with the basal joint notably thicker and nearly as long as the next two, the seta at apical seventh or eighth; vertex nearly smooth. *Prothorax* relatively rather well developed, about as long as wide, moderately dilated and rounded anteriorly, the sides more strongly rounded well before the middle, thence oblique and almost straight to the base, the angles much more than right and bluntly rounded; base fully $\frac{1}{2}$ the maximum width and as wide as the head; disk feebly convex, the median line rather deeply impressed; sublateral longitudinal impressions distinct, extending before the middle; reflexed margins moderate. *Elytra* evenly elongate-elliptical, nearly $\frac{1}{2}$ longer than wide, 3 times as long as the prothorax and scarcely more than $2\frac{1}{4}$ times as wide, obliquely and evenly rounded and not very full at the humeri; reflexed margins ample, with very coarse punctures; disk evenly and moderately convex, the striæ coarse, slightly uneven, broadly impressed, deep laterally but rather shallow toward the suture, the punctures coarse, uneven and close-set; intervals convex, but slightly uneven at the sides. Femora stout. Length 15.0 mm.; width 6.0 mm.

Washington State.

The two males before me represent a species allied to *marginatus* but slightly larger, and differing greatly from that, and all other forms of the present group, in the thicker femora and much more dilated anterior tarsi. The intercoxal plate of the mesosternum is rounded, flat, with abruptly elevated and rather fine side margins and the usual large posterior emargination.

34. **B. insularis** n. sp.—Elongate, rather feebly ventricose, shining throughout, black throughout the body and legs, the elytra rather dusky cupreo-violaceous, with narrow and bright æneous side margins. *Head* rather stout, moderately elongate, the vertex almost smooth, the broadly impressed transverse nuchal constriction rather pronounced; genæ feebly developed, with

the angular notch small and inconspicuous; supra-orbital ridges moderately strong and inwardly inclined at the antennæ, fine posteriorly; antennæ slender, moderate in length, the basal joint distinctly thicker, claviform, not as long as the next two, the seta at apical eighth. *Prothorax* well developed, scarcely as long as wide, moderately dilated and broadly rounded throughout anteriorly, the sides not more strongly rounded before, but becoming gradually oblique behind, the middle, to the base, with a scarcely visible ante-basal sinuation; angles much more than right and bluntly rounded; base wide, more than ½ the maximum width and fully as wide as the head; disk feebly convex, the median line strong; sublateral impressions deep, extending far before the middle; reflexed margins rather fine. *Elytra* elongate-elliptical, fully ½ longer than wide, nearly 3½ times as long as the prothorax and 2⅓ times as wide; humeri evenly and obliquely rounded; reflexed margins ample but rather finely punctate; disk strongly, evenly convex, the striæ deep and broadly impressed, rather uneven, obscurely punctate, readily traceable throughout the width, the intervals convex, much broken up toward the sides and finely so toward the apex. Legs very slender. Length 17.5 mm.; width 6.8 mm.

Queen Charlotte Islands.

This fine species is founded upon a single perfect specimen, recently sent to me by Mr. Fletcher and probably taken by Mr. Keen. It is a female, but the species will be readily known from *marginatus* by its much larger size, more elongate and convex elytra, larger and less posteriorly narrowed prothorax, with the sides less sinuate toward base and several other characters.

35. **B. marginatus** Fisch.—Ent. Russ., I, p. 79, pl. 7, fig. 1; Dej.: Spec., II, p. 12; Esch.: Mem. Mosc., 1823, vi, p. 98; Mann.: Bull. Mosc., 1843, p. 185; Horn: Trans. Am. Ent. Soc., VII, 1878, p. 178.

Moderately elongate and ventricose, shining throughout, the pronotum not distinctly alutaceous, black, the elytra cupreous-red with bright metallic-green or brassy-green reflexed margins. Head rather small, not much elongated, the vertex smooth; supra-orbital ridges fine posteriorly; genæ very feebly developed with the notch small; antennæ very slender, not ⅗ as long as the body, the basal joint but slightly thickened and much shorter than the next two. Prothorax relatively moderate is size, as long as wide, the sides dilated and evenly rounded anteriorly, becoming oblique and broadly, feebly sinuate to the base, which is narrow, ½ the maximum width and barely as wide as the head; angles much more than right and very bluntly rounded; disk but feebly convex, the median line and two diverging sublateral impressions deep and distinct, the latter extending to apical third; reflexed margins

moderately strong. Elytra narrowly elliptical, about $\frac{2}{5}$ longer than wide, 3 times as long as the prothorax and $2\frac{2}{5}$ times as wide, not full but obliquely and broadly rounded at the humeri, the reflexed margins distinct and coarsely, distantly punctate; disk evenly and moderately convex, deeply and coarsely striate, the striæ coarsely and unevenly punctate; intervals convex, distinct to the sides but frequently interrupted, more tuberculosely so toward tip. Length 12.0–14.0 mm.; width 4.5–5.5 mm.

Alaska to Oregon. The female type described above is from Fort Wrangel, Alaska, and presumably represents the true *marginatus*. Other representatives differ slightly; for example, a male from Oregon has the oblique sides of the prothorax almost straight behind, the sublateral impressions feebler and the surface alutaceous with violaceous reflection toward the sides. Another female, without locality label, has a smaller and shorter prothorax, which is duller black and without distinct indication of metallic lustre; finally a number of specimens from Washington State are very small, perhaps representing a geographical subspecies. The assumed typical form has the sides of the prothorax distinctly sinuate toward base, and the sublateral impressions very long and strong; as is frequently the case, the prothorax of the female is smaller than in the male.

36. **B. confusus** n. sp.—Elongate, feebly ventricose, shining throughout, the pronotum not distinctly alutaceous, piceous-black, piceous beneath, the elytra metallic æneo-cupreous in lustre, the reflexed margins brighter viridi-æneous. *Head* moderately stout and elongate, the median parts of the vertex very slightly wrinkled transversely; supra-orbital ridges fine posteriorly; genæ scarcely at all developed, with a very minute angulate notch; antennæ slender, scarcely $\frac{3}{5}$ as long as the body, the base joint moderately stout, about as long as the next two, the seta at apical sixth. *Prothorax* relatively moderate in size, scarcely as long as wide, moderately dilated and rounded anteriorly, broadly subangulate at apical $\frac{2}{5}$, the sides thence oblique and almost perfectly straight to the base; angles much more than right, bluntly rounded; base rather wide, somewhat more than $\frac{1}{2}$ the maximum width and fully as wide as the head; disk feebly convex, the median line and sublateral impressions deep, the latter sigmoid, extending to apical fourth. *Elytra* elongate-elliptical, not at all full but broadly and obliquely rounded at the humeri, nearly $\frac{1}{2}$ longer than wide, not quite 3 times as long as the prothorax and not more than twice as wide, the reflexed margins moderate in width and coarsely, unevenly punctate; disk evenly and moderately convex, coarsely and irregularly punctate, the punctures arranged in vaguely defined, feebly impressed striæform series, the intervals convex and much disintegrated. Length 11.7–13.7 mm.; width 4.8–5.6 mm.

Locality doubtful.

The male, which is the type of the above description, represents a species closely allied to *marginatus*, but differing in its less anteriorly inflated prothorax, with feebler reflexed margins and much straighter oblique sides, more narrowly elongate-elliptical elytra, with less impressed and very much less defined elytral striæ, in its rather smaller size, more æneous and less coppery-red elytra and other characters. The anterior tarsi are moderately dilated, with the soles very finely and extremely densely papillose, that of the first joint small, rounded and occupying scarcely apical third, the fourth without papillæ beneath; the intercoxal plate of the mesosternum is deeply concave. The female is larger, with the prothorax relatively smaller, but otherwise similar, and the elytra but little more broadly elliptical and not at all fuller at the humeri. The two examples before me are without indication of locality, but were undoubtedly taken at some point on the coast between northern California and Alaska.

37. **B. cordatus** Lec.—Trans. Am. Phil. Soc., 1853, p. 399; Horn: Trans. Am. Ent. Soc., VII, 1878, p. 178.

Rather elongate and moderately ventricose, highly polished throughout and deep black, sometimes with a faint violaceous metallic reflection. Head rather small, moderately elongate, the transverse nuchal constriction behind the eyes distinct though shallow; vertex perfectly smooth; genæ very feebly developed, the notch small or evanescent; supra-orbital ridges becoming fine posteriorly; antennæ slender, scarcely $\frac{3}{5}$ as long as the body, the basal joint moderately thickened, but longer than the next two, the seta between apical fifth and sixth. Prothorax relatively moderate in size, nearly as long as wide, rounded anteriorly, narrowly rounded just before the middle, the sides rather strongly sinuate nearer the base than usual, the angles nearly right and bluntly rounded; base $\frac{1}{2}$ the maximum width and as wide as the head; disk feebly convex, the median line rather distinct, the sublateral impressions parallel and strong, ending abruptly at basal $\frac{2}{5}$; side margins moderately reflexed. Elytra elongate, subcordiform, nearly $\frac{1}{2}$ longer than wide, 3 times as long as the prothorax and about $2\frac{1}{4}$ times as wide, full toward the humeri, which are strongly and subtransversely rounded at base, gradually pointed and rounded in ogive behind the middle; margins well reflexed and coarsely punctured; disk very depressed, nar-

rowly declivo-convex near the sides, the striæ rather fine, impressed, somewhat discontinuous, especially toward the sides, where, contrary to the general rule, they are less impressed; punctures moderately coarse and somewhat uneven; intervals slightly convex and even throughout. Length 13.0–13.7 mm.; width 5.0–5.5 mm.

California (near Monterey).

The intercoxal plate of the mesosternum seems to vary greatly in different individuals, in the female described above being more elongate than usual, convex and without elevated margins, while in another specimen, which is seemingly its male, the plate is rounded and deeply concave. The anterior tarsi of the male are extremely feebly dilated, with the pubescent pad of the first joint very small and apical. A female from Santa Cruz seems to indicate a variety or perhaps a closely allied species, with larger elytra, narrower base of the prothorax and more obtuse basal angles.

Although similar to the others in general organization, this species departs remarkably in facies because of the depressed elytra, which are more abruptly rounded at base and more gradually pointed at apex. It represents as distinct a group as *marginatus*, and there are possibly several closely allied forms included at present in our cabinets.

PEMPHUS Motsch.

The species of Pemphus are much less numerous than those of Brennus, but inhabit the same faunal regions; they are, however, more boreal, and do not extend to the southward further than the northern parts of California. They are distinguished by the feeble and subeffaced sculpture of the elytra, the latter being much more depressed toward base, narrower and elongate form of body, longer legs, and by the spinose and not pubescent inner lobe of the maxilla. Owing to the relatively much more elongate abdomen of the female, the femora extend only to the tips of the elytra in that sex; in the male they extend far beyond the elytra.

The three species before may be readily distinguished among themselves as follows:—

Basal joint of the anterior tarsi in the male densely pubescent beneath almost throughout its entire extent; prothorax widest and broadly rounded at the sides far before the middle; sides of the elytra reflexed and with coarse punctures.

Prothorax not longer than wide, the sides distinctly sinuate near the base; elytra red-brown with polished metallic green or cupreous side margins. **angusticollis** Fisch.

Prothorax elongate, the sides feebly oblique toward base and less distinctly sinuate; elytra deep black, generally with more obscure metallic margins. **velutinus** Menét.

Basal joint of the anterior male tarsi densely pubescent beneath only in apical half; prothorax widest and broadly angulate at the sides barely before the middle; sides of the elytra not reflexed and obscurely sculptured, having merely a minute elevated edge..... **longipes** n. sp.

In the first two species the reflexed side margins of the prothorax are also occasionally feebly metallic greenish in lustre.

P. longipes.—Elongate, moderately ventricose; body above deep and opaque black throughout, the legs and under surface shining and with an extremely faint violaceous lustre. *Head* very elongate, the vertex smooth; genæ thick, but little dilated, with a small angular notch beneath the eyes; neck long, without trace of constriction; supra-orbital ridges fine behind, moderate and subangulate above the antennæ; eyes relatively rather small in size; antennæ very long, nearly ¾ as long as the body, slender, feebly thickened toward base, the first joint thicker, elongate, feebly sigmoid, 2.7 mm. in length, much shorter than the next two; third joint 2 mm. in length. *Prothorax* distinctly longer than wide, moderately dilated anteriorly, the sides feebly convergent and broadly, feebly arcuate from just before the middle to the apex, more strongly oblique and nearly straight posteriorly to basal sixth, there sinuate and thence parallel and straight to the base; angles right and slightly blunt; base ⅔ the maximum width and scarcely as wide as the head; disk almost flat, the impressions all extremely feeble; reflexed side margins nearly as in *velutinus*. *Elytra*, viewed perpendicularly, ⅖ longer than wide, 3 times as long as the prothorax and 2¾ times as wide, widest near apical third, the sides thence feebly and evenly arcuate to the base, the humeri wholly undistinguishable, disk in profile vertical behind and slightly produced at tip, very feebly convex anteriorly, not striate but with minute subobsolete punctures arranged serially, with three intervals on each a little more pronounced as usual; margin nearly flat, more coarsely but unevenly punctate, the punctures broadly impressed and with a single series of minute, widely separated but strongly elevated granules; minute subvertical edge finer than that of the prothorax. Length 20.0 mm.; width 8.8 mm; length of head to extremity of mandibles 5.7 mm.; length of hind tibia 9.5 mm.

California (Humboldt Co.).

I obtained a single male of this species near the coast; it was at the time walking with rather slow straddling gait on the surface of a decayed log. The sides of the elytra are very oblique before posterior third, and there is scarcely a trace of the broadly rounded humeri of *angusticollis* and *velutinus*.

CALOSOMA Weber.

The following species, apparently hitherto undescribed, have been received from time to time from various sources.

C. marginalis n. sp.—Elongate and parallel, moderately convex, deep black, without metallic lustre except in the narrow concave elytral margins, which are violaceous; surface shining as in *lugubris*. *Head* less than ½ as wide as the prothorax, feebly rugose toward the eyes but not distinctly punctate at any part; epistomal impressions narrow but very deep; antennæ moderate, the third joint fully 3 times as long as the second. *Prothorax* transverse, fully twice as wide as long, widest just behind the middle where the sides are bluntly angulate, thence strongly convergent and evenly arcuate to the apex and rather more convergent and straight to the base, meeting the latter in an obtuse though very well marked angle, the immediate vertex of which is prominent and acute; base and apex equal in width, the former broadly arcuate, feebly sinuate at each side, the middle much more advanced posteriorly than the basal angles; disk rather feebly but evenly convex, broadly impressed laterally toward base, the side margins defined merely by a thick reflexed bead; median line fine but distinct; surface smooth except a few fine irregular creases and wholly impunctate. *Elytra* elongate, nearly twice as long as wide, ¼ wider than the prothorax, only just visibly wider at apical third; side margins moderately wide, becoming very fine at the humeri; surface smooth, moderately convex, with equal and wholly unimpressed series of extremely minute and subeffaced punctures, with a few scattered coarse punctures toward base, the lateral margin rather strongly and somewhat distantly punctate and with an entire series of minute elevated granules; three dorsal series effaced and barely traceable. *Legs* moderate in length; deep black throughout. Length 26.0 mm.; width 10.0 mm.

Arizona?

The single male from the Levette cabinet, without locality label, represents a species allied to *lugubris*, but differing in its much narrower and more elongate form, violaceous elytral margins, relatively broader prothorax and absence of punctures on the head. The anterior tarsi are rather strongly dilated, with the first three joints densely pubescent beneath, and the hind trochanters are simple.

C. sponsa n. sp.—Moderately stout, the head and prothorax very small when compared with the elytra; integuments deep black throughout, without trace of metallic coloring at any part, the surface strongly shining and very smooth. *Head* small though rather more than ½ as wide as the prothorax, feebly rugulose, finely and sparsely punctulate, the epistomal impressions moderate; labrum transverse at apex, with a small rounded median notch near which the surface is deeply impressed and finely pubescent, the setigerous punctures coarse, 4 in number; antennæ rather short, less than ½ as long as

the body, the third joint about 3 times as long as the second. *Prothorax* transverse, barely twice as wide as long, widest at the middle where the sides are prominently rounded, thence moderately convergent and strongly arcuate to the apex, oblique and straight to the base, the latter barely as wide as the apex, broadly, feebly arcuate, deeply sinuate for a short distance near the angles, which are right and posteriorly prominent, extending fully as far backward as the median parts ; disk broadly, evenly and feebly convex, impressed near the basal angles, the side margins defined by a thick reflexed bead ; surface smooth and almost sculptureless, but becoming rapidly coarsely and sparsely punctured at the sides, densely and more finely punctured in the impressions ; median line fine and feeble. *Elytra* oblong, scarcely more than $\frac{2}{5}$ longer than wide, $\frac{5}{6}$ wider than the prothorax, slightly wider at apical third than at base, the side margins very narrowly reflexed ; surface moderately convex, smooth, with wholly unimpressed equal series of extremely minute punctures, which become slightly more evident and to some extent transverse toward base, the three series on intervals 4, 8 and 12 composed of very fine and widely spaced but quite distinct asperate punctules ; marginal punctures only visible toward base, the submarginal series asperate and distinct throughout. *Legs* rather slender, black and non-metallic. Length 15.7 mm.; width 7.2 mm.

Utah.

The male type has the anterior tarsi quite moderately dilated, the three basal joints pubescent beneath, the pubescent pad of the first joint transversely oval and occupying less than apical third ; the hind trochanters and intermediate tibiæ are unmodified. This species is to be placed near *peregrinator* Guér. (*carbonata* Lec.), but differs greatly in its small size, much smaller head and prothorax, structure of the labrum and in many other details.

C. parviceps n. sp.—Rather stout, with relatively very small head and prothorax, deep black and devoid of metallic reflection throughout, the integuments rather shining. *Head* $\frac{3}{5}$ as wide as the prothorax, evenly and feebly convex, not rugose but finely, evenly and rather closely punctured, becoming smooth at apex where the lateral impressions are narrow and very deep; labrum dilated and rounded at the sides, transverse at apex, with a broad and very shallow median sinuation, the surface transversely impressed; antennæ short and rather stout, only slightly longer than the head and prothorax, the third joint fully 3 times as long as the second. *Prothorax* moderately transverse, about $\frac{4}{5}$ wider than long, widest at the middle where the sides are obtusely and somewhat bluntly angulate, thence very moderately convergent and broadly, evenly arcuate to the apex, oblique and straight behind, becoming slightly sinuate near the base, the latter rather narrower than the apex and somewhat as in the preceding species; disk broadly and very feebly convex, polished, feebly wrinkled, finely and rather sparsely punctate, the punctures becoming coarser and subcoalescent at the sides, more numerous in the impressions near the basal angles; side margins defined by a rather thin,

strongly reflexed bead; median line fine and very feeble. *Elytra* oblong, scarcely more than ⅓ longer than wide, fully twice as wide as the prothorax, only slightly wider at apical third than at base, the sides very feebly arcuate and very narrowly reflexed; disk moderately convex, with scarcely impressed even series of extremely fine punctures, which become stronger toward base, the intervals there becoming transversely broken by arcuate impressed lines as in *peregrinator*, the three series of interstitial asperate punctules very feeble; marginal punctures visible only toward base, the submarginal asperate punctures rather widely separated and uneven. *Legs* moderate in length and quite slender. Length 16.5 mm.; width 7.5 mm.

Arizona.

The anterior tarsi of the male have the first three joints rather feebly dilated and densely pubescent beneath, the pad of the first joint small and apical; the hind trochanters and intermediate legs are not modified. *Parviceps* also belongs near *peregrinator*, and greatly resembles the preceding species at first glance; it however differs in sculpture, structure of the labrum, in its much deeper epistomal impressions, less transverse prothorax with less rounded side angles, shorter and broader elytra and in several other minor characters.

C. monticola n. sp —Ovoidal, moderately stout, rather feebly convex, deep black throughout, without metallic lustre at any part, the surface polished, the elytra becoming somewhat alutaceous laterally and toward apex. *Head* well developed, a little more than ½ as wide as the prothorax, convex, minutely and sparsely punctate, rugose laterally behind the epistomal impressions, which are narrow and deep; labrum impressed in the middle, the apex angularly but feebly emarginate throughout the width; antennæ rather short, the outer joints glabrous on the compressed sides. *Prothorax* transverse, not quite twice as wide as long, widest near apical third, the sides evenly arcuate anteriorly, becoming more convergent and nearly straight behind, the basal angles rounded and prominent posteriorly; base transverse and slightly narrower than the apex; disk very feebly convex, broadly impressed sublaterally toward base, the sides rather narrowly explanato-reflexed, the marginal bead rather thin and strongly reflexed; surface minutely, sparsely punctate, the punctures becoming rapidly larger and transversely coalescent or rugose toward the sides; median line very fine. *Elytra* oval, scarcely ¼ longer than wide, ⅔ wider than the prothorax, wider behind the middle than at base, the sides rather strongly arcuate; disk very moderately convex, with impunctate striæ which become gradually strongly impressed toward the sides, but almost completely effaced toward the suture, the intervals convex laterally, frequently interrupted by transverse arcuate lines enclosing asperate tubercles, both becoming very pronounced toward the sides and apex but wholly obsolete toward the suture, where the intervals are flat and entire; three interstitial series traceable by fine but slightly more pronounced and remotely separated

asperate granules. *Legs* rather short and slender. Length 16.0 mm.; width 7.8 mm.

Nevada (Reno).

Related rather closely to *luxata*, but differing in the very unequal elytral sculpture, less punctured head and other characters. It belongs to the subgenus Callisthenes of Fischer.

C. arcuata n. sp.—Stout, deep black throughout, without metallic reflection at any part except a feeble trace of bluish lustre in the reflexed elytral margins. *Head* moderate in size, finely, sparsely punctate except anteriorly, and feebly rugose, especially toward the sides, the median parts of the front at a short distance behind the apical margin slightly tumid, a small median impression between the tumidity and apex quite distinct; epistomal impressions deep; labrum subtruncate at apex, with a feeble sinuation at the middle, the edge thence toward each side also feebly sinuate, the dorsal impression coarsely hairy; mandibles stout, striato-rugose, punctulate, the apex very acute and much produced internally; antennæ short, barely as long as the head and prothorax, the compressed sides of the outer joints only glabrous toward base. *Prothorax* large, transverse, not quite twice as wide as long, widest slightly before the middle, the sides evenly arcuate anteriorly, becoming slightly less so behind the middle to the basal angles, which are broadly arcuate posteriorly and only slightly produced backward, the base transverse; apex broadly, angularly emarginate, with a coarse flattened bead; disk broadly and moderately convex, broadly explanato-reflexed and broadly impressed toward the basal angles, the marginal bead narrow and strongly reflexed; surface confusedly creased, minutely and densely punctulate, also finely punctured near apex and base and more coarsely toward the sides, densely in the impressions; median line very fine. *Elytra* oval, scarcely $\frac{1}{5}$ longer than wide, not more than $\frac{1}{4}$ wider than the prothorax and but little more than $2\frac{1}{2}$ times as long; sides strongly, evenly arcuate, the margins rather narrowly, but strongly reflexed and confusedly punctate throughout; disk very strongly convex, with extremely minutely punctulate series which are feebly impressed toward apex, wholly unimpressed elsewhere except 3, 4, 7, 8, 11 and 12, which are somewhat impressed throughout; flanks becoming feebly punctulate toward the marginal concavity; the entire surface is also feebly, transversely and unevenly creased in a scratch-like manner; three interstitial series not traceable. *Legs* rather short. Length 18.5 mm.; width 8.5 mm.

Arizona.

This distinct species of the subgenus Callisthenes is to be compared only with *latipennis* of Horn, but differs in the female, the only sex of either known to me, in its shorter and stouter form, with much larger prothorax, which is broadly explanate and reflexed toward the basal angles, the latter being much more broadly arcuate, in its very much more convex elytra with more arcuate sides and more confused marginal punctuation, relatively larger head, and in numerous other features.

In *latipennis*, the sides of the prothorax are parallel and quite evenly arcuate throughout, and the edges of the elytra behind the humeri are said to have a few serrations, of which there is no trace in *arcuata;* at the same time, however, there is no trace of them discoverable in the single specimen before me from Tulare Co., California, which I have assumed to represent *latipennis.*

Notes. — Of *calida*, a species of extended distribution, I have before me specimens which seem to represent rather well defined subspecies. One of these, from Lake Superior, which I have called **stellata,** is similar in form to the typical *calida*, but has the elytral striæ quite feeble, with the greenish-golden spots very large and brillant and more approximate than in the normal forms. Another, from Keokuk, Iowa, which may be named **expansa,** has the prothorax very large, with the sides very broadly reflexo-explanate and distinctly greenish-metallic in lustre; the elytra in the male are only a fourth wider than the prothorax, but quite similar in every other respect to those of the normal forms, except that the coppery spots are smaller. A third, from Las Vegas, New Mexico, which may be denominated **laticollis,** has the body larger, broader and less convex than in the normal forms, the elytra more parallel and only just visibly wider behind the middle than at base; the antennæ are deep black throughout, and do not become pale toward apex as in the usual forms, and the coppery spots of the elytra are obscure.

In a similar manner with regard to *sayi*, I have taken specimens at the electric lights in Norfolk, Va., which represent quite a marked subspecies; it is narrower, with the middle tibiæ of the male less bent and the pubescent pad of the first tarsal joint entire; in the larger western forms of *sayi*, this pad is divided along the median line by a glabrous area. This subspecies may be called **virginica.**

A female specimen from Indiana appears to form a subspecies of *frigida*, which may be named **levettei.** It is similar in form and sculpture to the normal forms, but is a little more elongate, with a smaller and less transverse prothorax, which has no trace of the concave lateral margin of *frigida*, the surface being even in curvature to the reflexed marginal bead; the disk is distinctly less than twice as wide as long. In the typical forms the surface of the elytra has a feeble violaceous lustre, but in *levettei* the entire surface is deep black.

A subspecies of *obsoleta*, represented before me by two males from Fort Wingate, New Mexico, and from an unrecorded locality in Kansas, may be named **microsticta**; it is nearly similar in form and size to *obsoleta*, but has the elytra still shorter and broader, with the striæ less impressed, the transverse lines feebler and more approximate, with the punctures at the points of juncture with the striæ more pronounced; there are three well marked series of distinct though small, distant, steel-blue or violet foveolæ on each elytron. In the form and sculpture of the head and prothorax it is similar to *obsoleta*, but in the latter the foveolæ of the elytra are all but obsolete.

Pimeliodes Walk, *zimmermanni* Lec. and *striatula* Lec., are distinct species and should not be considered subspecies of *luxata*. The first differs from the second in its larger size, broader form, more pronounced elytral tubercles and much finer and closer punctuation of the head and pronotum; as shown by a good series these characters are perfectly constant. The third differs from either of the others in its deeper striæ, more irregularly interrupted intervals and less pronounced tubercles; the sculpture of the head and pronotum are nearly as in *zimmermanni*.

ELAPHRUS Latr.

The following species is allied rather closely to *lævigatus*, and represents it in the middle coast regions of California.

E. politus n. sp.—Moderately narrow, convex, black and highly polished throughout, the legs dark rufo-piceous; head with but feeble traces of metallic lustre at any part; depression near the basal angles of the prothorax greenish, the foveolæ of the elytra with a green or violaceous metallic reflection. *Head* scarcely as wide as the prothorax, nearly smooth on the convexities, finely punctate in the small depressions, of which there are two arranged longitudinally on the median line of the vertex, one, punctiform, at each side of the neck near the eye, and the usual feeble two on the front; vertex separated from the neck by a sensible transverse impression; labrum impressed along the median line; antennæ moderate. *Prothorax* slightly wider than long, the sides strongly rounded, constricted before the base, the sides thence divergent and straight to the basal angles, which are right and not in the least blunt; base broadly, evenly arcuate; disk convex, smooth, impunctate except in the sublateral basal depression; sublateral pit before the middle feeble, slightly punctate; impressed median line short between the vague transverse angular impressions, which also have a few scattered punctures; under surface minutely and densely punctured on the propleuræ, the hypomera impunctate. *Elytra* $\frac{2}{5}$ longer than wide, nearly twice as wide as the prothorax, slightly

widest behind the middle, smooth and impunctate, the foveolæ nearly as in *lævigatus* but smaller, feebler and less perfectly defined. *Legs* moderate in length, the femora somewhat metallic greenish, the anterior tibiæ and tarsi violaceous; first four joints of the anterior male tarsi feebly dilated. Length 6.5–6.8 mm.; width 2.8–3.0 mm.

California (San Francisco).

The three specimens, which I took in the suburbs of the city, represent a species which is smaller than *lævigatus*, and which differs besides in its smaller head, feebler pronotal impressions with shorter median line, and still finer and very much denser punctuation of the propleuræ.

PROMECOGNATHUS Chaud.

The body in this genus is very smooth, highly polished and impunctate, even the elytral striæ being wholly obliterated. There are two supra-orbital setæ, and usually two anterior and one basal seta at each side of the pronotum. Of the two described species, *crassus* has the elytra much shorter and broader than *lævissimus*, and is a stouter insect in all its proportions; the following is almost as much more slender than *lævissimus*, as the latter is narrower than *crassus*.

P. debilis n. sp.—Slender, moderately convex, very highly polished and sculptureless, dark piceous-brown in color throughout. *Head* nearly as in *lævissimus*, except the mandibles which are shorter, the left much less prolonged inwardly and less aciculate at apex. *Prothorax* fully ¼ longer than wide and much narrower than in *lævissimus*, widest near apical third, the sides evenly rounded, gradually convergent posteriorly, sinuate near the base, the sides thence straight and parallel to the basal angles, which are slightly obtuse but not in the least blunt and feebly reflexed dorsally, the impression of the surface being quite deep. *Elytra* evenly elliptical, ⅗ longer than wide, ⅖ wider than the prothorax and less than twice as long; sides broadly and evenly arcuate. Length 9.0 mm.; width 2.8 mm.

California (Sta. Cruz).

There are no well marked structural characters to distinguish this species from either of the other two, but on comparing the type with a very large series of *lævissimus*, its distinctness seems to be apparent at once. It is only because of the completeness of this series and the absence of any approach to the present form, even in its smallest components, that I have deemed it advisable to found a species upon the unique individual taken by myself about ten years ago. The type bears no special evidences of immaturity other than its paler color.

DIPLOCHILA Brull.

The species of Diplochila are quite limited in number and closely resemble each other in external characters. The labrum is deeply sinuate at the middle of the apex, with the surface convex and unimpressed, the left mandible acute, the right broadly truncate in a line which is longitudinal when the mandibles are closed. The first three tarsal joints of the male are somewhat excentrically dilated, and are coarsely and uniformly squamulose beneath. The forms known to me may be thus identified :—

Hind angles of the prothorax well defined.

Prothorax but slightly narrower at apex than at base; outer striæ of the elytra generally somewhat distinct; head larger, much more than ½ as wide as the prothorax.

Elytra black throughout; apical angles of the prothorax more feebly deflexed and well rounded.....**impressicollis** Dej.

Elytra black, the intervals alternately dark rufo-testaceous in color; apical angles of the prothorax strongly deflexed and narrowly rounded. **alternans** n. sp.

Prothorax much narrower at apex than at base, the marginal bead at apex much less broadly reflexed and the head smaller, generally about ½ as wide as the prothorax or less; outer striæ of the elytra more or less completely obliterated.

Prothorax widest at the middle.....**cliens** n. sp.

Prothorax widest well behind the middle.

Larger species, the apical thoracic angles well rounded. **laticollis** Lec.

Small, the apical angles right and only slightly blunt; surface more polished.....**nupera** n. sp.

Hind angles of the prothorax obtuse and ill-defined; outer striæ of the elytra feeble.....**obtusa** Lec.

The new species referred to in the table are described below.

D. alternans.—Moderately stout and convex, black, the elytral intervals 2, 5 and 7 rufous; head polished, the remainder feebly alutaceous in lustre. *Head* convex, nearly ⅔ as wide as the prothorax, the eyes rather prominent and the neck but slightly constricted; frontal impressions rather pronounced; mandibles feebly punctulate toward tip; palpi piceous, the apices of the joints pale. *Prothorax* nearly ⅗ wider than long, widest at or just before the middle, the sides almost evenly arcuate; basal angles more than right but not rounded; disk very feebly convex, more strongly as usual toward the apical angles, flattened toward the basal angles, the inner impression pronounced, the outer extremely feeble; median line fine but distinct; surface wholly impunctate. *Elytra* ⅗ longer than wide, ⅓ wider than the

prothorax and more than 3 times as long; sides parallel and very feebly arcuate; apex obtuse, with very feeble sinuation; striæ pronounced throughout the width, feebly punctulate, the intervals perceptibly convex. Under surface and legs deep black and polished throughout. Length 14.5 mm.; width 6.0 mm.

Lake Superior (Bayfield).

The smaller size of the body, still more distinct outer striæ, and wider basal angles of the prothorax, will readily distinguish this species from *impressicollis*, in addition to the characters of the table.

D. cliens.—Rather stout and quite convex, deep black throughout, the upper surface somewhat strongly shining, the head polished. *Head* moderate in size, not distinctly more than ½ as wide as the prothorax, convex, the eyes moderately prominent and the neck scarcely constricted; frontal impressions rather shallow; mandibles extremely minutely and remotely punctulate toward tip; palpi slender, piceous, the apices of the joints paler; antennæ slender, but slightly longer than the head and prothorax, the basal joint but slightly thicker. *Prothorax* ⅗ wider than long, widest at the middle where the sides are rather broadly rounded, thence feebly convergent and straight to the basal angles, which are slightly more than right; apex ¾ as wide as the base; surface broadly convex, flattened and broadly depressed toward the basal angles, the impression rather feeble; median line fine. *Elytra* barely ⅖ longer than wide, fully ⅖ wider than the prothorax and barely 3 times as long; sides parallel and distinctly arcuate; striæ subobliterated toward the sides, rather deep toward the suture, not evidently punctulate. Length 15.0 mm.; width 6.5 mm.

Kansas.

Allied somewhat to *laticollis* but more convex, and with more oval and convex and much less alutaceous elytra, less prominent eyes and less obliterated sublateral striæ of the elytra; it is described from the female. *Laticollis* occurs at Austin, Texas, in its normal form.

D. nupera.—Moderately stout and convex, deep black and strongly shining throughout. *Head* small, orbicular, convex and highly polished, the eyes moderate in size and prominence; frontal impressions rather shallow; palpi blackish-piceous, the last joint gradually pale in apical half; antennæ short and slender. *Prothorax* more than ½ wider than long, widest behind the middle, the sides broadly arcuate, only very feebly convergent and feebly sinuate toward the basal angles, which are more than right and not at all blunt, converging and broadly arcuate anteriorly; apex scarcely more than ⅔ as wide as the base; surface broadly and moderately convex, flat toward the basal angles, the impression deep and longitudinally sulciform; median line fine. *Elytra* scarcely ⅖ longer than wide, about ⅓ wider than the prothorax and scarcely 3 times as long; sides parallel and feebly arcuate; apex rather acute, the sin-

uation scarcely traceable ; surface quite strongly convex, the first four striæ distinct, feebly punctulate, becoming deep near the suture, the remaining striæ obsolete, the fifth only traceable toward base. Under surface alutaceous, the legs rather short and slender. Length 9.6 mm.; width 4.2 mm.

Florida (Lake Worth).

The single female representing this species, by far the smallest of the genus, was recently taken and very kindly placed in my cabinet by Mr. F. Kinzel, of Palm Beach.

CALATHUS Bon.

The following species belongs to the *gregarius* division, in the neighborhood of *obscurus* and *behrensi*.

C. guadalupensis n. sp.—Rather stout, elongate-oval, somewhat convex, dark rufo-testaceous in color, the elytra generally a little darker ; head and pronotum moderately shining, the elytra opaque and lustreless, the minute reticulations strongly marked. *Head* longer than wide, evenly convex, feebly constricted at base, the eyes moderately convex ; antennæ slender, scarcely ½ as long as the body, the basal joint distinctly shorter than 3–6. *Prothorax* scarcely ¼ wider than long, the sides almost evenly and moderately arcuate, more convergent near the apex, just visibly narrower at base than behind the middle ; apex between ⅔ and ¾ as wide as the base, broadly sinuate ; disk feebly convex, rather broadly flattened toward the basal angles, the margins gradually less broadly reflexed thence to the apex ; basal angles rounded ; subbasal impressions very feeble ; median line very fine, obliterated toward base and apex. *Elytra* oval, moderately convex, rather less than ½ longer than wide, nearly ½ wider than the prothorax and 2⅖ times as long; sides broadly and evenly arcuate; striæ very fine and feeble, obsolescent toward the sides, the intervals broad and perfectly flat; three punctures of the third interval distinct and near the third stria. Under surface shining, the legs rather long and slender. Length 11.5–12.0 mm.; width 4.7–5.0 mm.

Guadalupe Island.

This species differs from *behrensi* and *obscurus* in its much larger size, and, from the former, also in the very much smaller and feebler punctures of the eighth stria. It is represented in my cabinet by a very homogeneous series of six examples.

GALERITA Fabr.

There are before me two examples which seem to represent species not hitherto described. The members of this genus very closely resemble each other both in form and color, but there are certain constant differences in the vestiture, form of the head and color of the legs, which serve amply for identification. The following form is closely allied to *janus*:—

G. thoracica n. sp.—Rather stouter than *janus*, but similar in color and vestiture. *Head* much longer than wide, broadly subtruncate and rounded at base, the sides becoming nearly parallel behind the eyes; antennæ long and rather thick, the basal joints unusually long. *Prothorax* large, a little longer than wide, similar in form to that of *janus* but more finely and densely punctate and pubescent. *Elytra* black with scarcely a trace of violaceous reflection, dull, ⅗ longer than wide, slightly more than twice as wide as the prothorax and about three times as long; outline and sculpture nearly as in *janus*, the pubescence a little denser. Under surface blackish, the prosternum, propleuræ and legs pale throughout. Length 21.0 mm.; width 7.0 mm.

Florida.

Differs from *janus* in its larger size, and especially in its much larger and more finely and closely sculptured prothorax. The joints of the antennæ are relatively more elongate, and the first is less narrowed at base and less clavate.

G. infirma n. sp.—Color as in *californica*, the body smaller and less elongate. *Head* but slightly elongate, similar at base, in sculpture and in the large rufous central spot to *californica;* antennæ but slightly more than ½ as long as the body. *Prothorax* relatively small, but slightly wider than the head, somewhat longer than wide, nearly similar to that of *californica*, but with the sides more reflexed toward apex and less convergent and more feebly sinuate toward base. *Elytra* unusually short, ½ longer than wide, 2⅖ times as wide as the prothorax and only 3 times as long, distinctly wider behind the middle than at base; striæ quite coarse and somewhat impressed; punctures fine and close-set. Length 14.0 mm.; width 5.0 mm.

Arizona (Yuma). Mr. Dunn.

Allied to *californica*, but differing very much in its shorter, more coarsely striate elytra and smaller prothorax. The pubescence is in great part rubbed off from the basal and sutural parts of the elytra, but that which remains does not seem to be erect as it is in *californica* and *lecontei*, which last appear to be mutually different. This is much the smallest species of the genus within our territorial limits, as *thoracica* is the largest.

There are before me two well marked geographic subspecies of *bicolor;* the first, which may be called **obliqua**, being larger and stouter than the normal forms, though nearly similar in other respects, except that the prothorax is narrowed anteriorly from a point more posterior; it occurs in the extreme southern parts of Florida, the specimens in my cabinet being from Lake Worth. The second is represented by an example somewhat smaller than the typical forms, with relatively shorter elytra and more abbreviated prothorax, the latter not longer than wide, and the head

is less narrowed behind the eyes, with the tempora more rounded; it occurs in Iowa and may be named **intermedia.**

SCYDMÆNIDÆ.

There is undoubtedly a strong resemblance in habitus between the Scydmænidæ and Pselaphidæ, but whether this similarity indicates a real affinity due to community of descent, or has been gradually brought about in widely diverging descent-stems by reason of common habits and environments, may be a debatable point. The principal reasons for believing that the latter may be the case, are the entire or subentire elytra, and the purely and exceedingly constant pentamerous tarsi in the most widely divergent forms, both of these characters being completely foreign to the Pselaphidæ. The truth is probably, that the Scydmænidæ have developed from staphylinid architypes, but along lines widely diverging from the Pselaphidæ. The abdominal sutures are straight, as a rule, in the Scydmænidæ and arcuate in the Pselaphidæ, but in the tribe Eumicrini, which is distinguished from all other scydmænids by a large vertical pygidium and pselaphidous hind trochanters, the abdomen cannot be distinguished from that of a purely typical pselaphid, the sutures being strongly arcuate.

It is not necessary to dwell at length upon the general anatomical characters of the exoskeleton, as most of these will be brought out in the tables given below, but it may be proper to point out some of those which seem to be either peculiar to the Scydmænidæ, or prominent features of this family. The head is borne on a constricted neck, except in the Cephenniini, which constitute for this reason a very isolated tribe. In two cases, Chevrolatia and Lophioderus, the neck is not abruptly constricted, but is elongated and deeply excavated upon its dorsal surface. The eyes are present in every species known to our fauna, except *Cephennium anophthalmicum;* they are usually rather finely faceted. The occurrence of foveæ on the vertex is very rare in comparison with the Pselaphidæ, but when present they are usually of generic import, as for example in Veraphis, this genus being otherwise proved distinct from Eutheia by the strong carination of the mesosternum. The mandibles are generally small, but in the European Leptomastax, become remark-

ably developed, and, in that genus, the labrum, which is small and transverse as a rule, also becomes enormously large. The variations of the antennæ and palpi are explained in the tables of tribes and genera.

The prothorax is an important somite in classification, especially the circular impressed foveæ which are generally visible near the basal margin, and the relative extent of the prosternum before the coxæ. The form of the elytral apices, impressions at the base of the elytra, form of the pygidium, and form and degree of separation of the hind coxæ, are all useful taxonomic elements, but varying in importance in different tribes. The degree of separation of the coxæ is, for example, much more unstable in the Euconnini than in the Scydmænini, the latter tribe having, as one of its most persistent characters, the subcontiguous coxæ, with a constant narrowly cleft metasternal prolongation. The elytra never have a trace of epipleuræ, and this may be considered an additional bond of affinity with the Pselaphidæ.

The side-pieces of the metasternum are rarely exposed in the Scydmæninæ, but are always distinct in the Clidicinæ, where also the hind coxæ have an entirely different form. The mesosternum is generally more or less carinate, but becomes perfectly flat in some genera, such as Eutheia. Its parapleuræ are peculiarly modified in the Scydmæninæ, but in so constant a manner that but little use can generally be made of them in classification. The middle coxæ are entirely closed by the sterna, the mes-episternum being tumid and setose and elevated above the surface of the metasternum behind it, the epimeron, when present, forming the obliquely sloping connecting piece, except in the remarkable genus Ceramphis, where the conical prothorax seems to abut directly upon the smooth and very extended metasternum.

The legs are generally rather short, the femora always more or less clavate, the tibiæ simple and without terminal spurs, the anterior frequently flattened within toward apex and densely clothed on the modified surface with short stout spinuliform vestiture, this being a highly developed feature in the Euconnini, but so constant and fixed that it affords no variations of tangible weight in classification. The claws are small, slender, divergent and simple.

The taxonomic value of the maxillary palpi of course varies greatly in different groups of Coleoptera. In the Aleocharini of

the Staphylinidæ, a very extensive group, with structures varied in almost every direction to an extraordinary degree, it has an extremely fixed and constant form, while in the Omalini, the most radical differences only serve for generic division, and, in extreme cases of development such as Lesteva, they vary much from species to species, in the two sexes, or even to some extent individually. In the Pselaphidæ, palpal structure is also of subordinate value, as it may vary greatly within nearly all the tribes, but in the Scydmænidæ, the structure of this organ is of great importance because of its constancy throughout groups of genera and species, which it is evident, for other reasons, ought to be associated together. Any decided divergence in the palpal structure is held in this revision to have tribal weight, and is always accompanied by other important peculiarities of structure.

Another character of vastly more importance in the present family than in many other groups of the Coleoptera, and one which has been singularly overlooked thus far, is the scutellum. Even when very minute this sclerite displays an astonishing constancy throughout the various genera possessing it, and, in one case, its complete absence forms an important tribal element. It would be as remarkable an exception for any scydmænid having the fourth palpal joint subulate, the neck narrow and the eyes anterior in position, to present the slightest vestige of a scutellum, as it would for a harpalid beetle to exhibit a claviform antenna. The scutellum has been made use of extensively in the following memoir, and will be found to be a character of considerable value.

The Scydmænidæ form an extensive family, but the species are so small in size as a rule, and live so concealed a life, that they are seldom collected in numbers, and, with the exception of some six or eight species, they appear besides to be either individually rare or local in habitat. That they are very numerous in species, is proved by the collecting of Mr. P. Jerome Schmitt about his home in the mountains of Pennsylvania, where, in a single isolated region, and that not one of the best, he has succeeded in bringing to light about 37 distinct species, belonging to some 11 genera. All of these were placed in my hands and have given a substantial advance to our knowledge of these minute animals.

The Scydmænidæ are resolvably into two subfamilies by the following characters :—

Antennæ generally distinctly clavate, usually geniculate, but with the basal joint short or moderate in length; posterior coxæ always transverse or transversely oval; metasternum large, the abdomen short; elytra never striato-punctate; scutellum visible or not; fourth joint of the maxillary palpi invariably small ..... SCYDMÆNINÆ

Antennæ generally filiform or gradually enlarged toward tip, but without a distinct club, strongly geniculate, with the basal joint greatly elongated; posterior coxæ small, globular, with a subconic and truncate prolongation, widely separated; metasternum short, the abdomen elongate; elytra striato-punctate except in Mastigini, and always entire; scutellum completely obsolete; fourth palpal joint more variable in size..... CLIDICINÆ

These subfamilies are both represented within the limits of the United States, but are exceedingly unequal in numerical importance, the first being abundant in genera and species, while the second is represented by a few rare forms in the desert regions of the extreme southwest. The Clidicinæ are much better represented in Europe by three remarkable genera.

Brathinus, which was attached to the Scydmænidæ by LeConte, is a staphylinid, belonging to the tribe Omalini, in the vicinity of Lesteva; it cannot, therefore, be included in the table given above.

SCYDMÆNINÆ.

This subfamily, which comprises within its limits all but one of the described species of the United States, may be conveniently separated into ten tribes by the characters which follow:—

Fourth joint of the maxillary palpi finely aciculate, subulate and oblique; antennæ widely separated at base.

Prosternum short and deeply sinuate before the coxæ; hind coxæ generally attaining the sides of the body.

Head borne on a long, moderately constricted and deeply sculptured neck; scutellum present, though very minute..... LOPHIODERINI

Head borne on a neck which is short and abruptly constricted.

Neck narrow; eyes anterior in position, more median in Smicrophus; scutellum completely wanting; hind coxæ usually distinctly separated but varying greatly in this respect..... EUCONNINI

Neck wide; eyes basal or subbasal in position; scutellum always present; prothorax generally cordiform; hind coxæ constantly very approximate but not contiguous..... SCYDMÆNINI

Prosternum rather long and pubescent before the coxæ; neck somewhat wide, abruptly constricted; eyes and scutellum variable; prothorax oboval; hind coxæ attaining the sides of the body, or very nearly; species all very minute..... OPRESINI

Fourth joint of the maxillary palpi obtuse, obscure or fused rigidly to or within the apex of the third, varying greatly in form, never acuminate or subulate, always spongiose in structure and sometimes wanting.

Hind coxæ transverse, extending to the sides of the body, rather widely separated; antennæ widely separated at base.

Head deeply inserted and strongly deflexed, the neck invisible; eyes basal, frequently wanting; elytra entire or subentire, more or less rounded at tip; prosternum very short and deeply emarginate before the coxæ; scutellum large and distinct.....CEPHENNIINI

Head exserted and but feebly inclined, the neck exposed and constricted; eyes subbasal; third palpal joint smaller and more coarsely pubescent.

Third palpal joint stouter, oval, obliquely truncate at tip, the truncature oval and spongiose, the fourth wanting; prosternum short and deeply emarginate before the coxæ.....ASCYDMINI

Third joint subobconic, the fourth minute and indistinct at its apex; prosternum rather long and well developed before the coxæ.

EUTHEIINI

Hind coxæ oval, not extending to the sides of the body; prosternum always long and well developed before the coxæ; antennæ very approximately inserted at the apex of the front; neck strongly constricted.

The front prolonged and rounded in the form of a broad tubercle; antennal cavities separated by a thin partition which does not extend to the apex of the tubercle; metasternal side-pieces concealed but visible behind, where they extend inward and partially enclose the coxæ, the latter remotely separated; elytra truncate, exposing a feebly declivous dorsal pygidium; third palpal joint stout, oval, obliquely truncate at tip, the truncature feebly convex and spongy; hind trochanters normal .....CHEVROLATIINI

The front truncate and not prolonged; fourth palpal joint small, obtuse and rounded, inserted axially within the apex of the third which is elongate; pygidium vertical or greatly inclined, the ventral segments arcuate, at least toward apex.

Posterior trochanters normal and small; antennal cavities large and completely coalescent under the thinned and horizontal apical surface of the front; metasternal side-pieces very narrow and concealed by the elytra, but projecting inwardly behind to meet the coxæ.....LEPTOSCYDMINI

Posterior trochanters elongate; antennal cavities separated by a narrow partition, which extends to, and forms part of, the apical declivity of the front.....EUMICRINI

Of these tribes, the Ascydmini, Eutheiini, Chevrolatiini and Leptoscydmini have not as yet occurred upon the Pacific coast, and the Eumicrini are only represented there by a single extraordinary form in the extreme south, which does not properly form

part of the Pacific coast fauna; the Opresini are probably represented in those regions by *Scydmænus ovithorax* Bndl.

Lophioderini.

The very elongate neck, with peculiar dorsal sculpture, indicates a marked isolation of Lophioderus from any other type of Scydmænidæ, and in fact renders it as aberrant among the tribes with subulate fourth palpal joint, or Scydmænidæ subulipalpi, as Chevrolatia is among those having that joint rigidly fused to the third; it should therefore constitute a distinct tribal group.

LOPHIODERUS n. gen.

The head in this genus is porrect and greatly exserted, borne upon a long, moderately constricted neck, which is carinate and biexcavate upon its dorsal surface, the eyes median in position, and the antennæ widely separated and strongly modified in structure in the male. The maxillary palpi are of the usual type prevailing in the large tribes Euconnini and Scydmænini, the fourth joint being distinct, subulate, finely acuminate and inserted obliquely in the hollowed apex of the third joint. The mandibles are unusually small, and appear to be hidden when closed under the large declivous and conical clypeus. The prothorax is more elongate than usual in this family, carinate at the sides posteriorly and impressed transversely near the base, but without submedian foveæ, the prosternum deeply emarginate and quite short before the coxæ, with an oval pubescent foveiform excavation before each.* The scutellum is present between the bases of the elytra, but is extremely small and somewhat elongate in form. The elytra are entire, conjointly rounded at apex and are of the usual structure and pronounced convexity prevailing in the Euconnini.

The metasternal side-pieces are entirely covered by the elytra, the hind coxæ very wide, extending to the sides of the body and completely contiguous, the posterior edge of the metasternum

* The fact that this abbreviation of the prosternum before the coxæ is as evident in the present type, with elongated prothorax, as is the large development of this part in forms like Eutheia, with short and broad prothorax, shows that the relative development of the prosternum before the coxæ is a really important tribal character, and is not due directly to the mere greater or less elongation of the prothorax.

having a very minute circular emargination at the middle, which is evidently a remnant of the deep fissure observable in the narrow produced intercoxal process in Scydmænini. The middle coxæ are contiguous, with the acetabula apparently confluent and bordered along their entire posterior edge with short dense pale and scale-like pubescence. The abdomen is normal and the dorsal pygidium not exposed. Legs generally well developed, slender, with the femora noticeably clavate and the hind tarsi slender, the four basal joints decreasing more or less rapidly in length.

The four species represented before me may be separated as follows:—

Body uniformly testaceous or ferruginous in color.
Larger, the transverse impression of the pronotum narrowly but completely interrupted at the middle.
Prothorax feebly constricted at the sides near the base; male antennæ without an excavated arc, the fifth joint short but much wider than the others .....1 **biformis**
Prothorax parallel and not constricted near the base, the male antennæ with a deep and regular arcuate excavation internally involving joints four to six.....2 **arcifer**
Smaller and more slender, the transverse impression more broadly but feebly and incompletely interrupted at the middle.....3 **gracilis**
Body black, the elytra rufo-testaceous; transverse impression of the pronotum not at all interrupted.....4 **myops**

In geographical range the genus Lophioderus is confined, as far as known, to the Pacific coast line, from the vicinity of Monterey probably to the Aleutian Peninsula. It will prove to be rather abundant in species.

1. **L. biformis** Mäkl.—Bull. Mosc., 1852, p. 330 (Scydmænus.)

Elongate-oval, somewhat stout, polished, impunctate, dark rufo-testaceous, the legs and antennæ slightly paler and more brownish; pubescence sparse, pale and coarse, longer, denser and bristling on the neck, short and erect at the sides of the prothorax, rather short, even and strongly recurved on the elytra. Head with the neck distinctly longer than wide, the eyes at the middle of the sides, moderate in size but very convex and prominent; antennal prominences large but feeble, the front broadly impressed and feebly declivous between them, the clypeus long, with a conical, strongly declivous surface and broadly rounded apex; labrum short and transverse; mandibles small; neck long, broadly constricted, the sides from the eyes to the prothorax feebly convergent and

broadly sinuate, broadly depressed above and with two deep impressions, separated by a narrow longitudinal carina. Antennæ* about $\frac{1}{2}$ as long as the body, rather stout, the last four or five joints constituting a parallel, moderately dilated club; first joint cylindrical, twice as long as wide, not quite as long as the next two and slightly thicker; second only slightly shorter, feebly obconical, $\frac{4}{5}$ longer than wide, more than twice as long as the third and slightly thicker; third not quite as long as wide, more rounded internally; fourth $\frac{4}{5}$ wider than the third, transversely oval, $\frac{1}{2}$ wider than long; fifth $\frac{2}{5}$ wider than the preceding, obtusely produced externally, nearly $\frac{3}{5}$ wider than long, wider than the succeeding two and as wide as eight to ten; sixth parallel-sided, almost as long as wide; seventh obtrapezoidal, slightly wider than the sixth, a little wider than long; eight to ten slightly wider than the seventh, subequal, distinctly transverse; eleventh not wider, conoidal at apex, as long as the two preceding; joints one to three polished and sparsely setose, four to eleven finely asperulate and densely clothed with short coarse hairs in addition to the setæ. Prothorax parallel, slightly longer than wide, $\frac{1}{4}$ wider than the head, broadly rounded at the sides anteriorly, moderately constricted toward base; surface carinate at each side toward base, with a transverse impression near the base, stronger toward the middle, where it is interrupted by a narrow abrupt elevation not rising above the general surface; at each side along the lateral carinæ there is an elongate foveiform impression. Scutellum very small, slightly elongate. Elytra elongate-oval, fully $\frac{1}{2}$ longer than wide, $2\frac{1}{2}$ times as long as the prothorax and twice as wide, slightly wider and a little more rounded at the sides just before the middle; apex conjointly rounded; humeri obsolete, the sides oblique to the base; humeral plica long, acutely elevated, the impression long and deep; inner fovea large and deep, its impression large, becoming rapidly shallow posteriorly; subsutural impressions obsolete, the suture not beaded. Legs long,

*As in nearly all clavicorn Coleoptera, the enlarged outer joints of the antennæ are not exactly circular in cross section, and the form of these joints therefore varies with the point of view, sometimes very greatly. Throughout the present revision the dimensions given refer to the broadest or compressed side of the antennæ. It is hoped that the considerable detail given will be found valuable to some degree in identifying closely allied species, and will not prove to be wholly unwarranted by reason of individual variation. As far as I have been able to discover this variability is not pronounced.

the femora all strongly clavate. Length 2.0 mm.; width 0.8 mm.

Alaska (Prince of Wales Island) and Queen Charlotte Islands. The specimen described is a male, taken by Mr. H. F. Wickham. Mr. Keen states that he has taken it at Massett, but I have not seen any examples from that region. This and the next are by far the largest and stoutest species of the four known to me.

2. **L. arcifer** n. sp.—Suboval, rather stout and ventricose, polished, impunctate, dark rufo-testaceous throughout, the legs and antennæ but slightly paler; pubescence moderately abundant, coarse, not very long, suberect and strongly recurved, shorter and not conspicuous on the prothorax, denser and coarse at the sides, very sparse and inconspicuous on the head except toward base, where there are many long erect and conspicuous hairs and slender spinules bristling over the nuchal excavations. *Head* with the neck a little longer than wide, the surface convex anteriorly but gradually declivous to the neck, which is deeply excavated transversely, the hollow bisected by a fine longitudinal carina of moderate elevation; clypeus moderate in length, broadly rounded, the surface subconical; eyes not very large, at the middle of the sides, convex and prominent. *Antennæ* distinctly longer than the head and prothorax, stout, gradually enlarged distally; basal joint cylindric, as long as the next two and thicker, scarcely ½ longer than wide; second feebly obconic, scarcely ¼ longer than wide; third equally wide but very short, sublenticular, twice as wide as long; four to six enlarged and closely connected, the three having within a common deeply hollowed excavation, which is even and extremely finely, densely rugulose and pubescent, the hairs very short; seven to eleven normal, gradually and slowly increasing in thickness; seventh about ⅔ as wide as the sixth; seven to ten almost perfectly similar in form, obtrapezoidal, slightly wider than long; eleventh as long as the two preceding, gradually and obliquely pointed. *Prothorax* slightly longer than wide, ⅖ wider than the head; sides carinate and parallel in about basal half, feebly convergent and slightly arcuate thence to the apex, which is truncate and nearly ¾ as wide as the base; disk transversely impressed near the basal margin, the impression very finely and abruptly interrupted at the middle, and also with a deep, slightly elongate-oval fovea at each side near the carina and not connected with the transverse impression. Scutellum small, elongate-oval, flat. *Elytra* ½ longer than wide, 2⅖ times as long as the prothorax and twice as wide, oval, widest near basal ⅖ but with the sides broadly and very evenly arcuate, gradually parabolic behind; humeri obliquely and more strongly rounded; humeral plica long, oblique, acute, the subhumeral impression long, narrow, deep and oblique; basal fovea distinct, its impression large, oval; subsutural impressions subobsolete, the suture very faintly beaded toward base; the bead becoming lost at the apex of the scutellum. *Legs* well developed, the four anterior femora rather strongly clavate, the posterior evidently less strongly; tibiæ gradually very narrow toward base; tarsi slender. Length 1.9 mm.; width 0.7 mm.

Oregon (Astoria). Mr. Schwarz.

The singular arcuate excavation on the interior surface of antennal joints four to six is very distinct is the male above described. This species resembles *biformis* in the general form and size of the body, but differs profoundly in the antennæ, there being no suggestion of a regular arcuate excavation in that species, in its longer and more abundant pubescence, more strongly and obliquely narrowed elytra posteriorly, smaller lateral fovea of the pronotum and in many other features.

3. **L. gracilis** Lec.—Proc. Acad. Nat. Sci., Phila., 1852, p. 155 (Scydmænus).

Elongate-oval, narrow, polished, impunctate, pale ferruginous throughout, the antennæ and legs concolorous; pubescence sparse, moderate in length, coarse, pale in color, recurved on the elytra, more abundant on the neck. Head longer than wide, the neck carinate and biimpressed above as usual; eyes median, moderate in size, not very convex; clypeus as in *biformis*. Antennæ very long, $\frac{2}{5}$ as long as the body; first and second joints equal, cylindric, twice as long as wide; third scarcely narrower, nearly as long as wide, less than $\frac{1}{2}$ as long as the second; fourth very large, rounded, more than twice as long and wide as the third; fifth narrow, longer than wide; sixth obliquely and angularly prolonged internally, transverse, wider than any other joint; inner sides of joints four to six forming an even sinuosity; seventh small, oval, rather longer than wide; eighth a little larger, subglobular, rather narrower than the ninth and tenth, which are almost as long as wide; eleventh not quite as long as the two preceding, obtusely ogival; ninth to eleventh just visibly increasing in thickness. Prothorax distinctly elongate, rather gradually and arcuately narrowed anteriorly, parallel and carinulate at the sides toward base, $\frac{1}{4}$ wider than the head; disk transversely and feebly impressed near the base, the impression feebly interrupted at the middle and with a small and very feeble fovea near each basal angle. Scutellum minute, elongate. Elytra fully $\frac{1}{2}$ longer than wide, $2\frac{1}{2}$ times as long and $2\frac{1}{3}$ times as wide as the prothorax, almost evenly elliptical, the humeri somewhat visible; humeral plica moderate in length and acuteness, the impression distinct and elongate; inner fovea deep; disk somewhat flattened near the suture toward base, the suture acutely elevated but not beaded in basal third. Legs long and slender, the femora only moderately clavate. Length 1.5 mm.; width 0.58 mm.

California. The inner arcuate outline formed by the strongly modified joints four to six of the male antennæ, reminds us of a similar structure in Arthmius, and, in fact, the sixth joint here is almost exactly similar to the eighth joint of the male antenna of *A. globicollis*. This internal sinus, formed by the joints, is probably of direct use in clasping the antennæ of the female during copulation.

This species differs greatly from *biformis* and *arcifer* in its smaller size, much narrower form, narrower prothorax, and, from the former, in the male antennæ, which are radically different; these are relatively very much longer and more slender than in *arcifer*.

4. **L. myops** n. sp.—Elongate-oval, rather ventricose, polished and impunctate, black, the elytra, legs and antennæ pale rufo-testaceous; pubescence coarse, pale, bristling but short on the flanks of the prothorax, moderately short and recurved on the elytra. *Head* oval, distinctly elongate, very convex anteriorly, gradually depressed posteriorly, where the neck is deeply excavated on each side of the distinct median carina as usual; basal parts of the head and sides of the neck bristling with long stiff pale setæ; eyes rather small, feebly convex, with about ten rather coarse facets, median, the tempora behind them very long, convergent and exactly straight to the narrowest part of the neck; clypeus conically declivous, rounded at apex; labrum transverse, parallelogramic, truncate; mandibles invisible in repose. *Antennæ* barely $\frac{2}{5}$ as long as the body, regular, gradually and rather strongly incrassate toward apex; first joint cylindric, $\frac{1}{5}$ longer than wide, slightly longer and thicker than the second, the latter distinctly obconic, $\frac{1}{2}$ longer than wide, as long as the next two and obviously thicker; four to six subequal, about as long as wide and more or less rounded, the third a little shorter and scarcely as wide, shorter than wide, six to eleven increasing perfectly evenly in width; seventh feebly, the eighth more strongly, transverse; ninth $\frac{2}{3}$, tenth $\frac{4}{5}$, wider than long, obtrapezoidal; eleventh stout, oval, obtusely and very obliquely ogival at tip, about as wide as the two preceding. *Prothorax* scarcely longer than wide, fully $\frac{1}{3}$ wider than the head, feebly and somewhat arcuately narrowed anteriorly from near the middle, and just visibly narrower and strongly carinate at the sides toward base; surface transversely impressed near the base, the impression not extending to the sides, where there is a deep elongate fovea just within each carina, also a large deep fovea on each flank below the carina. Scutellum very minute. *Elytra* fully $\frac{1}{2}$ longer than wide, $2\frac{3}{4}$ times as long as the prothorax and a little more than twice as wide, strongly, evenly arcuate at the sides and widest at the middle; humeri almost obsolete; humeral plica narrow, moderate in length and rather feeble, the adjacent impression very feeble; inner fovea large, deep, rounded, without a prolonged impression; subsutural impressions feeble but broadly visible toward base, the suture finely and very feebly elevated but not beaded. *Legs* long, slender, the femora

abruptly but moderately clavate; tarsi moderate. Length 1.35 mm.; width 0.6 mm.

California (San Francisco).

The simple antennæ and absence of secondary modification, show that the two specimens, which I took some years ago, are both females, but the species departs widely from *gracilis* in the shorter, less pubescent palpi, much more anteriorly thickened head, coarser, non-interrupted basal line of the pronotum and much longer lateral foveiform impressions; it also differs in the coloration of the body. The metasternum is broadly, feebly tumescent in a large elongate-oval area at the middle anteriorly, from which stiffer bristles arise sparsely and radially on its outer slopes.

Euconnini.

The special characters distinguishing this tribe, which is by far the most extensive of the Scydmænidæ in North America, have been sufficiently set forth in the table previously given. The genera may be outlined as follows:—

Eyes anterior in position as usual; side-pieces of the metasternum not exposed.
- Pronotum foveate near the basal margin.
  - Posterior coxæ more or less widely separated; antennal club 3 or 4-jointed.
    - Third joint of the maxillary palpi normally obconic, gradually narrowed toward base.....**Euconnus**
    - Third joint extremely slender, rather abruptly clavate in about apical half; body glabrous, the head large; antennal club 4-jointed. **Pycnophus**
  - Posterior coxæ subcontiguous; antennal club 5-jointed; tibiæ thick, the tarsi extremely slender.....**Noctophus**
- Pronotum not foveate near the basal margin, though frequently more or less feebly and transversely impressed, the impression completely or partially interrupted at the middle.
  - Prothorax oval, narrowed at base, impressed and finely carinate at the basal angles.....**Drastophus**
  - Prothorax conical, never narrowed at base, not at all carinate or prominent at the sides near the basal angles.....**Connophron**

Eyes median or submedian in position; side-pieces of the metasternum somewhat exposed by the elytra; scutellum completely obsolete as usual; prothorax nearly as in Euconnus.....**Smicrophus**

These genera all belong to the fauna of eastern North America, except Drastophus, which is founded upon a single rather abun-

dant and widely distributed species in the regions bordering the Pacific Ocean.

EUCONNUS Thoms.

This genus, in the sense here understood, is by no means so abundant in species in North America as in Europe, and is even more obviously resolvable into homogeneous groups, based upon important differences of special structure or general habitus. In fact these groups are so isolated among themselves as to warrant distinctive appellations, as will be noted in the table below. The common distinguishing features of all the groups are an exserted head, with anterior eyes and an oblong prothorax, narrowed more or less at base and at least bifoveate near the basal margin. In the form and structure of the head it is similar to Connophron, but in the form and sculpture of the prothorax it is radically different. In the pubescence of the head and body it differs greatly from Connophron, except in the subgenus Scopophus, which possesses the peculiar stiff and posteriorly directed vestiture of the occipital parts, so peculiarly distinctive of Connophron, but the thoracic structure is still purely that of Euconnus.

As in Connophron, the antennæ may have either a 4 or 3-jointed club, and the hind coxæ vary even more in degree of separation, this being virtually fixed, however, within the limits of each subgenus. The elytra mutually overlap for a short transverse distance and are independently rounded at apex, as in Connophron and other related genera, and the scutellum is wholly invisible as usual in this part of the family.

All the subgenera appear to be equally widely distributed over nearly the same territorial area, but no species is at present known from the Pacific coast, and this is a somewhat remarkable fact. But it should also be noted that the genus is more varied structurally in the United States than in Europe, for Connophron, Drastophus, Pycnophus and Noctophus, besides the subgenera named below, all belong to the Euconnus type, as shown by general constitution, and especially by elytral, cephalic and antennal structure, and it is therefore probable that this type originated in North America and migrated to Europe in somewhat remote geologic time by way of Greenland. Either this, or else there are peculiar and inexplicable reasons for the early extinction of all species except *Drastophus lævicollis* in the Pacific coast regions, and the latter is a less likely supposition.

The subgenera of Euconnus within our faunal limits may thus be defined:—

Antennal club 4-jointed, very variable in development and in abruptness of formation.

Elytra with long, erect and very sparse hairs; head sparsely pubescent; clypeus separated from the front by a fine transverse canal joining the antennal cavities; antennæ generally long; eyes not prominent; posterior coxæ rather widely separated; male with well marked secondary sexual characters on the surface of the abdomen.....**I**

Elytra abundantly pubescent, the dense and stiff pubescence of the head directed backward as in Connophron; clypeus not separated by a transverse sulcus; antennæ generally shorter, with a more abrupt club; eyes more prominent; hind coxæ very narrowly separated; secondary sexual characters of the male not apparent..... **II**

Antennal club 3-jointed.

Clypeus not porrect, its surface almost evenly continuous with the wide convex front between the antennal cavities; pronotum, in addition to the usual median foveæ, with a lateral subbasal fovea and a minute and rudimentary cariniform elevation at the basal margin only; hind coxæ quite widely separated; head and elytra glabrous.....**III**

Clypeus slightly porrect, the surface between the antennal cavities tumid; pronotum with a fine but long and well defined longitudinal carina at each side, extending obliquely to the base; hind coxae but slightly less widely separated; head and elytra distinctly though rather sparsely pubescent, the hairs of the former not directed backward; species minute.....**IV**

The species assigned below to Euconnus proper, agree satisfactorily with European species of the *hirticollis* type, except that the hind coxæ are more widely separated and the sublateral carinæ of the pronotum much less developed, in fact in some forms, such as *ventralis*, becoming completely obsolete; but this is a very variable character also in the European species. Those known to me may be recognized as follows:—

Subgenus I.

Euconnus Thoms.

Secondary sexual characters of the male confined to the third and fourth ventral segments; head always much narrower than the prothorax.

Large, stouter, the antennæ very slender, with all the joints distinctly elongate.....1 **ventralis**

Smaller and more slender, the antennæ less elongate, the penultimate joint, at least, not distinctly longer than wide.

Lateral carina of the pronotum extremely rudimentary and only visible at base; secondary male sexual characters large and conspicuous.

2 **clavipes**

Lateral carina somewhat long and quite distinct; secondary sexual characters of the male much reduced and not at all conspicuous.

Body black, the elytra bright red; antennæ but slightly dusky toward tip; elytral bead wide and gradually broader toward base.

3 **semiruber**

Body blackish, the elytra dark rufo-piceous; antennæ a little shorter, the last five joints blackish; elytral bead fine, abruptly and strongly expanded at base.....4 **varicornis**

Secondary sexual modifications of the male confined to the sixth ventral segment; antennal club stronger, more abrupt and more moniliform; prothorax scarcely perceptibly wider than the head; body rather narrow.

5 **bicolor**

Subgenus II.

Scopophus n. sg.

Antennæ rather short, with a strong submoniliform club which is usually very abruptly formed; elytral pubescence more or less strongly recurved or subdecumbent.

Antennal club very abruptly formed, the eighth and ninth joints subequal in width.

Larger species, more than 1½ mm. in length.

Elytra deeply concave on the suture toward base..... 6 **cavipennis**

Elytra not concave toward base; body slightly less stout.

7 **occultus**

Smaller species, always distinctly less than 1½ mm. in length.

Body black throughout above; size larger.

Head small, much narrower than the prothorax.....8 **nigrescens**

Head larger, only slightly narrower than the prothorax; elytra more inflated and oval.....9 **affinis**

Body pale rufo-testaceous throughout, very small in size and of somewhat narrow, elongate-oval form.....10 **gratus**

Antennal club very strong but somewhat gradually formed, the eighth joint intermediate in size between the preceding and succeeding.

Prothorax broad, strongly narrowed anteriorly; head very narrow and subelongate; color dark rufo-testaceous.....11 **putus**

Prothorax narrow, feebly narrowed anteriorly, the head relatively broader; color pale throughout.....12 **merus**

Antennæ long, a little more than ½ as long as the body, the club slender, gradually incrassate and very feebly differentiated, the eleventh joint much thicker and somewhat abnormal; elytral pubescence long, straight and erect.....13 **relucens**

Subgenus III.

Xestophus n. sg.

Antennæ very long and slender, with all the joints longer than wide; elytra subrhombiform; head almost as wide as the prothorax.....14 **salinator**

Subgenus IV.

Psomophus n. sg.

Antennal club darker in color than the stem.
  Eighth antennal joint fully as long as wide.
    Elytra strongly ventricose .....15 **hædillus**
    Elytra feebly ventricose; antennal club blacker .....16 **fatuus**
  Eighth joint distinctly transverse, the club noticeably stouter.
    Antennæ longer; joints three to seven all much elongated; hind body more inflated.....17 **impotens**
    Antennæ shorter and relatively stouter; joints three to seven not distinctly longer than wide, except the fifth which is invariably longer.
      Hind body rather strongly inflated and shorter, the elytra much more broadly truncate at base.....18 **callidus**
      Hind body feebly inflated, the elytra more elongate, narrower and more evenly oval .....19 **debilis**
Antennal club very stout, paler in color than the shaft.....20 **capitatus**

The species *mississippicus* of Zimmermann and *consobrinus* of LeConte, which I have been unable to identify, will be alluded to at the end of this revision.

1. **E. ventralis** n. sp.—Somewhat stout, polished, impunctate, piceous-black, the head becoming testaceous anteriorly; elytra bright and pale rufous, blackish posteriorly; legs and antennæ throughout pale rufous; pubescence abundant and stiff on the pronotum, sparse on the head and elytra, long, pale, stiff and suberect on the latter. *Head* nearly as long as wide, the eyes rather large and convex but not prominent, extending to their own length from the base and evenly continuous in curvature with the sides of the occiput, which are convergent and arcuate to the neck, the latter deeply constricted, having the bulbiform enlargement within the prothorax minutely asperulate; front not visibly impressed; clypeus even and rectilinear at apex. *Antennæ* very long and slender, $\frac{3}{4}$ as long as the body, the club very slender and elongate but well differentiated; second joint almost as long as the first but much narrower, nearly cylindric, $2\frac{1}{2}$ times as long as wide and much shorter than the next two; two to four uniformly decreasing in length; three to six equal in width and slightly narrower than the second, feebly obconic and elongate; third $2\frac{1}{3}$, fourth $1\frac{1}{2}$, fifth 2, sixth $1\frac{3}{4}$ times longer than wide; seventh slightly thicker, very long, feebly thickened toward apex, more than twice as long as wide; eighth $\frac{2}{5}$ thicker than the seventh and slightly shorter, obovoidal, $\frac{1}{2}$ longer than wide; ninth and tenth just visibly thicker, obconic, abruptly conic at the middle of the apex, $\frac{1}{3}$ and $\frac{1}{4}$ longer than wide respectively; eleventh not thicker, elongate, obliquely and gradually pointed, much shorter than the two preceding. *Prothorax* not quite as long as wide, parallel and broadly rounded at the sides anteriorly, broadly constricted toward base, fully $\frac{1}{4}$ wider than the head, the subbasal impression and foveæ distinct. *Elytra* fully $\frac{2}{5}$ longer than wide, $2\frac{1}{2}$ times longer than the prothorax and very nearly twice as wide, widest and more narrowly rounded only slightly before

the middle; humeral plica large, the subhumeral impression large and conspicuous; basal foveæ deep; subsutural impressions narrow and strong, the suture strongly beaded basally, the bead strongly expanded at base. *Legs* long, the femora rather strongly and subequally clavate; tarsi filiform, the first four joints of the posterior decreasing moderately in length, with the first distinctly longer than the second. Length 1.75–1.85 mm.; width 0.8 mm.

Massachusetts; New York.

The description is taken from the male, in which sex the third and fourth ventral segments have each two similar discal teeth, separated by a little less than half the entire width; the teeth are short, stout, inclined posteriorly and have their apices obliquely truncate, the truncate surface black and finely and evenly rugose. The female is very much more abundant than the male, and has the elytra very slightly shorter, the antennæ a little shorter and more slender, with a less thickened club, and the femora perceptibly less clavate. The posterior coxæ are rather widely separated, the metasternal edge between them broadly sinuate and acutely prominent at the sides as usual.

2. **E. clavipes** Say—Narrative Long's Exped., Phila., 1824, vol. 2, p. 272; Lec.: Proc. Acad. Nat. Sci., Phila., 1852, p. 154; *pilosicollis* Lec.: Agassiz "Lake Superior," p. 218 (Scydmænus).

Feebly ventricose, polished, impunctate, black, the elytra dark rufous, sometimes slightly blackish toward tip; legs and antennæ dark rufous or more obscure, the latter sometimes slightly darker toward tip; pubescence very sparse on the head and elytra, moderately long and suberect on the latter. Head rather small, as long as wide, subparabolic behind, the eyes somewhat small, anterior and not prominent; clypeus simple. Antennæ slender, $\frac{3}{5}$ as long as the body, the club well differentiated but narrow and parallel; second joint distinctly narrower than the first, much shorter but only slightly thicker than the next two, subcylindric and fully twice as long as wide; three to six equal in width, elongate, feebly obconic; third and fifth, and fourth and sixth mutually subequal and about $\frac{1}{2}$ and $\frac{1}{4}$ longer than wide respectively; seventh a little thicker, feebly obconical and fully $\frac{3}{5}$ longer than wide; eighth but little shorter than the seventh and fully $\frac{2}{5}$ thicker, obovoidal, $\frac{1}{3}$ longer than wide; ninth and tenth just visibly thicker and equal, fully as long as wide; eleventh much shorter than the two preceding and not distinctly thicker, gradually pointed. Prothorax barely as long as wide, narrowed

at base, parallel and broadly rounded anteriorly, nearly $\frac{1}{3}$ wider than the head, the transverse impression and foveæ deep. Elytra $\frac{2}{3}$ longer than wide, slightly more than twice as long as the prothorax and nearly twice as wide, widest slightly before the middle, the sides rather strongly arcuate; apex subacute; humeral plica and impression rather strong and conspicuous; foveæ deep and approximate; subsutural impressions narrow and somewhat distinct, the strong subbasal bead rather rapidly expanded at base. Legs rather long; tarsi filiform and slender; four anterior femora strongly, the two posterior less markedly, clavate. Length 1.5 mm.; width 0.55 mm.

Massachusetts, Pennsylvania, Canada (Toronto), Michigan (Detroit) and Lake Superior. A widely diffused species but apparently not very common; the bright red of the elytra mentioned by Say is probably a character of slight immaturity, as most of the examples before me have the elytra quite dark rufous or piceous in color.

The male from which the description is drawn has remarkable abdominal characters, as in the case of the allied though much larger *ventralis*. The third and fourth segments have each a posteriorly inclined short thick sublamellate discal plate, occupying about $\frac{1}{2}$ and $\frac{1}{3}$ of their widths, respectively, each plate broadly sinuate throughout its width at apex and terminating laterally in subdentiform projections, the thick apices of the plates to the extreme lateral tips densely paved with combs of excessively minute thick and short spinules. The female does not differ much in general form or structure, but the femora are a trifle less clavate, and the antennæ perhaps just visibly shorter.

3. **E. semiruber** n. sp.—Moderately ventricose, polished, impunctate, black, the elytra bright rufous, dusky behind; legs piceous-black; antennæ pale rufous, sometimes slightly dusky toward tip; pubescence long, coarse, suberect and sparse on the elytra, less sparse on the head, abundant, short and stiff on the prothorax. *Head* orbicular, not quite as long as wide, the eyes moderate in size and not prominent; clypeus short and broad, convex and simple. *Antennæ* slender, nearly $\frac{3}{5}$ as long as the body, the club rather well differentiated and somewhat incrassate; second joint nearly as long as the first but much thinner, subcylindric, more than twice as long as wide, nearly as long as the next two and distinctly thicker; three to six equal in width, feebly obconic; third and fifth about $\frac{2}{3}$, the fourth and sixth nearly $\frac{1}{2}$, longer than wide; seventh a little longer than the fifth, $\frac{1}{5}$ wider, suboval, narrowed at base, $\frac{1}{2}$ longer than wide; eighth oval, $\frac{2}{5}$ wider than the seventh and a little shorter, fully $\frac{1}{4}$ longer than wide; ninth nearly $\frac{1}{4}$ thicker than

the preceding, globular ; tenth still slightly thicker, not quite as long as wide; eleventh slightly broader than the tenth, gradually, acutely pointed but not obviously oblique at apex, not quite as long as the two preceding. *Prothorax* about as long as wide and ⅕ wider than the head, feebly narrowed at base, broadly rounded anteriorly, the transverse impression distinct and crossed by a fine but distinct carina near each side but not in the middle ; foveæ obvious. *Elytra* ⅖ longer than wide, only slightly more than twice as long as the prothorax and about twice as wide, widest but little before the middle, where the sides are rather more strongly arcuate ; humeral plica long and strong, the subhumeral impression large, elongate and deep ; foveæ approximate and deep ; subsutural impressions obsolete, the suture strongly beaded subbasally, the bead rather gradually expanded toward the basal margin. *Legs* well developed, the femora quite strongly clavate, the posterior only just visibly less so. Length 1.25–1.45 mm. ; width 0.55–0.6 mm.

Northern and Central Illinois. Mr. F. M. Webster.

The male, which serves as the type of the above description, has the secondary modifications of the third and fourth segments rather feeble, the former having two very small subapical dentiform projections, separated by scarcely more than a tenth of the total width, the latter with a short suberect dense comb of spicules having the same lateral extent and limited at each end by a very minute corneous tooth much shorter than the spicules. The female is a little larger and slightly more ventricose, with rather shorter antennæ, but does not differ otherwise.

4. **E. varicornis** n. sp.—Somewhat ventricose, polished and impunctate, black, the elytra dull and translucent rufous ; legs blackish, the tarsi and basal parts of the tibiæ pale ; antennæ pale testaceous, the outer five joints blackish ; pubescence sparse but coarse, pale, rather long and suberect on the elytra, shorter and less sparse on the head, abundant and stiff on the prothorax. *Head* orbicular, not quite as long as wide, the eyes moderate in size and not prominent ; clypeus simple, with the usual short transverse sulcus at base. *Antennæ* moderately slender and scarcely more than ½ as long as the body, the club rather strong and distinctly incrassate ; second joint about as long as the first but thinner, feebly obconical, twice as long as wide, shorter than the next two and distinctly thicker ; three to six equal in width, feebly obconical; third and fifth subequal, barely ½, fourth ¼, sixth ⅓ longer than wide ; seventh much thicker, suboval, narrowed at base, ⅖ thicker than the sixth, ⅖ longer than wide ; eighth distinctly shorter and ⅖ wider than the seventh, scarcely ⅕ longer than wide ; ninth nearly ⅓ thicker than the preceding, subglobular, as long as wide ; tenth scarcely visibly thicker, oval, not quite as long as wide ; eleventh elongate, very gradually pointed, almost as long as the two preceding and distinctly thicker. *Prothorax* as long as wide and ¼ wider than the head ; sides parallel and broadly arcuate, sinuate toward base ; transverse impression feeble at the middle, crossed near each side by a fine carina

which extends to the basal margin ; foveæ large and deep ; pubescence wanting along the median line, the hairs bordering which are longer and directed backward and upward toward base. *Elytra* scarcely $\frac{2}{5}$ longer than wide, fully twice as long as the prothorax but only $\frac{3}{4}$ wider, strongly rounded at the sides, widest only slightly before the middle ; humeral plica and impression small and inconspicuous, the foveæ deep ; subsutural impressions entirely obsolete, the suture finely and strongly beaded basally, the bead rapidly expanded at the base. *Legs* moderate ; four anterior femora strongly, the two posterior moderately clavate. Length 1.25 mm. ; width 0.5 mm.

Wyoming.

This species is closely allied to *semiruber*, but differs in its shorter and more strongly clavate antennæ, rather broader prothorax, much smaller and less conspicuous humeral plica and impression, more abruptly and basally expanded sutural bead and other structural characters. It is represented before me by a single male.

The secondary sexual characters are nearly similar to those of *semiruber*, the minute teeth of the third ventral being fully as approximate, but the suberect comb of pale spicules of the fourth segment is still shorter in a transverse sense, though composed of slightly longer spicules, these being planted along the apex of a short projection which is emarginate in circular arc throughout its width ; in *semiruber* the base of the comb is the straight and unmodified edge of the segment, the only trace of the emarginate projection being the minute teeth which limit it laterally.

5. **E. bicolor** Lec.—Proc. Acad. Nat. Sci., Phila., 1852, p. 154 ; *lecontei* Schauf. (Scydmænus.)

Rather narrow and feebly ventricose, polished and impunctate, black, the elytra somewhat rufo-piceous ; legs and antennæ throughout pale testaceous ; pubescence sparse on the head, very sparse but rather long and erect on the elytra, dense and stiff on the pronotal flanks. Head orbicular, as long as wide, the eyes moderate, anterior and not prominent ; contour behind them semicircular ; clypeus smooth, rectilinear at apex, separated from the front by the transverse sulcus between the antennal cavities characterizing this group. Antennæ rather stout, slightly more than $\frac{1}{2}$ as long as the body, the club well differentiated and perceptibly incrassate ; second joint almost as large as the first but obconic, $\frac{4}{5}$ longer than wide, much shorter than the next two and but slightly thicker ; three to six equal in width, oval, subconstricted at base ; third $\frac{1}{2}$, fourth $\frac{1}{5}$, fifth $\frac{2}{5}$, sixth $\frac{1}{3}$ longer than wide ;

seventh rather more than $\frac{1}{4}$ thicker, oval, $\frac{2}{5}$ longer than wide; eighth almost $\frac{1}{2}$ wider than the seventh, subglobular, conic in apical third, scarcely visibly longer than wide; ninth and tenth $\frac{1}{3}$ and $\frac{2}{5}$ thicker than the eighth respectively, similar in outline, the former scarcely as long as wide, the latter nearly $\frac{1}{4}$ wider than long; eleventh much stouter, obliquely ogival toward tip, nearly as long as the two preceding. Prothorax a little longer than wide, scarcely visibly wider than the head, broadly rounded and parallel at the sides anteriorly and broadly sinuate toward base; transverse impression distinct, interrupted near each side by a fine longitudinal carina, which does not extend beyond the impression; foveæ deep. Elytra nearly $\frac{1}{2}$ longer than wide, scarcely more than twice as long as the prothorax and about $\frac{4}{5}$ wider, almost evenly oval, subacute behind, widest very near the middle, the sides broadly arcuate; humeral plica and adjacent impression rather small and feeble; subsutural impressions small and narrow, the suture strongly beaded basally, the bead gradually wider toward base. Legs moderate in length; four anterior femora strongly, the posterior moderately clavate. Length 1.3 mm.; width 0.45 mm.

Massachusetts, Rhode Island, Michigan and Iowa (Iowa City). The description given above applies to the male, the abdomen in that sex being simple but with a small, deep and transversely lunate impression at the middle of the sixth segment, bordering the apical margin. The female differs scarcely at all in general form or structure. I have found this to be an abundant species under stones in early springtime, but LeConte states that it occurs with *Formica pennsylvanica.*

If *Scydmænus bicolor* Denny, (Mon. p. 68), be the species alluded to by Schaufuss as disabling the name *bicolor* Lec., it may be stated that the former is a Scydmænus, and is considered to be a synonym of *exilis* Er., so that the name *bicolor* Lec. (Euconnus) will still hold good.

6. **E. cavipennis** n. sp.—Moderately stout and ventricose, polished, subimpunctate, pale and uniform red-brown throughout the body, legs and antennæ; pubescence coarse, pale, abundant and conspicuous, directed backward on the occiput, short and bristling on the pronotum, quite dense and complex in arrangement on the elytra, strongly recurved throughout but longer, coarser and normal on the flanks, very short on the upper portions, where it streams obliquely outward, externally, and toward the suture, internally, behind, and intermingled throughout with inconspicuous erect setæ. *Head* as long as

wide, almost evenly parabolic behind the eyes, which are anterior and rather small but convex and somewhat prominent; clypeus nearly as in *occultus;* labrum large, sinuate at the middle of the apical margin. *Antennæ* stout, barely longer than the head and prothorax, the club strong and very abruptly formed, almost parallel; joints proportioned nearly as in *occultus*, the seventh not as long as wide and the two penultimate more strongly transverse; seventh joint but very slightly wider than the sixth; eighth fully $\frac{3}{5}$ wider than the seventh. *Prothorax* fully as long as wide, nearly $\frac{1}{5}$ wider than the head, formed nearly as in *occultus;* surface bifoveate near the base at each side, but scarcely at all impressed, the outer fovea the smaller and continued obliquely in a narrow excavation to the basal margin between two minute carinæ. *Elytra* $\frac{2}{5}$ longer than wide, distinctly more than twice as long as the prothorax and nearly $\frac{4}{5}$ wider, widest before the middle, the sides evenly arcuate throughout; apex narrowly parabolic; humeral plica and impression rather long but extremely feeble; foveæ deep and approximate; suture minutely beaded subbasally, the bead rapidly expanded into a large but feeble triangular plate at the basal margin; on and involving the suture there is a large and deep concavity of elongate-oval form, occupying nearly basal third of the length. *Legs* well developed, the two anterior femora strongly, the four posterior moderately, clavate; hind tarsi with the first four joints subequal, the first two exactly equal. Length 1.6 mm.; width 0.63 mm.

Pennsylvania (Westmoreland Co.). Mr. Schmitt.

This is one of the most interesting species of the genus and is probably myrmecophilous. The description applies to the female, the male antennæ being nearly half as long as the body, the second joint much longer than the next two, three to seven noticeably longer than wide, the club abrupt and parallel as in the female but a little more elongate; the hind trochanters are truncate at tip, but there are no abdominal modifications. The elytra are more elongate, the humeral plica more distinct and the sutural indentation rather more feeble in the male.

This species is allied closely to *occultus* but is slightly stouter, and may be readily distinguished by the indented elytral suture; the erect setæ of the elytra are much less conspicuous.

7. **E. occultus** n. sp.—Somewhat narrow and feebly ventricose, polished, the elytra minutely, sparsely and feebly punctulate, pale rufo-testaceous throughout, the legs and antennæ concolorous; pubescence pale, stiff and rather abundant on the elytra, where it is intermingled with much longer sparse and erect setæ, the hairs rather short and recurved, coarse on the flanks, finer and shorter toward the suture, toward which they are obliquely directed behind the middle, abundant, short, coarse and stiff on the head and pronotum. *Head* wider than long, broadly rounded at base, the sides subparallel and rounded behind the eyes, which are small but convex and prominent; antennal prominences convex and distinct; clypeus transversely truncate,

feebly porrect and short; surface between the antennal cavities on the subvertical part of the front convex and tumid. *Antennæ* rather stout, not quite ½ as long as the body, the club strong and abruptly differentiated; second joint as long and about as wide as the first but strongly obconic, twice as long as wide, as long as the next two and noticeably thicker; three to six subequal, oval, the third and fifth rather longer, the fourth and sixth somewhat shorter, than wide; seventh ¼ wider, roughly sculptured apically, subquadrate; eighth fully ½ wider, conic in apical ⅖, about as long as wide; ninth and tenth similar to the eighth but a little wider, the former not quite as long as wide, the latter distinctly wider than long; eleventh a little stouter, very obtusely ogival at apex, a little shorter than the two preceding. *Prothorax* as long as wide, scarcely ⅕ wider than the head, the sides parallel and broadly sinuate posteriorly, rounded anteriorly; apex truncate and ¾ as wide as the base; surface bifoveate at each side near the base but not distinctly impressed, the outer fovea much the smaller, also minutely excavated near each flank at the basal margin. *Elytra* rather long, ½ longer than wide, much more than twice as long as the prothorax and about ⅔ wider, widest near basal ⅖, the sides moderately rounded; apex narrow; humeral plica and adjoining impression rather small, feeble; basal foveæ small but deep, perforate and approximate; at some distance from the base there is a very feeble impression on the suture, the latter not at all beaded basally. *Legs* well developed; two anterior femora strongly, the four posterior rather feebly, clavate; hind tarsi with the first four joints subequal, the first scarcely as long as the second. Length 1.6 mm.; width 0.55 mm.

Iowa (Iowa City); District of Columbia.

No marks indicative of sex can be discovered in the two specimens before me, but in the eastern specimen the two penultimate antennal joints are more transverse, and the seventh joint is perfectly similar to the sixth and just visibly larger. This species is said to occur with ants.

8. **E. nigrescens** n. sp.—Rather narrow and feebly ventricose, black throughout, the abdomen pale at apex; legs and antennæ testaceous; integuments polished, the elytra feebly but distinctly punctate; pubescence abundant, pale and coarse, long, stiff and densely bristling posteriorly on the occiput, especially at the sides, bristling on the pronotum, unusually short, even and closely recurved on the elytra, where the sparse erect hairs are quite short and inconspicuous. *Head* not quite as long as wide, semicircularly rounded behind the eyes, which are rather small, anterior and but slightly prominent; antennal tubercles small, feeble and distant, the front not concave, the cavities very large and narrowly separated on the declivous front; clypeus simple, rectilinearly truncate. *Antennæ* short and somewhat stout, barely as long as the head and prothorax, the club strong and very abrupt; second joint as long as the first and somewhat narrower, very feebly obconical, ¾ longer than wide, fully as long as the next two and distinctly thicker; three to five equal and very slightly wider than long, the sixth scarcely perceptibly wider

and more transverse, nearly ⅓ wider than long; seventh nearly ⅓ wider than the sixth, ⅓ wider than long, conic in apical half; eighth fully ⅖ wider than the preceding, conic in apical third, ⅓ wider than long; ninth and tenth very slightly wider, about ½ wider than long; eleventh scarcely stouter, oval, ogival at tip, not as long as the two preceding. *Prothorax* not quite as long as wide, nearly ⅖ wider than the head, broadly rounded at the sides anteriorly, slightly narrowed toward base; surface near the base with two large median foveæ and a small fovea at each side, also with a small pit at the basal margin behind the lateral fovea and disconnected; transverse impression almost completely obsolete. *Elytra* oval, rather feebly narrowed at base, ⅓ longer than wide, distinctly more than twice as long as the prothorax and nearly ⅔ wider, widest but slightly before the middle, the sides broadly and almost evenly arcuate; humeral plica and impression small and feeble; foveæ small, deep and approximate; subsutural impressions very feeble, the suture beaded only very near the base, and feebly, the bead expanding at base. *Femora* subequally and rather feebly clavate. Length 1.3 mm.; width 0.45 mm.

New York (Hudson Valley). Mr. H. H. Smith.

There are no means of directly determining the sex of the unique type, the external characters in the present subgenus being extremely feeble, but, from analogy with *affinis* in the pubescence of the elytra, it is a female. The species may be readily known from any of those which precede by its black color, with pale legs and antennæ, and it may also be distinguished by the punctate elytra.

9. **E. affinis** n. sp.—Narrowly suboval and moderately ventricose, polished, the elytra sparsely punctulate, black throughout above, the last two ventral segments paler; legs and antennæ pale rufo-testaceous; pubescence abundant, pale, bristling backward at the sides of the head and occiput and outward on the pronotum, closely recurved and rather short on the elytra, where it is finer, shorter and still denser toward the suture posteriorly, the hairs near the suture inclined obliquely theretoward, sparsely intermixed throughout with short erect setæ. *Head* well developed, distinctly wider than long, subcircular in outline behind the eyes, which are moderate in size, anterior and somewhat prominent; antennal prominences small and feeble; clypeus simple, rectilinearly truncate. *Antennæ* as long as the head and prothorax, the club stout and very abrupt; second joint obconic, ½ longer than wide, as long and nearly as wide as the first, equal in length to the next two and slightly thicker; three to six equal in width, cylindric; third as long as wide; fourth and fifth a little shorter; sixth distinctly wider than long; seventh ¼ wider, oval, nearly ⅓ wider than long; eighth ⅗ wider than the seventh, suboval, slightly wider than long; ninth and tenth very slightly wider, ⅓ and ⅖ wider than long respectively; eleventh scarcely thicker, not quite as long as the two preceding, ogival at tip. *Prothorax* fully as long as wide and only very slightly wider than the head, rounded at the sides ante-

riorly and distinctly narrowed toward base ; surface near the base with two distinct median foveæ joined by a coarse and rather strong transverse impression, and a single fovea at each side above the flank, also with a small pit at the basal margin behind the latter, closed by two short longitudinal carinæ. *Elytra* $\frac{2}{5}$ longer than wide, quite distinctly more than twice as long as the prothorax and nearly $\frac{4}{5}$ wider, oval, widest slightly before the middle, the sides broadly and evenly arcuate ; humeral plica and impression moderate in size, the latter distinct ; foveæ small and approximate ; subsutural impressions feeble and rather narrow ; suture very feebly beaded near the base, the bead expanded at the basal margin. *Legs* well developed, the femora moderately clavate, the anterior slightly more strongly. Length 1.25 mm.; width 0.42 mm.

Pennsylvania (Westmoreland Co.). Mr. Schmitt.

The male serves as the type of description, and the female has the elytral pubescence much less abnormal and almost uniform throughout, being sparser toward the middle posteriorly than in the male, but scarcely differs in any other particular.

The tip of the copulatory spicule in the male is slender, thin, parallel, with the tip obtuse, but produced in the middle in a minute rounded lobe, the lateral lobes each with a slender, setiform and unusually elongate appendage, extending much beyond the tip of the corneous median portion. The first four joints of the hind tarsi are almost exactly equal among themselves.

This species is closely allied to *nigrescens*, but differs in its much narrower prothorax and relatively larger head, somewhat narrower form of the body and more oval and more basally narrowed elytra. It is represented by a large and homogeneous series.

10. **E. gratus** n. sp.—Narrowly suboval, somewhat ventricose, polished, impunctate, bright rufo-testaceous, the legs and antennæ still paler and more luteous ; pubescence rather abundant, pale, strongly bristling backward on the head, unusually short, closely recurved, very even and completely devoid of intermingled erect setæ on the elytra. *Head* rather well developed, not quite as long as wide, subcircularly rounded behind the eyes, which are only moderate in size but rather convex and prominent ; antennal prominences moderate, the excavations very narrowly separated on the declivous front ; clypeus normal, rectilinearly truncate at apex. *Antennæ* short, as long as the head and prothorax, moderately stout, the club strong, parallel and very abrupt in formation ; second joint obconic, scarcely $\frac{1}{2}$ longer than wide, as long as the next two and noticeably thicker ; three to six subequal among themselves, distinctly wider than long ; seventh $\frac{1}{5}$ wider, $\frac{2}{5}$ wider than long ; eighth fully $\frac{3}{4}$ wider and $\frac{3}{4}$ longer than the seventh, suboval, $\frac{2}{5}$ wider than long ; ninth and tenth mutually equal and scarcely visibly wider than the eighth, fully $\frac{1}{2}$

wider than long; eleventh short, not quite as long as the two preceding and just visibly thicker, rather rapidly pointed at tip. *Prothorax* as long as wide, scarcely $\frac{1}{5}$ wider than the head, feebly narrowed at base and only slightly more rapidly so at apex, the latter fully $\frac{3}{4}$ as wide as the base; surface near the base with two strong rounded foveæ, separated by $\frac{1}{3}$ the width at the middle, and a small fovea near each side which is continued to the basal margin, the inner side of the canal finely cariniform. *Elytra* evenly oval, $\frac{2}{5}$ longer than wide, barely twice as long as the prothorax and fully $\frac{3}{4}$ wider, widest only slightly before the middle, the sides very evenly and broadly arcuate throughout the length; humeral plica moderate in length, strong and distinct, the impression deep and obvious; foveæ evident; subsutural impressions rather short and narrow but deep; suture finely beaded, the bead triangularly expanded at base. *Legs* moderate in length, the femora distinctly clavate. Length 1.0 mm.; width 0.38 mm.

North Carolina (Asheville).

The single type before me is a male, the œdeagus being partially protruded; its narrowed apical portion is subparallel, bluntly rounded at tip, thin and with its plane turned strongly upward toward tip in profile; the lateral appendages are well developed and finely setose at apex.

This small but distinct species may be readily distinguished by the isolated foveæ of the pronotum, distinct humeral plica, short, recurved and even elytral pubescence, strong and abrupt antennal club and other characters.

11. **E. putus** n. sp.—Somewhat narrowly oval and very feebly ventricose, polished, impunctate, dark rufo-testaceous throughout; legs and antennæ slightly paler, brownish-testaceous; pubescence rather abundant, pale, long, stiff and directed backward on the basal parts of the head, bristling on the pronotum, moderately long, even, recurved and intermingled with longer erect hairs on the elytra. *Head* rather small, narrow, elongate-oval and unusually prolonged, evenly and narrowly parabolic behind the eyes, the latter moderate in size but rather convex and slightly prominent; antennal tubercles strong and somewhat approximate, the front concave between them; front between the antennal cavities rather narrow but not swollen, the clypeus normal, rectilinearly truncate at apex; labrum rather small; third palpal joint somewhat swollen. *Antennæ* short and slightly stout, not quite as long as the head and prothorax, the club distinct but gradual, the eighth joint intermediate; second joint obsuboval, $\frac{1}{2}$ longer than wide, as long as the next two and thicker; three to six equal in width; third and sixth not quite as long as wide; fourth and fifth quadrate; seventh scarcely $\frac{1}{5}$ wider, not as long as wide; eighth fully $\frac{2}{5}$ wider than the seventh, oval, $\frac{1}{3}$ wider than long; ninth $\frac{1}{3}$ wider, $\frac{1}{3}$ wider than long, subequal to tenth; eleventh not thicker, much shorter than the two preceding, obliquely pointed at tip. *Prothorax* large, not quite as long as wide, about $\frac{1}{2}$ wider than the head, feebly narrowed at

base, gradually, arcuately narrowed in apical half, the apex nearly $^{2}/_{3}$ as wide as the base; surface strongly, transversely impressed near the basal margin, the ends of the impression foveate near each side of the disk. *Elytra* oval, $^{2}/_{5}$ longer than wide, barely twice as long as the prothorax and scarcely more than $^{3}/_{5}$ wider, widest and rather more strongly rounded at the sides before the middle; humeral plica narrow, rather long but feeble, the corresponding impression slight; foveæ small; subsutural impressions narrow and strong, the suture finely beaded basally, the bead very feebly and gradually wider toward base. *Legs* of the usual length, the femora moderately clavate; hind tarsi filiform, with the first three joints equal, the fourth a little shorter. Length 1.25 mm.; width 0.4 mm.

Texas (Colorado River).

This species is very distinct from any other of this peculiar group in the elongate-oval and narrow form of the head, form of the pronotum and in many other structural features. The sex of the unique type is not determinable.

12. **E. merus** n. sp.—Rather narrowly oval and very feebly ventricose, polished, subimpunctate, pale rufo-testaceous throughout, the legs and antennæ a little paler and more brownish; pubescence abundant, pale, stiff, somewhat long and very coarse but recurved on the elytra, where there is an admixture of a few slightly longer erect setæ. *Head* well developed, fully as long as wide, prolonged unusually behind the eyes and sulparabolic, the eyes moderate in size but very convex and prominent, anterior; antennal tubercles rather pronounced; clypeus simple and rectilinearly truncate at apex; antennal cavities well separated, the intervening surface not modified. *Antennæ* short and rather stout, scarcely as long as the head and prothorax, the club pronounced but not very abruptly formed; second joint fully as long as the first and not narrower, but obconic, rather longer than the next two and distinctly thicker; three, four and six almost equal, much wider than long; fifth a little larger and more oval, almost as transverse; seventh $^{1}/_{4}$ wider than the sixth, nearly $^{1}/_{2}$ wider than long; eighth $^{2}/_{5}$ wider than the preceding, transversely suboval, $^{1}/_{4}$ wider than long; ninth and tenth nearly similar, almost $^{1}/_{4}$ wider than the eighth and about $^{1}/_{3}$ wider than long; eleventh scarcely visibly thicker, only slightly longer than wide, much shorter than the two preceding. *Prothorax* rather longer than wide and fully $^{1}/_{3}$ wider than the head, narrowed slightly at base and gradually and arcuately toward apex; surface with two submedian foveæ near the base, joined by a deep and conspicuous subarcuate impression. *Elytra* barely $^{2}/_{5}$ longer than wide, scarcely twice as long as the prothorax and about $^{3}/_{5}$ wider, oval, widest but little before the middle, the sides evenly and broadly arcuate throughout; humeral plica narrow and strong, the subhumeral impression distinct; outer fovea large and strong, the inner minute; subsutural impressions rather narrow, long and distinct; suture beaded in almost basal $^{2}/_{5}$, the bead with a small expansion at the base. *Legs* moderate, the femora all rather feebly clavate. Length 1.1 mm.; width 0.42 mm.

Texas (Colorado River).

A small species, somewhat allied to *gratus* but differing in the less abruptly formed antennal club, deep impression joining the pronotal foveæ, smaller head and much longer and more bristling elytral vestiture. From *putus* it differs greatly in its narrower and less apically narrowed prothorax, much broader head and in other features of structure and facies. The single type in my cabinet is of undetermined sex.

13. **E. relucens** n. sp.—Narrowly elongate-oval, scarcely at all ventricose, polished, the elytra sparsely and feebly punctate, piceo-castaneous, the elytra slightly paler and more rufous; legs and antennæ dark rufous; pubescence abundant, pale, stiff and bristling on the head and pronotum, directed posteriorly on the occiput, long, stiff, erect and even on the elytra. *Head* nearly as long as wide, parabolically rounded behind the eyes, which are anterior, moderately large, very convex and prominent; antennal prominences rather feeble, the narrowed front between the antennal cavities not tumid or sulcate; clypeus feebly rugose, rectilinearly truncate at apex; labrum strongly asperato-punctate and setose. *Antennæ* rather more than ½ as long as the body, moderately slender, the club feeble and extremely gradual in formation, scarcely at all differentiated; second joint distinctly narrower than the first, strongly obconic, nearly twice as long as wide, about as long as the next two and but just visibly thicker; three to six subcylindric, with beaded base, equal in width; third barely longer than wide; fourth ⅓, fifth nearly ½, sixth ⅖, longer than wide, seventh only just visibly wider, subcylindric, ⅓ longer than wide; eighth obconic in basal ⅗, strongly conic in apical ⅖, scarcely ⅓ wider than the seventh and a little longer than wide; ninth and tenth subsimilar, successively just visibly thicker, as long as wide and slightly wider than long respectively, rather closely joined; eleventh abnormal, oval, with an almost axial ogival point, nearly as long as the two preceding, much thicker and joined obliquely. *Prothorax* about as long as wide, nearly ¼ wider than the head, narrowed slightly at base, broadly rounded anteriorly, the sides gradually convergent toward apex; surface near the base with an isolated fovea at each side near the flank, and a deep transverse double fovea at each side of the median line. *Elytra* oval with evenly rounded sides, widest but not more strongly rounded near basal ⅖, nearly ½ longer than wide, more than twice as long as the prothorax and scarcely ⅗ wider; humeral plica long, oblique but fine and feeble; the impression long but very feeble; foveæ small, approximate and feeble; subsutural impressions feeble, oblique, uniting on the suture behind the base; suture finely and feebly beaded basally, the bead expanded at base. *Legs* well developed; femora all rather strongly clavate; hind tarsi filiform, with the joints decreasing perceptibly in length, the first distinctly longer than the second. Length 1.55 mm.; width 0.55 mm.

Florida.

The single type is probably a male, as there appears to be a narrowly obtuse corneous apex of the copulatory spicule visible

at the tip of the abdomen, but there are no secondary abdominal or crural modifications.

Although the hind coxæ are very narrowly separated, this species differs very greatly from the others of the present subgenus in its long and erect elytral vestiture, antennal structure, pronotal impressions, punctate elytra, tarsal structure and many other characters.

14. **E. salinator** Lec.—Proc. Acad. Nat. Sci., Phila., 1852, p. 154 (Scydmænus).

Strongly ventricose, highly polished and impunctate, piceous-black, the elytra dark piceo-rufous; legs dusky; antennæ black, dark rufous toward base; head and elytra glabrous, the prothorax abundantly clothed with stiff erect setæ. Head orbicular, nearly as long as wide, the eyes rather well developed and very slightly prominent; occiput with a setigerous puncture at each side; front with a similar puncture near each antennal cavity, not in the least impressed; clypeus evenly declivous, the apex broadly, feebly sinuate throughout the width in circular arc; labrum thickly setose. Antennæ long and slender, $\frac{3}{5}$ as long as the body, the 3-jointed club well differentiated and elongate; second joint as long as the first, slightly thinner, cylindric, twice as long as wide, thicker but much shorter than the next two; three to six equal in width, feebly obconic, $\frac{3}{5}$, $\frac{1}{2}$, $\frac{4}{5}$ and $\frac{1}{2}$ longer than wide respectively; seventh feebly obconic, with arcuate sides, fully as long as the fifth and $\frac{1}{5}$ thicker, $\frac{3}{5}$ longer than wide; eighth $\frac{1}{5}$ thicker than the seventh, obsuboval, nearly $\frac{1}{2}$ longer than wide; ninth much longer than any of the preceding, oval, narrowed toward base, $\frac{1}{2}$ wider than the eighth, nearly $\frac{1}{2}$ longer than wide; tenth not thicker, elliptical, very slightly elongate; eleventh not thicker, gradually and conically pointed, scarcely $\frac{1}{2}$ longer than the tenth. Prothorax fully as long as wide and only just visibly wider than the head, parallel, broadly rounded at the sides anteriorly, broadly sinuate toward base; surface with two large foveæ at each side near the base, the two inner larger and transversely connected by a feeble impression. Elytra subrhomboidal, $\frac{2}{5}$ longer than wide, more than twice as long as the prothorax and $\frac{4}{5}$ wider, widest and strongly rounded only slightly before the middle, the sides thence strongly oblique to the narrowly rounded apex; humeral plica and subhumeral impression obsolete; basal foveæ distinct and deep; subsutural impressions wanting, the

suture not beaded toward base; each elytron with a setigerous puncture at basal $\frac{1}{4}$ and inner $\frac{2}{5}$. Legs long, the four anterior femora rather strongly, the two posterior a little less strongly but more abruptly and apically clavate. Length 1.4–1.5 mm.; width 0.55–0.6 mm.

New York, Pennsylvania, Tennessee, Illinois and Iowa. A very common and rather widely diffused species in swampy places. The above description applies to the male, but the female differs only slightly, having the antennæ a little shorter but at the same time more slender throughout, with a less elongate and a less conspicuous club. There are no secondary sexual characters on the surface of the abdomen, the latter being black with the last two segments testaceous. The hind coxæ are well separated, the posterior tarsi filiform, with the first three joints equal, the fourth a little shorter, and the claws rather long, slender and strongly arcuate.

This species forms an isolated subgenus of Euconnus, distinguished by the form of the clypeus, glabrous head and elytra, entirely obsolete humeral plica and impression, unbeaded suture, 3-jointed antennal club, peculiarities of pronotal sculpture and other characters.

15. **E. hædillus** n. sp.—Strongly ventricose, polished, subimpunctate, black, elytra very slighter paler and piceous; legs and antennæ pale testaceous, the club of the latter only slightly dusky; pubescence as in *fatuus*. *Head* orbicular, scarcely as long as wide, semicircularly rounded behind the eyes, which are rather well developed, but anterior and scarcely at all prominent. *Antennæ* very slender, a little longer than the head and prothorax, the club abrupt, parallel and moderately dilated; second joint slender, as long as the first but narrower, feebly obconic, nearly twice as long as wide, about as long as the next two and much thicker; three to six equal in width, the seventh but just visibly wider, all smooth and of the same structure, feebly narrowed at base; third $\frac{1}{3}$, fourth rather more than $\frac{1}{3}$, fifth $\frac{1}{2}$, sixth scarcely $\frac{1}{3}$, seventh $\frac{1}{4}$ longer than wide; eighth $\frac{1}{4}$ wider, as long as wide, the outer side straight, the inner somewhat angulate; ninth $\frac{3}{4}$ wider and $\frac{2}{3}$ longer than the seventh, subglobular, barely as long as wide; tenth scarcely wider, $\frac{2}{5}$ wider than long; eleventh scarcely thicker than the preceding, not quite as long as the ninth and tenth, gradually, acutely and obliquely pointed at tip. *Prothorax* not quite as long as wide, only just visibly wider than the head, parallel and broadly rounded at the sides, narrowed a little at base, with subbasal modifications nearly as in *fatuus*. *Elytra* inflated, scarcely $\frac{1}{3}$ longer than wide, much more than twice as long as the prothorax and fully $\frac{1}{5}$ wider, ovoidal, widest before the middle, with the side strongly, evenly arcuate, oblique and straighter behind, the tip subacute; humeral plica broad and strong, the subhumeral im-

pression long, very deep and conspicuous ; foveæ small and very approximate ; subsutural impressions obsolete ; suture feebly beaded for some distance basally, the bead gradually slightly wider toward base. *Legs* moderate, the femora feebly clavate, the anterior pair more strongly. Length 0.9 mm.; width 0.45 mm.

Rhode Island (Boston Neck).

This species is allied quite closely to *fatuus*, as indeed are all the species of this subgenus, but may be distinguished at once by the strongly inflated hind body, much paler antennal club, slightly larger head and other structural characters. Sexual marks are not discernable in the four specimens before me.

16. **E. fatuus** Lec.—Proc. Acad. Nat. Sci., Phila., 1852, p. 155 (Scydmænus).

Moderately stout and feebly ventricose, polished, impunctate, piceous-black with slightly paler elytra; legs and antennæ testaceous, the latter with the club blackish; pubescence moderately abundant, short, fine and not directed backward on the head, somewhat bristling with long and finer and short and thicker hairs on the prothorax throughout, rather short, sparse and recurved and without erect setæ on the elytra, pale in color. Head rounded, not quite as long as wide, the eyes moderate, anterior and scarcely prominent; antennal tubercles subobsolete; clypeus truncate or very feebly sinuate at apex. Antennæ slender, a little longer than the head and prothorax, the club abrupt and parallel; second joint as long and wide as the first, very feebly obconic, nearly twice as long as wide, noticeably longer than the next two and much thicker; three to seven equal in width, similarly smooth, feebly obconic; third just visibly, fourth $\frac{1}{3}$, fifth $\frac{2}{5}$, sixth $\frac{1}{3}$ and seventh $\frac{1}{3}$, longer than wide; eighth very slightly wider, quadrate, just visibly darker in color; ninth nearly $\frac{3}{5}$ wider, a little longer than wide; tenth scarcely visibly wider than the eighth and obviously wider than long; eleventh not thicker, but little shorter than the two preceding, gradually and obliquely pointed. Prothorax subquadrate, not quite as long as wide, $\frac{1}{5}$ wider than the head, parallel and broadly rounded at the sides, narrowed slightly toward base, the surface with two feeble submedian foveæ near the base, connected by a feeble transverse impression, and with two small and sublateral foveæ adjoining the sublateral carina externally, one at the basal margin, the other in advance. Elytra $\frac{2}{5}$ longer than wide, much more than twice as

long as the prothorax and nearly ¾ wider, evenly oval, widest slightly before the middle; sides evenly and broadly arcuate throughout; humeral plica rather long and strong, the subhumeral impression large, deep and conspicuous; subsutural impressions nearly obsolete, the suture not beaded though very feebly elevated and expanded at the immediate base; basal foveæ deep, the inner small. Legs rather short, the two anterior femora strongly, the four posterior rather feebly, clavate; hind tarsi filiform and rather long, with the first four joints subequal; hind coxæ rather widely separated. Length 0.9 mm.; width 0.38 mm.

Massachusetts and New York. A minute species, which can be readily identified by the characters given above. The abdomen is pale at apex as usual, and I can perceive no indications of sexual identity.

I have attached to this species for the present, as varietal forms, a large series from Ottawa, Canada, which differs from the typical form in its deep black color and stouter antennæ, with much stouter club, and two specimens from Illinois, which are decidedly larger, black in color and with stouter antennæ.

17. **E. impotens** n. sp.—Strongly ventricose, polished, impunctate, black, the elytra paler, rufo-testaceous; legs and antennæ pale, the club of the latter slightly dusky; pubescence as in *fatuus*. *Head* small, rounded, slightly wider than long, circularly rounded behind the eyes, which are anterior but large and slightly prominent, extending fully half way to the base; antennal prominences rather distinct. *Antennæ* very slender, a little longer than the head and prothorax, the club very abrupt and parallel; second joint about as long and very nearly as wide as the first, very feebly obconic, as long as the next two and distinctly thicker, nearly twice as long as wide; three to seven equal in width, feebly obconic, all distinctly elongate; third, fourth, sixth and seventh very nearly equal, ⅓, the fifth fully ½, longer than wide; eighth fully ⅖ wider, transverse, ⅖ wider than long; ninth at least ¾ wider than the eighth, not more than ¼ wider than long, just visibly narrower than the tenth, which is distinctly shorter, ⅖ wider than long; eleventh not at all thicker, obliquely pointed, much shorter than the two preceding. *Prothorax* subquadrate, convex, not quite as long as wide, formed as in *fatuus* and the others of this subgenus, with the subbasal foveæ, impression and carinæ fully developed. *Elytra* short, inflated, not more than ¼ longer than wide, only slightly more than twice as long as the prothorax and about ⅘ wider, subrhomboidal, widest and rather more strongly rounded at the sides only slightly before the middle; humeral plica broad and short but distinct, the subhumeral impression small but very deep; foveæ small but deep; subsutural impressions narrow though rather distinct; suture strongly beaded basally, the bead suddenly and moderately expanded at base. *Legs* slender, the two anterior

femora rather strongly, the four posterior feebly, clavate. Length 0.9 mm.; width 0.45 mm.

Texas (Galveston).

The two specimens, which I took some years ago, represent a species allied to *fatuus* and *hædillus*, but distinguishable from the former by the shorter and more inflated elytra, smaller head with larger and more prominent eyes, still more slender antennæ with paler club and transverse eighth joint, and from the latter by its very much smaller head and larger eyes.

18. **E. callidus** n. sp.—Moderately slender and ventricose, polished, subimpunctate, black, the elytra very slightly paler, dark piceous; legs and antennæ pale, the club of the latter dark; pubescence nearly as in *fatuus*. *Head* rather small, almost circular, convex as usual, the eyes moderate in size and not prominent. *Antennæ* rather short but slender, with the club abrupt and strong, barely as long as the head and prothorax; second joint strongly obconic, not quite twice as long as wide, distinctly longer than the next two and much thicker; three to seven subequal in thickness, the fifth and seventh possibly a little thicker, oval; third, fourth and sixth equal and as long as wide; fifth much longer, $\frac{2}{5}$ longer than wide; seventh quadrate; eighth much wider, $\frac{2}{5}$ wider than the seventh, very short and transverse, at least $\frac{2}{3}$ wider than long, with its apex broadly conic; ninth abruptly fully $\frac{3}{4}$ thicker than the eighth; ninth and tenth perfectly similar, transverse and fully $\frac{2}{5}$ wider than long; eleventh not thicker, distinctly shorter than the two preceding, obliquely, gradually and acutely pointed. *Prothorax* not quite as long as wide, fully $\frac{1}{4}$ wider than the head, in form and sculpture nearly similar to the preceding species. *Elytra* oval, short, not more than $\frac{1}{4}$ longer than wide, but little more than twice as long as the prothorax and nearly $\frac{3}{4}$ wider, widest before the middle, the sides evenly and rather strongly arcuate throughout the length; humeral plica and adjacent impression strongly developed and conspicuous; suture feebly beaded for some distance from the base. *Hind wings* well developed, coarsely cellular in structure, fringed with rather long erect hairs. *Legs* somewhat short, the femora moderately clavate. Length 0.85 mm.; width 0.35 mm.

Texas (Colorado River).

This species is also closely allied to *fatuus*, but differs in numerous structural characters, among which may be mentioned the shorter and smaller, though rather more inflated elytra, much smaller head and shorter antennæ, with a much shorter and more transverse eighth joint, and shorter, more equal and more transverse ninth and tenth joints. The elytra are less basally narrowed and broader at the basal margin than in *fatuus*.

19. **E. debilis** n. sp.—Moderately ventricose, polished, the elytra very feebly and sparsely punctulate; body deep black throughout, the legs dark;

antennæ pale rufo-testaceous, the club quite distinctly blackish; pubescence nearly as in *fatuus*. *Head* rounded, as long as wide; base of the occiput rather more feebly arcuate than the sides of the tempora; eyes rather well developed and slightly prominent but anterior as usual. *Antennæ* slender, fully as long as the head and prothorax, the club very abrupt; second joint as long as the first and about as thick, very feebly obconic, distinctly longer than the next two and much thicker, nearly twice as long as wide; three to seven equal in width; third just visibly longer than wide; fourth and sixth quadrate; fifth and seventh apparently a little thicker, ⅓ longer than wide and quadrate respectively, slightly narrowed at base; eighth fully ¼ wider than the seventh, nearly ⅖ wider than long; ninth abruptly ¾ wider, ¼ wider than long, just visibly narrower than the tenth, which is ⅖ wider than long; eleventh not at all thicker, not quite as long as the two preceding, very gradually, acutely and obliquely pointed. *Prothorax* scarcely as long as wide, strongly convex, fully ¼ wider than the head, subquadrate, rounded on the sides and narrowed at base, strongly bifoveate and impressed near the base and bicarinate as in other species of this subgenus. *Elytra* nearly ⅖ longer than wide, distinctly more than twice as long as the prothorax and about ¾ wider, oval, widest before the middle, the sides evenly and rather strongly arcuate to the base; humeral plica distinct, the impression moderate in size but elongate and very deep; foveæ approximate; subsutural impressions very narrow but distinct, the suture finely but strongly beaded for a long distance from the base, the bead abruptly though slightly expanded at the basal margin. *Legs* moderate, the two anterior femora strongly, the other four feebly, clavate. Length 0.75 mm.; width 0.32 mm.

Michigan.

This is the smallest species of the genus and holds strongly to the *fatuus* type in its general organization; it however differs in its intense black color, antennal structure and in its much smaller size. Two specimens.

20. **E. capitatus** n. sp.—Somewhat stout, moderately ventricose, polished and subimpunctate; head black, the prothorax piceous, paler at apex, the elytra pale rufo-testaceous throughout; legs and antennal club very pale, luteous, the antennal funicle and base darker testaceous; pubescence nearly as in *fatuus*. *Head* distinctly wider than long, circularly rounded behind the eyes, which are rather small and scarcely at all prominent; antennal prominences very feeble, widely separated; declivous front transversely tumid just behind the clypeus as usual. *Antennæ* as long as the head and prothorax, slender, the club very strong and abrupt; second joint not as long as the first, but fully as thick, very strongly obconic, ¾ longer than wide, much longer and thicker than the next two; three to seven equal in thickness, the fifth perhaps a little thicker; third and seventh quadrate; fourth and sixth ¼, the fifth ⅓, longer than wide; eighth fully ⅖ wider, transverse, ⅖ wider than long, strongly conic in apical ⅖; ninth twice as long and nearly twice as wide as the eighth, feebly obtrapezoidal, more than ¼ wider than long; tenth not in

the least wider, similar to the ninth but a little shorter, ⅓ wider than long; eleventh barely as wide and distinctly shorter than the two preceding, gradually narrowed in a slender and very acute ogive, which is not oblique. *Prothorax* subquadrate, about as long as wide, parallel and scarcely narrowed at base, not distinctly arcuate laterally, but feebly and arcuately narrowed near the apex, fully ¼ wider than the head; subbasal impression strong, the foveæ feeble; carinæ distinct. *Elytra* ⅓ longer than wide, scarcely more than twice as long as the prothorax and nearly ¾ wider; sides evenly, strongly arcuate throughout the length; humeral plica wide and convex, the subhumeral impression long, rather narrow and very deep; foveæ deep and approximate; subsutural impressions obsolete, the suture very finely beaded basally, the bead minutely, triangularly expanded at base. *Legs* slender, the four posterior femora feebly, the two anterior more strongly, clavate. Length 0.95 mm.; width 0.4 mm.

North Carolina. Mr. Schmitt.

This species, though evidently allied closely to *fatuus*, differs obviously in its much stouter antennal club, the latter differing further from any other of this section, in being much paler, instead of darker, than the remainder. Sexual characters are not observable, but in the type the anterior tibiæ are turned inward slightly at tip.

In the type specimen the right elytron is removed, and, by lateral sight, the inner edge of the left is observed to have a vertical inner keel under the subbasal bead, and immediately behind this a grooved and rather complex locking fold of the edge. The dorsal pygidium covered by the elytra is very large, strongly convex and is feebly punctulate and sparsely pubescent toward tip.

Besides the above forms which are deemed worthy of description, there is before me another example, from Florida, which seems to represent a distinct species, but as it appears to be immature and is closely allied to some others, it is best not to name it at present. Indeed all of these six forms of Psomophus might readily be regarded as strongly marked geographical subspecies of one type, but the structural differences are so radical and obvious, that it becomes a matter of necessity to name them, in order that they may be subsequently referred to.

PYCNOPHUS n. gen.

The species described by LeConte under the name *Scydmænus rasus*, presents numerous structural peculiarities which declare its isolation from every other known type of the Euconnini. In

habits also it is more purely myrmecophilous than most other North American species of the tribe, though even here we may have cause to doubt the completeness of the symbiosis.

The head is large and truncate at base, but is borne on a strongly constricted and exserted neck, the antennal cavities widely separated on the declivous front, with the intermediate surface not modified, the clypeus short but abruptly subporrect, so that there is a strong reëntrant angle in profile between the front and plane of the clypeus, the apex of the latter even. Labrum large, transverse. Mandibles relatively very small, the maxillæ and palpi more than usually developed, the second joint of the maxillary palpi slender, moderately clavate and slightly bent at apex, the third long, rather abruptly and strongly clavate in apical half, the basal half forming a long and very slender peduncle; fourth joint slender and aciculate. In most of its remaining characters the single known species might be regarded as an aberrant Euconnus; it may be described as follows:—

1. **P. rasus** Lec.—Proc. Acad. Nat. Sci., Phila., 1852, p. 153 (Scydmænus).

Stout, polished and impunctate, pale rufo-testaceous throughout; body completely glabrous, with the exceptions noted below. Head large, subquadrangular, much wider than long, glabrous, except a brush of dense coarse pale hairs at each side of the basal surface of the occiput near the neck, the latter $\frac{2}{5}$ as wide as the head; eyes small, rounded, anterior and not prominent. Antennæ rather thick, with a somewhat abrupt and moniliform 4-jointed club, nearly $\frac{1}{2}$ as long as the body; joints two to seven cylindric and very closely connected, the second a little thicker and slightly elongate; three to six equal in width; third, fourth and sixth subequal and not quite as long as wide; fifth rather longer than wide; seventh but just visibly wider, feebly obconic and a little longer than wide; joints of club much more loosely connected; eighth $\frac{2}{5}$ wider than the seventh, oval and a little longer than wide; ninth and tenth $\frac{1}{3}$ wider, a little wider than long, narrowed apically, the apex narrowly truncate; eleventh rather thicker, very obtusely ogival and slightly oblique at apex, much shorter than the two preceding. Prothorax rather small, about as long as wide, not quite as wide as the head; sides parallel in basal half, convergent apically; surface completely glabrous except a few short hairs on the flanks anteriorly near the head,

the apical margin at the sides broadly lobed; disk with two small and very widely separated foveæ near the basal margin but not otherwise modified. Elytra large, oval, somewhat less than three times as long as the prothorax and twice as wide; sides subparallel, broadly, evenly arcuate; humeral plica broad and indefinite, the subhumeral impression large but feeble; foveæ deep, perforate and approximate; suture not beaded, the impressions obsolete. Mesosternum finely and strongly carinate. Metasternum large and long. Hind coxæ rather narrowly separated. Legs stout and well developed; two anterior femora strongly, the other four moderately, clavate; hind tarsi cylindric, the joints compactly joined, the first four equal in length; ungues slender and moderately arcuate. Length 1.65–1.9 mm.; width 0.7–0.85 mm.

Canada (Ottawa), New York, Pennsylvania and Iowa (Iowa City). A rather common species and more than usually variable in point of size. The parapleuræ of the mesosternum are tumid, as usual, and have a few sparse hairs. The above description is drawn from the female, but sexual differences are not obvious in the series before me, and the male has no striking secondary characters.

It appears to be certain that the *Euconnus calvus* of Sharp, recently described in the "Biologia" from Guatemala, is not only a member of this genus, but that it is exceedingly closely allied to *rasus*.

NOCTOPHUS n. gen.

This name is proposed for a large species, densely pubescent throughout, having in general the structural characters of Euconnus, but exhibiting differences in antennal, labral and crural features which seem to demand a generic separation. The head is large, the antennal cavities widely separated by the simple declivous front, the clypeus simple and rectilinearly truncate, its plane of inclination nearly the same as the front, from which it is separated by a feeble transverse depression joining the cavities. Labrum large and transverse, its anterior margin very deeply sinuate at the middle. Mandibles and eyes well developed. Palpi missing in the type. Antennæ moderate in length, with a clearly defined 5-jointed club.

The prothorax is nearly as in Euconnus but without trace of

carinæ, merely having in a common transverse line near the base, a fovea at each side at the summit of the flank, and three, clearly defined, toward the middle of the disk, not united by a transverse impression. The elytra overlap and are individually rounded at apex as in Euconnus, but leave exposed a declivous dorsal pygidium of small extent. The prosternum is deeply emarginate before the coxæ, and the mesosterum strongly carinate, as in all the other genera of this tribe. The hind coxæ are almost completely contiguous. Legs well developed, the femora all extremely clavate, the tibiæ thickened and densely pubescent but narrowed at base, the tarsi filiform and slightly compressed, the first four joints of the posterior decreasing very slightly and uniformly in length. The hind coxæ extend to the extreme sides of the body, and the met-episterna are not in the least exposed.

The species may be described as follows :—

1. **N. schmitti** n. sp.—Moderately stout, polished, subimpunctate; anterior parts and antennæ dark rufo-piceous, the elytra and legs paler, dark rufo-testaceous; pubescence very abundant, coarse, pale in color, bristling densely backward from the occiput, short and not very conspicuous on the prothorax, close-set, even, moderate in length and distinctly recurved on the elytra. *Head* transversly oval, the base broadly rounded; eyes moderately large, subanterior, somewhat convex, much wider than long and composed of large, well developed and very convex contiguous lenses. *Antennæ* stout, not quite ½ as long as the body; second joint shorter and very much thinner than the first, only slightly thicker than the following, feebly obconic, much shorter than the next two and ½ longer than wide; three and four equal, cylindric, just visibly longer than wide; fifth a little wider, quadrate; sixth still a little wider, more obviously beaded at base, slightly wider than long, conic at apex; seventh abruptly ⅖ wider, very nearly as long as wide; eight to ten perfectly similar to the seventh, but just visibly wider and successively slightely more transverse; joints seven to ten strongly conic at apex; outer five transversely truncate and strongly beaded at base; eleventh slightly thicker, ogival but not oblique at tip, not quite as long as the two preceding. *Prothorax* rather large, nearly as long as wide, ⅕ wider than the head; rounded at the sides anteriorly, broadly constricted toward base, narrowed toward apex, the latter truncate and ⅔ as wide as the base. *Elytra* elongate-oval, nearly ½ longer than wide, almost 2½ times longer than the prothorax and barely ⅔ wider, broadly, evenly arcuate at the sides, rather obtuse at apex; humeral plica rather long, the subhumeral impression large and conspicuous, gradually evanescent; foveæ distinct, not very approximate, the inner the stronger; subsutural impressions rather strong, the suture feebly elevated but not definitely beaded toward base. *Abdomen* very densely pubescent, dark brown, the last two segments pale. Length 2.1 mm.; width 0.78 mm.

North Carolina. Mr. Schmitt.

The type appears to be a female from the aspect of the opening between the dorsal and ventral plates at the apex of the abdomen.

It is probable that the *Scydmænus crassicornis* of Schaum, (Anal. Ent., 1841, p. 23), from Colombia, also belongs to this genus.

DRASTOPHUS n. gen.

The sole representative of Euconnus thus far discovered in the Pacific coast faunal region, is of a distinct and pronounced type in having the prothorax strongly and subglobularly convex, with a minute and feeble double fovea bordered inwardly by a very small carina at each side, at the basal margin, but without further modification of any kind, the median foveæ and transverse impression being wholly obsolete; there is, in fact, not the feeblest trace of a character which is peculiarly constant and distinctive of Euconnus in all its eastern representatives. Otherwise, however, there is no structural feature which would prohibit us from associating *lævicollis* with Euconnus as a subgenus.

The typical representative of the genus may be described as follows from the male:—

1. **D. lævicollis** n. sp.—Rather strongly ventricose, polished, impunctate, uniformly blackish-piceous in color, the head pale, the legs and antennæ pale flavo-testaceous throughout; last two segments of the abdomen paler; pubescence moderately abundant, sparse on the head, short, coarse, erect and bristling on the prothorax, moderate in length, recurved and intermingled with longer sparse and more erect setæ on the elytra. *Head* moderately developed, very slightly wider than long, broadly subparabolic behind the eyes, which are very anterior in position, rather small and not prominent; front feebly swollen between the antennal cavities and separated from the clypeus by a feeble transverse groove, the clypeus simple, subporrect, rectilinearly truncate at apex; labrum well developed, almost circularly rounded, apparently very obsoletely sinuate at the middle of the apex; palpi normal. *Antennæ* moderately long, fully ½ as long as the body, somewhat slender; club pronounced though not robust, rather well differentiated; second joint nearly as long as the first but slightly narrower, obconic, ⅘ longer than wide, barely as long as the next two but distinctly thicker; three to six equal in width, cylindric; third ⅓, and fifth ¼ longer than wide; fourth scarcely visibly elongate; sixth distinctly shorter than wide; seventh ¼ wider, subglobular, as long as wide; eighth ½ wider than the seventh, rounded, not quite as long as wide; ninth ⅕ wider; last three increasing very slightly and gradually in thickness among themselves; ninth ⅓, tenth ⅖ wider than long; eleventh large, as long as the two preceding, gradually and acutely pointed but only slightly oblique at apex.

Prothorax subglobular, scarcely as long as wide, nearly ⅓ wider than the head, truncate at apex, strongly rounded at the sides, narrowed at base, the surface strongly and evenly convex. *Elytra* nearly ⅖ longer than wide, 2½ times longer than the prothorax and ⅚ wider, strongly inflated near the middle and very much narrowed thence to the base; apex narrowly rounded; humeral plica and impression obsolete; foveæ large, deep, equal, perforate and approximate, the inner slightly emarginating the sutural bead; subsutural impressions obsolete, the suture feebly beaded and only very near the base, the bead rapidly and triangularly expanded at base. *Legs* well developed, the femora moderately clavate, the anterior more strongly; hind tarsi filiform, the first three joints subequal and slightly elongate, the fourth distinctly shorter; hind coxæ only moderately separated, the distance being equal to about ⅓ of their individual width. Mesosternum strongly carinate. Length 1.25 mm.; width 0.45 mm.

California (San Francisco); British Columbia.

The male has the abdomen simple, with the exception of the fifth segment, which has on the disk near the apex two small and feeble wart-like elevations, mutually separated by about ⅓ of the width of the segment. The female does not differ appreciably from the male. The pubescence of the head is sparse and irregular in arrangement, except at the sides on the tempora, where it is coarse, abundant and directed posteriorly. This species is abundant throughout the Pacific coast districts.

CONNOPHRON n. gen.

The species separated under this name constitute by far the largest and most characteristically American element of the family, and the European fauna does not appear to possess any types which can be associated with them, either in structure or general facies. We in fact have here an example of the non-conformity frequently observable between the faunas of Europe and eastern North America, as evidenced further in the genera Meligethes, Bythinus, Tenebrioides, Otiorhynchus, Hymenorus and numerous other instances, where large genera are confined principally to one continent, although represented also in the other. Connophron does not appear to extend into the true Pacific coast fauna, which fact might rather have been anticipated than otherwise, in consideration of its purely American origin; it however penetrates very nearly to that limit, being found in southern California and eastern Oregon.

In general structure Connophron is closely allied to Euconnus, but differs in its conical prothorax, devoid of basal foveæ, this

apparently constituting a differential feature of true generic weight which appears to have been overlooked. The pronotum is however frequently impressed transversely near the base, the impression generally distinctly interrupted at the middle, but there is in no case even so much as a trace of the circular pits so characteristic of Euconnus.

The body is generally somewhat stout and noticeablv ventricose, much more so as a rule than in Euconnus, and there are but few exceptions—such as *clavatum*—where the form becomes slender, though always remaining strongly convex. The head is moderate in size, convex, without asexual irregularity of any kind except in the extremely minute *caviceps*, strongly rounded behind, the occiput descending abruptly and almost vertically in profile to the neck, which is constricted as usual. The eyes are quite anterior in position and vary greatly in size and prominence. The antennæ vary but little in type of structure, and are not affected sexually to more than a slight degree, the two basal joints larger, the next four cylindric and equal in width, forming a peduncle for the enlarged apical parts, the seventh forming a transition to the more or less elongate 4-jointed club, which, however, becomes purely 3-jointed in a few species, the eighth joint then being nearly similar to the seventh; but the eighth varies considerably in size in the 4-jointed club, so that the 3-jointed condition is simply an extreme limit, and the species possessing it do not present any other differential feature. The species having a 3-jointed club in Euconnus constitute much more abruptly circumscribed groups. The maxillary palpi have the third joint elongate and obconic or suboval, the fourth small, slender and aciculate.

The hind coxæ are rather narrowly separated, in one group becoming almost contiguous and with the abdominal process angulate; in these species the first ventral segment is peculiarly modified, the posterior tarsi longer, with the joints more unequal and the hind tibiæ provided at apex with a long and slender spur in the male. This singular spur is, however, not confined to the group with triangular intercoxal process, but occurs also in some of the minute species with simple clypeus assigned to the preceding section. The clypeal tooth so prominent in the larger species of the first group, having an unimpressed pronotum, is a perfectly asexual feature, and seems to be constant in form and size in all

the individuals of the respective species, wherever an opportunity has occurred to inspect a series of examples. The elytra are separately rounded at apex and mutually overlap for a considerable distance, the fine raised line indicating the limit of overlap diverging on each from the inner edge posteriorly. The hind wings are fringed with stiff erect hairs. There is a terminal dorsal pygidium which is entirely concealed by the elytra. The integuments are always rather plentifully clothed with hair, which is simple in structure on the elytra, but intermingled with shorter and stiffer spicules on the anterior parts; it is directed backward on the head and densely clothes the basal parts; there is also a short erect and oblique fringe at each side of the occiput.

The sexual characters are very feeble as a rule, but in the very minute *biceps*, and, to a less degree, in *caviceps*, become extremely pronounced, the head in the male being modified to as great a degree as in Batrisus. In *frontale* and its immediate allies there is a small pubescent area between the antennal prominences which is wanting in the female, but beside these cases I have noticed no sexual modification in any part of the body, except occasionally a very slight one in general form. The terminal spur of the hind tibiæ in the males of a large section of the genus, is a character altogether peculiar to Connophron. The form of the œdeagus is noticed under the descriptions of those species in which it happened to be visible in the particular representative studied, but the organ is seldom protruded in mounted specimens.

The species are exceedingly numerous and those which I have before me seem to be conveniently classified as follows :—

Basal joint of the hind tarsi not, or scarcely, longer than the second, the first four joints subequal among themselves; hind coxæ moderately separated, the abdominal process obtuse; posterior margin of the first segment simple; hind tibiæ of the male never calcarate at apex, except in certain small species with simple clypeal margin..... 2

Basal joint of the hind tarsi elongate, always distinctly longer than the second, the joints one to four decreasing rapidly in length, the tarsi frequently very slender and filiform; hind coxæ more approximate, the abdominal process angulate; posterior margin of the first segment arcuate and generally fringed with membranous hairs or a coriaceous border; hind tibiæ of the male with a slender terminal process.....33

2—Antennal club 4-jointed, frequently gradual in formation.....3

Antennal club 3-jointed, always abruptly formed.....32

3—Clypeus toothed at the middle of the apical margin, the tooth sometimes minute.....4

Clypeus without trace of marginal inequality.....20
4—Body distinctly more than 1 mm. in length.....5
Body about 1 mm. in length.....19
5—Elytral pubescence long, erect and generally fine.....6
Elytral pubescence coarse, shorter and recurved.....18
6—Pronotum not transversely impressed near the basal margin, though with two faint rounded and nearly contiguous impressions in *repletum*.....7
Pronotum transversely and rather feebly impressed near the basal margin....17
7—Clypeal tooth large or moderate, distinct.....8
Clypeal tooth very minute.....16
8—Elytra with a large and conspicuous subhumeral impression.....9
Elytra with the subhumeral impression and humeral plica obsolete or very nearly so.....15
9—Large species, always more than 1½ mm. in length.....10
Small species, much less than 1½ mm in length.....14
10—Pronotum with two feeble, approximate and probably evanescent impressions in the middle near the basal margin.....1 **repletum**
Pronotum even, without trace of impression at any part.....11
11—Elytra strongly impressed at each side of the suture near the base.....12
Elytra feebly or not at all impressed near the suture.....13
12—Elytra long and rather acutely pointed behind, fully ½ longer than wide.
Clypeal tooth entire; femora all strongly clavate.
Antennal club scarcely at all differentiated; elytra bright red with the suture finely blackish.....2 **optatum**
Antennal club somewhat distinct; elytra uniformly blackish-piceous in color; body narrower.....3 **longipenne**
Clypeal tooth narrow, bifid at tip; hind femora much less strongly clavate.....4 **acutipenne**
Elytra shorter and much more obtuse at apex, evidently less than ½ longer than wide.
Elytra dull red, nubilate with black posteriorly.....5 **formale**
Elytra bright red throughout; body notably smaller.....6 **simulans**
13—Antennæ shorter, the club strongly differentiated; subsutural impressions feeble but visible, the suture beaded toward base.
Legs bright rufo-testaceous throughout.....7 **schaumi**
Legs blackish; tibiæ paler, the tarsi flavate.....8 **flavitarse**
Antennæ shorter, the club strongly differentated; subsutural impressions nearly obsolete, the suture not at all beaded toward base; size much smaller.....9 **oreophilum**
Antennæ long and slender; hind femora evidently less strongly clavate than the four anterior; elytral suture not beaded toward base.
Body rufo-piceous in color.....10 **longicorne**
Body bright and pale rufo-testaceous in color.....11 **rubrum**
14—Prothorax shorter than wide, with the sides straight; penultimate joints of the antennæ moderately transverse.....12 **dentiger**
Prothorax fully as long as wide, with the sides arcuate; penultimate joints of the antennæ strongly transverse.....13 **extricatum**

15—Hind body normally inflated; body blackish throughout.
Prothorax small, about ½ as wide as the elytra and much less than ½ as long.....14 **ludificans**
Prothorax fully ⅗ as wide as the elytra and very nearly ½ as long
15 **gaudens**
Hind body relatively narrow, ½ wider than the prothorax, rufous in color, the elytra black though becoming paler at apex.....16 **nigripenne**
16—Hind body normally inflated, the elytra more than ½ wider than the prothorax.
Subsutural impressions obsolete, the suture not at all elevated or beaded toward base.....17 **fossiger**
Subsutural impressions visible, the suture more or less beaded toward base.
Anterior femora moderate, not modified in the male.
Small; elytra red throughout and much inflated, the subhumeral impression strong.....18 **novellum**
Small; elytra reddish, becoming black toward the sides and apex, much less inflated, the subhumeral impression small.
19 **brevicorne**
Larger and stouter, the body black throughout; sutural bead and subhumeral impression very strong and conspicuous..20 **tenebrosum**
Anterior femora large and modified in the male; body black throughout.
21 **femorale**
Hind body narrow, the elytra not more than ½ wider than the prothorax; color pale throughout.....22 **procerum**
17—Clypeal tooth rather well developed; body elongate and narrow, pale in color, the elytra but slightly more than ½ wider than the prothorax.
23 **elongatum**
18—Antennæ stout, not longer than the head and prothorax, strongly clavate, the penultimate joints very transverse.
Larger, the basal foveæ of the elytra strong, the outer large.
24 **clavicorne**
Small, the basal foveæ small and feeble; antennal club more nearly 3-jointed.....25 **abducens**
Antennæ rather slender, much longer than the head and prothorax.
Penultimate joints of the antennæ distinctly wider than long; body blackish throughout, the legs and antennæ pale.
Elytra inflated, fully ⅘ wider than the prothorax.....26 **luteipes**
Elytra but slightly inflated, scarcely ⅔ wider than the prothorax; body narrower.....27 **lætulum**
Penultimate joints of the antennæ fully as long as wide; body rather narrowly oval, pale in color throughout; antennal club feebly differentiated.
28 **furtivum**
19—Pronotum without trace of transverse impression, perfectly even throughout; male probably without cephalic modification; antennal club gradual in formation, the eighth joint intermediate in width; elytral pubescence rather short, coarse and recurved.

Penultimate joints of the antennæ only slightly transverse, the club moderate in thickness; elytra ½ longer than the head and prothorax combined.....29 **comptum**

Penultimate joints strongly transverse, the club strong; elytra obviously less than ½ longer than the head and prothorax.

Clypeus distinctly keeled along the middle.....30 **humile**

Clypeus simple; body narrower and less pubescent, the antennæ less stout.....31 **pallidum**

Pronotum more or less feebly impressed transversely near the basal margin; male with a more densely punctured frontal area; antennal club rather slender.

Elytral pubescence short, coarse and recurved, with widely dispersed erect setæ intermingled; color bright testaceous throughout. 32 **angusticolle**

Elytral pubescence long, suberect and virtually uniform.

Body stouter, with the head well developed, piceous or blackish in color.....33 **frontale**

Body narrower and more rhomboidal, paler in color, the head much smaller in size.....34 **frustum**

20—Head not greatly modified in the male.....21

Head conspicuously modified in the male, being more or less prominently angulate at the sides behind the eyes in that sex; body extremely minute...31

21—Pronotum even, without distinct transverse impression; body slightly larger; eyes small or moderate.....22

Pronotum with a transverse interrupted impression near the basal margin, which is however generally feeble.....23

22—Elytral pubescence long, even and suberect; male without tibial spur, at least in *occidens*.

Black, the elytral suture beaded toward base.....35 **integrum**

Rufous, the suture not at all beaded.....36 **occidens**

Elytral pubescence rather long and suberect but intermingled with still longer tactile setæ; male with a slender spur at the apex of the hind tibiæ.

Body feebly ventricose, the elytral vestiture dense.....37 **anale**

Body strongly ventricose, the elytral vestiture coarser and much sparser. 38 **ventricosum**

Elytral pubescence short, coarse and recurved; body rufo-testaceous throughout.

The elytral vestiture even, or with the erect setæ not obviously longer.

Femora strongly clavate; subhumeral impression rather distinct though moderate.....39 **hirtellum**

Femora feebly clavate, especially posteriorly.

Subhumeral impression almost obsolete.....40 **decorum**

Subhumeral impression distinct; male with a spur at the apex of the hind tibiæ.....41 **digressum**

The elytral pubescence intermingled with long, erect and conspicuous tactile setæ; subhumeral impression very long and deep; femora quite feebly clavate.....42 **setiger**

23—Body more ventricose, the elytra always distinctly more than ½ wider than the prothorax.....24

Body narrow and elongate but convex as usual, the elytra about ½ wider than the prothorax; transverse pronotal impression strong.....30

24—Prothorax strongly conical.....25

Prothorax very feebly conical and frequently subparallel in basal half.....29

25—Elytra strongly but sparsely punctate toward base, the punctures obsolescent broadly along the crest of the flanks.....43 **divisum**

Elytra not punctured or uniformly and very inconspicuously punctulate.....26

26—Elytra strongly inflated, the humeral plica and adjacent impression well developed.....27

Elytra less inflated, the humeral plica and impression smaller and less distinct.....28

27—Prothorax very small, scarcely more than ½ as wide as the elytra; eyes very large and prominent.

Body black throughout; antennal club pronounced.....44 **testaceipes**

Body blackish, the elytra bright red; antennal club very slender and more gradual in formation.....45 **inerme**

Prothorax not so small, always distinctly more than ½ as wide as the elytra; eyes moderately large in size.

Elytral vestiture rather long and suberect; antennal prominences evident, with the front impressed between them.

Elytral suture with a broad bead which is broadly expanded at base. 46 **innocuum**

Elytral suture not beaded; head larger and more transverse, with larger eyes.....47 **conifer**

Elytral vestiture shorter, more abundant and recurved, even; antennal prominences completely obsolete, the front not impressed. 48 **castaneum**

28—Elytra not punctulate, the transverse pronotal impressions very feeble as usual; elytral suture with a strong bead toward base, which is rapidly expanded at the basal margin.

Elytral vestiture rather long and abundant though recurved; body dark in color.....49 **triviale**

Elytral vestiture shorter and sparse; body paler in color; penultimate joint of the antennæ more transverse.....50 **osculans**

Elytra vaguely punctulate, the pronotal impressions rather strong; elytral suture only very feebly elevated toward base; body minute in size. 51 **pyramidale**

29—Elytral pubescence very short and decumbent; head larger; posterior femora rather strongly clavate; size much larger.....52 **oregonense**

Elytral pubescence longer and less decumbent, rather sparse; head noticeably small, distinctly impressed between the antennal prominences; posterior femora feebly clavate; size minute.

Body pale rufous; elytral pubescence rather short; prothorax parallel, with the sides straight toward base.....53 **nimbatum**

Body black or piceous-black, the legs pale; elytral pubescence quite long and only feebly recurved; prothorax feebly conical, with the sides broadly arcuate, becoming parallel near the base.....54 **parcum**

30—Head large, nearly as wide as the prothorax.....55 **clavatum**

Head smaller, much narrower than the prothorax, the latter more strongly narrowed at apex.....56 **decipiens**

31—Head transversely excavated in the male and strongly angulate laterally, perfectly simple and of the normal form in the female.....57 **biceps**

Head concave toward the middle of the vertex in both sexes, feebly angulate at the sides in the male.....58 **caviceps**

32—Clypeal tooth rather well developed, narrow and acute; antennæ stouter. Larger, blackish in color, the hind femora but slightly less clavate; elytra longer, much more than twice as long as the prothorax.....59 **trinifer**

Small, testaceous, the four posterior femora less clavate; elytra smaller, not more than twice as long as the prothorax.....60 **debilitans**

Clypeal tooth extremely minute, short and obtuse; antennal funicle much narrower, slender.

Hind body obese, the elytra with a distinct subhumeral impression. 61 **trifidum**

Hind body narrowly oval, the subhumeral impression almost wholly obsolete; size more minute.....62 **fulvum**

33—Larger species, distinctly more than 1 mm. in length; basal joint of the hind tarsi more elongate.....34

Minute species, less than 1 mm. in length.....46

34—Clypeus triangularly toothed at the middle; pronotum strongly, transversely impressed near the basal margin.....63 **repugnans**

Clypeus not toothed, or not more than excessively feebly modified at the middle of the apical margin in a broadly rounded inequality.....35

35—Pronotum without trace of subbasal impression; tibial spur of the male very long; hind body strongly ventricose; body black throughout. 64 **calcaratum**

Pronotum transversely impressed or biimpressed near the basal margin.....36

36—Piceous or paler in color, with the elytra generally paler testaceous or bright red.....37

Black throughout, the elytra sometimes with a scarcely perceptible piceous tinge.....44

Dark rufo-testaceous, the elytra black or piceous-black.....45

37—Apex of the first abdominal segment fringed with scale-like porrect hairs, or with a solid pale coriaceous border.....38

Apex of the first segment almost perfectly simple and normal.....43

38—Terminal tibial process of the male split into two or three more slender filaments.....39

Terminal process simple; elytral suture always beaded toward base, the bead abruptly expanded at the basal margin.....40

39—Antennæ longer, with a stronger and more incrassate club; subhumeral impression feeble.....65 **bifidum**

Antennæ shorter, with a more feebly marked club; subhumeral impression very large and conspicuous.....66 **mutilans**

40—Large species, always over 1½ mm. in length ; subsutural impressions very deep.....41

Smaller species, always under 1½ mm. in length.....42

41—Subhumeral impression large, deep and conspicuous.

Antennal club distinctly differentiated.....67 **capillosulum**

Antennal club scarcely at all defined ; tarsi longer.....68 **proximum**

Subhumeral impression smaller and very feeble ; elytra more elongate, less ventricose and more posteriorly pointed than in *capillosulum*.

69 **illustre**

42—Prothorax larger, much more than ½ as wide as the elytra.

Antennal club pronounced, parallel and well differentiated...70 **lynceum**

Antennal club incrassate, narrow and more feebly differentiated.

71 **basale**

Prothorax small, not much more than ½ as wide as the elytra.

Pronotum strongly impressed near the basal margin.

General color piceous ; subbasal impression of the pronotum not distinctly interrupted at the middle.....72 **politum**

General color pale testaceous ; elytral pubescence very long ; subbasal impression of the pronotum completely divided..73 **longipilosum**

Pronotum very feebly and obsoletely impressed ; general color piceous ; elytral pubescence moderately long and erect.....74 **lacunosum**

43—Elytral pubescence unusually sparse.....75 **filitarse**

44—Femora dark in color.

Larger species, more than 1½ mm. in length.....76 **atrum**

Small species, but little more than 1 mm. in length ; prothorax small, about ½ as wide as the elytra.....77 **pertinax**

Femora and entire legs pale testaceous in color.

Penultimate antennal joint not strongly transverse.

Prothorax small, scarcely more than ½ as wide as the elytra ; hind body strongly inflated ; small species .....78 **pallidipes**

Prothorax rather distinctly more than ½ as wide as the elytra ; larger species.....79 **nigrum**

Penultimate antennal joint strongly transverse ; pronotum strongly and almost continuously impressed near the basal margin...80 **paganum**

45—Elytral pubescence rather coarse, pale, erect and conspicuous ; pronotal impression strong, very narrowly and imperfectly interrupted at the middle.....81 **limatum**

46—Basal joint of the hind tarsi relatively shorter, not as long as the next two combined.....82 **pumilum**

The extreme constancy of type throughout the genus is very remarkable, and necessitates a careful scrutiny in order to distinguish the numerous species, which in some parts become closely allied among themselves; but, as in nearly all similar cases, this

adherence to a common type characterizes also the individuals of the various species, there being but little variability throughout extended series, even in size of the body, so that with some study, there can be no more than the usual uncertainty in recognizing species.

1. **C. repletum** n. sp.—Stout, polished and impunctate; head blackish, the prothorax slightly paler, the elytra dark rufo-testaceous throughout; abdomen blackish, slightly pale toward tip; legs and antennæ bright rufo-testaceous; pubescence long and abundant, flavous, darker on the prothorax. *Head* about as long as wide, strongly parabolic behind the eyes, which are notably small and but slightly prominent; clypeal margin strongly toothed at the middle. *Antennæ* ½ as long as the body, gradually but rather strongly incrassate toward tip, the three basal joints decreasing slightly in thickness; second nearly twice as long as wide; three to six differing but little among themselves and about ⅔ longer than wide, seventh but slightly thicker, ½ longer than wide; eighth elongate-oval, beaded at base as usual and ⅔ longer than wide; last three joints increasing very slightly in thickness; ninth and tenth oval, narrowed at base, the latter not longer than wide, the former slightly elongate; eleventh oval, gradually and obliquely pointed, not as long as the two preceding. *Prothorax* conic, the sides feebly arcuate, the apex about ½ as wide as the base, the latter broadly arcuate and scarcely more than ⅓ wider than the head; disk with two large rounded and excessively feeble contiguous impressions at the middle, near the basal margin. *Elytra* not quite ½ longer than wide, twice as long as the prothorax and about ⅘ wider, oval, the sides evenly arcuate, somewhat obtuse at apex; humeral plica feeble; subhumeral impression large but feeble, the two foveæ approximate and not strong; surface strongly impressed at the suture near the base, the suture finely but strongly elevated basally. *Legs* well developed, the femora all strongly clavate, but, as usual, decreasingly so posteriorly. Length 2.1 mm.; width 0.9 mm.

Arkansas (Carlisle). Mr. Wickham.

The individual before me is without doubt a male, and the species may be known by its large size, strong elytral impressions, elevated suture and inflated hind body. The two approximate impressions of the pronotum are so feeble, that, were they not symmetrically placed in the unique type, I should be disposed to regard them as spurious and accidental; it is more than probable that they are inconstant and may disappear altogether.

2. **C. optatum** n. sp.—Elongate-oval, moderately stout, polished and impunctate, dark piceo-castaneous, the elytra dark rufous throughout but blackish along the suture; abdomen pale and somewhat yellowish; legs and antennæ dark rufous; pubescence long and abundant, pale, dense and bristling anteriorly. *Head* nearly as long as wide, broadly parabolic behind the eyes,

which are rather small but prominent; frontal impression distinct and with a few coarser punctules in a double series; frontal margin transversely truncate at apex, the tooth strong and narrow; occiput vertical at base. *Antennæ* slender and elongate, rather more than ½ as long as the body, incrassate toward tip; first three joints decreasing gradually and slightly in thickness, feebly obconic, the first twice as long as wide; second ⅔ longer than wide; three to seven subequal in thickness and subcylindric; third and fifth ⅖, fourth and sixth ⅓, and seventh ½, longer than wide; eighth, elongate-oval, narrowed toward base, ⅖ longer than wide, distinctly longer than the seventh or ninth; three outer joints increasing but little in thickness, the ninth a little longer than wide; tenth subquadrate; eleventh gradually pointed, much shorter than the two preceding. *Prothorax* rather longer than wide, conic, the sides but slightly arcuate; apex not tubulate, feebly arcuate and ½ as wide as the base, the latter feebly arcuate and not ⅖ wider than the head; disk perfectly even and without trace of impression. *Elytra* fully ½ longer than wide, more than twice as long as the prothorax and ⅔ wider, widest before the middle; sides evenly arcuate from base to apex, the latter narrowly rounded; two basal foveæ on each rather approximate; subhumeral impression moderate, the humeral plica wide and distinct but not much elongated disk distinctly impressed at the suture near the base, the suture strongly beaded toward base. *Abdomen* coarsely flavo-pubescent. *Legs* rather long, the femora all strongly clavate. Length 2.2 mm.; width 0.85 mm.

Florida (St. Johns River).

The sex of the single specimen before me is undoubtedly male, as shown by antennal structure and the conformation of the apical plates of the abdomen. Sexual differences in form are probably very slight. The species may be readily known by its large size and impressed elytra, with the suture strongly beaded.

3. **C. longipenne** n. sp.—Elongate and moderately slender, polished and impunctate, piceous-black, the elytra throughout very dark rufo-piceous; under surface blackish, the abdomen pale at tip; legs and antennæ dark rufous, the femora still darker; pubescence long and abundant, flavescent on the elytra. *Head* slightly wider than long, almost semicircularly rounded behind the eyes, the latter rather small and moderately convex; neck narrow, barely ⅖ of the maximum width; clypeal tooth strong and rather pointed; occiput deeply vertical at base. *Antennæ* ½ as long as the body, slender, the club feebly differentiated; first three joints decreasing uniformly and gradually in thickness, the first and second nearly twice as long as wide, the latter shorter than the next two; three to six equal in width, cylindric; third and sixth ⅓, fourth ⅖, fifth ½, longer than wide; seventh slightly thicker, ½ longer than wide, as long as the eighth, the latter feebly obconic, ⅖ longer than wide, rather longer than the ninth, which is but slightly longer than wide; outer joints increasing feebly in thickness. *Prothorax* a little longer than wide, conic, the sides very feebly and almost evenly arcuate; apex truncate, not at all tubulate, ½ as wide as the base, the latter feebly arcuate and scarcely ⅓ wider than the head;

surface even, without trace of impression. *Elytra* rather more than ½ longer than wide, about ⅘ wider than the prothorax and more than twice as long, oval, the sides evenly arcuate throughout; apex narrowly rounded; humeral plica pronounced and somewhat elongate; subhumeral impression rather deep and extending some distance from the base; two basal foveæ moderate; subsutural impressions, near the base, deep and distinct, the suture beaded thence to the basal margin. *Legs* well developed, the femora strongly clavate. Length 2.0 mm.; width 0.8 mm.

Iowa (Keokuk).

The type is a male, as shown by the acutely produced extremity of the broad copulatory spicule. This species may be known by its dark colors, elongate elytra, large size and some other features as shown in the table.

4. **C. acutipenne** n. sp.—Rather narrowly subrhomboidal in form, polished, subimpunctate, piceous-black, the elytra feebly rufescent; abdomen castaneous; legs and antennæ dark rufous; pubescence abundant, stiff anteriorly, long, pale and quite dense on the elytra. *Head* nearly as long as wide, semicircularly rounded behind the eyes, the latter moderate in size and rather convex ; neck ⅔ of the maximum width; occiput deeply vertical at base; frontal margin truncate, the tooth narrow, elongate, with the tip bifid and bearing a setiform hair. *Antennæ* nearly ½ as long as the body, the eighth joint rather abruptly wider than the seventh and the club almost parallel; second joint feebly obconic, ½ longer than wide, almost as long as the next two; three to six almost exactly equal, cylindric, slightly narrower than the second and barely ¼ longer than wide; seventh but little thicker, cylindric-oval, ⅔ longer than wide; eighth wider, suboval, ¼ longer than wide, equal in length to the ninth, which is slightly longer than wide; tenth not longer than wide; eleventh obliquely pointed, slightly stouter than the ninth and tenth and distinctly shorter than the two together. *Prothorax* conic, slightly longer than wide, the sides feebly arcuate; apex not at all tubulate, fully ½ as wide as the base, which is about ⅓ wider than the head, surface perfectly even throughout. *Elytra* rather more than ½ longer than wide, more than twice as long as the prothorax and ⅘ wider; sides more strongly arcuate at basal ⅔, thence oblique and straighter to the apex, which is acutely rounded; humeral plica and impression somewhat short and feeble but distinct; foveæ small and feeble; surface strongly impressed at the suture near the base, the suture finely and moderately elevated basally. *Abdomen* densely fulvo-pubescent. *Legs* rather long; anterior and middle femora strongly, the posterior rather feebly, clavate. Length 1.8 mm.; width 0.65 mm.

Texas (Houston).

Readily distinguishable by the elongate and acute elytra, which are strongly impressed along the suture toward base. It resembles *longipenne*, but is smaller, with the vestiture much denser and differs greatly in the form of the clypeal tooth, which is simple,

acute and triangular in that species. The genital segment in the type is truncate and feebly, transversely impressed at tip. The type is a male.

5. **C. formale** n. sp.—Rather stout, elongate-oval, polished and subimpunctate, piceous-black, the elytra dark rufous, blackish behind; abdomen blackish, pale at apex; legs and antennæ dark rufous, the femora blackish; pubescence long and rather abundant, the darker anterior bristles numerous. *Head* slightly wider than long, semicircular behind the rather small eyes, which are not prominent; neck less than ½ the maximum width; occiput deeply vertical at base; clypeal tooth strong, simple, triangular, not very acute. *Antennæ* barely ½ as long as the body, somewhat gradually incrassate distally; club only feebly differentiated; three basal joints decreasing only very slightly in thickness; third feebly obconic, fully ¾ longer than wide, much shorter than the next two; three and six ⅓, four and five nearly ½, longer than wide; seventh but little thicker, ⅔ longer than wide; last four joints increasing very little in thickness, the ninth but slightly longer than wide; tenth on the compressed side rather wider than long; eleventh almost as long as the two preceding. *Prothorax* scarcely longer than wide, conic, the sides feebly arcuate; apex rather more than ½ as wide as the base, the latter scarcely more than ¼ wider than the head. *Elytra* not ½ longer than wide, fully twice as long as the prothorax and nearly twice as wide, regularly oval, the sides evenly arcuate and widest only slightly before the middle; apex rather obtusely rounded; humeral plica and subhumeral impression well developed; foveæ small and very feeble; subsutural impressions distinct, the suture very finely and feebly elevated basally. *Abdomen* coarsely and moderately densely fulvo-pubescent. *Legs* well developed; femora strongly clavate, the posterior tibiæ broadly arcuate basally. Length 1.9 mm.; width 0.8 mm.

Iowa (Iowa City). Mr. Wickham.

The type above described is a female, and the male will probably prove to be more slender. Four specimens from Ohio, in poor state of preservation, are associated for the present with *formale*, but possibly represent a closely allied species, as the elytra are brighter red and invariably become gradually black in posterior third or fourth. This species is said to occur in ant-nests, but the association is probably in part fortuitous.

6. **C. simulans** n. sp.—Moderately stout, highly polished and impunctate, piceo-testaceous in color, the elytra bright red throughout; under surface dark, paler at the tip of the abdomen; legs and antennæ rufous; pubescence long but only moderately close, pale, the anterior bristles darker and numerous at the sides. *Head* moderate, semicircular behind the eyes, which are well developed, convex and prominent; clypeal tooth very stout and strong, rounded at apex and with its upper surface tumid. *Antennæ* scarcely more than ⅔ as long as the body, the outer joints thick, increasing but slightly among themselves and forming a tolerably well defined club; second joint feebly

obconic, ½ longer than wide, slightly shorter and thicker than the next two; three to six equal in thickness, cylindric; three and six only just perceptibly longer than wide; fourth ¼, and fifth ⅓, longer than wide; seventh decidedly and abruptly thicker, cylindric-oval and only slightly longer than wide; eighth abruptly thicker but intermediate between seven and nine, not longer than wide; tenth barely as long as wide; outer five joints strongly beaded at base. *Prothorax* but slightly longer than wide, strongly conic, apex ½ as wide as the base, the latter ⅖ wider than the head; surface perfectly even, without trace of impression. *Elytra* less than ½ longer than wide, barely twice as long as the prothorax and almost twice as wide, oval, widest but little before the middle, the sides evenly arcuate; humeral plica elongate and strong, the subhumeral impression large and distinct; subsutural impressions deep and distinct. *Legs* long, the femora all strongly clavate. Length 1.75 mm.; width 0.75 mm.

Texas (Galveston).

The description of the antennæ is drawn from a specimen which is undoubtedly male, the other does not permit of identification in regard to sex. Two specimens.

This species almost exactly resembles *schaumi* in the form and convexity of the clypeal tooth, but the antennæ differ somewhat in relative lengths of the joints, and the elytra are decidedly shorter, relatively wider and more strongly impressed near the suture.

7. **C. schaumi** Lec.—Proc. Acad. Nat. Sci., Phila., 1852, p. 151 (Scydmænus); *magister* Lec.: Sm. Misc. Coll., 140, p. 21 (catalogue name).

Moderately stout, fusiform, polished, subimpunctate, brownish-red, the elytra and legs pale and bright rufo-testaceous; antennæ slightly darker; pubescence long, moderately abundant, fulvous. Head but slightly wider than long, semicircular behind the eyes, the latter quite well developed, convex; base vertical, the neck narrow; clypeal tooth strong, wide, obtusely rounded at tip and with its upper surface convex. Antennæ less than ½ as long as the body, the club rather abrupt and parallel; second joint ⅔ longer than wide; third not longer than wide; fourth and sixth ¼, the fifth ⅖ longer than wide; seventh thicker, cylindric, ⅓ longer than wide, rather shorter than the eighth, which is very little elongate; ninth and tenth subequal, not longer than wide; eleventh almost as long as the two preceding. Prothorax but slightly longer than wide, the apex rather more than ½ as wide as the base, the latter broadly arcuate and nearly ½ wider than the head; surface perfectly even, not impressed. Elytra elongate,

fully $\frac{1}{2}$ longer than wide, more than twice as long as the prothorax and $\frac{3}{4}$ wider, oval, widest slightly before the middle, the sides evenly arcuate; humeral plica and subhumeral impression well developed; subsutural impressions narrow and rather feeble, the sutural bead very fine and feeble. Legs rather thick, moderate in length; femora all strongly clavate. Length 1.75 mm.; width 0.65 mm.

Louisiana. This species may be recognized by the stout, blunt and convex clypeal tooth, narrowish form, elongate elytra, pale rufous and strongly clavate femora and antennal structure; the type described appears to be a male, but I am not certain of this, as the œdeagus is entirely concealed.

Schaumi is of course not a preoccupied name in Connophron, and, in Euconnus, *schaumi* Lucas, is considered by the authorities of the most recent catalogue as a synonym of *intrusus* Schaum, so the name appears to be perfectly valid for the present species, and need not be replaced by *magister* as suggested by LeConte.

8. **C. flavitarse** Lec.—Proc. Acad. Nat. Sci., Phila., 1852, p. 152 (Scydmænus).

Moderately stout, elongate-oval, polished and subimpunctate, black, the elytra feebly rufescent except posteriorly; legs rufopiceous, the femora blackish, the tarsi flavate; antennæ rufoferruginous; pubescence long, abundant, fine and darkish on the elytra. Head much wider than long, the eyes moderately developed; clypeal tooth rather large, short, broadly triangular and rather tumid. Antennæ less than $\frac{1}{2}$ as long as the body, the club moderately abrupt and with its joints perceptibly increasing in thickness; second twice as long as wide and as long as the next two; third, fourth and sixth equal and very slightly elongate; fifth a little longer, $\frac{1}{4}$ longer than wide; seventh only very slightly thicker, slightly longer than wide; eighth $\frac{2}{3}$ thicker and $\frac{1}{3}$ longer than the seventh, a little longer than wide, ovoidal; ninth thicker, as long as wide; tenth rather wider than long; eleventh very gradually and obliquely pointed. Prothorax conic, the surface perfectly even, not longer than wide and at base scarcely more than $\frac{1}{4}$ wider than the head. Elytra nearly $\frac{1}{2}$ longer than wide, a little more than twice as long as the prothorax and about $\frac{3}{4}$ wider; sides rather more strongly rounded at basal $\frac{2}{5}$; humeral plica strong, moderate in length, the subhumeral impression only moderate in length; two basal foveæ strong; subsutural impres-

sions rather feeble, the suture finely elevated toward base. Legs rather long, the femora all strongly clavate. Length 1.75 mm. width 0.75 mm.

Michigan (Detroit); originally described from New York. The original description would equally satisfy a dozen species of the genus, and I do not have the type before me at present. The above outline is drawn from a female specimen communicated by Mr. Schwarz, and is probably a true representative of *flavitarse;* at any rate it will produce less subsequent confusion to so consider it, whether or not it agrees rigorously with the original and virtually undescribed type of LeConte. The statement in the original description that the elytra at the middle are "fully $\frac{1}{3}$ wider" than the prothorax, is grossly erroneous for any species of this group of the genus.

9. **C. oreophilum** n. sp.—Moderately stout, polished and impunctate, dark piceo-rufous, the elytra throughout paler and brighter rufous; legs and antennæ still paler and more flavo-ferruginous; pubescence abundant, only moderately long and rather coarse on the elytra, pale in color. *Head* well developed, slightly wider than long, semicircularly rounded behind the eyes, which are small and not prominent; clypeal tooth rather well developed, convex, parallel, the tip transversely truncate. *Antennæ* but little longer than the head and prothorax, rather slender, the club abrupt but elongate, only moderatly stout and nearly parallel; second joint but slightly shorter and narrower than the first, very feebly obconic, barely as long as the next two and $\frac{2}{3}$ longer than wide; three to six equal in width, cylindric, the seventh only very slightly thicker; third quadrate; fourth only very slightly longer than wide; fifth and sixth distinctly longer, the former $\frac{1}{3}$, the latter $\frac{1}{4}$, longer than wide; seventh quadrate; eighth $\frac{1}{2}$ wider and longer than the seventh, nearly as long as wide, conic at apex from the middle, slightly narrower than the ninth, the latter similar in form and size to the tenth and very slightly wider than long; eleventh elongate-oval, the tip slightly oblique. *Prothorax* strongly conic, the sides feebly arcuate, scarcely as long as wide; apex rather more than $\frac{1}{2}$ as wide as the base, the latter $\frac{1}{3}$ wider than the head; surface perfectly even throughout. *Elytra* evenly elongate-oval, fully $\frac{1}{2}$ longer than wide, evidently more than twice as long as the prothorax and very nearly twice as wide, widest slightly before the middle, the sides evenly arcuate; apex not very acute; humeral plica elongate, oblique and pronounced, the subhumeral impression large and well developed; basal foveæ distinct; subsutural impressions subobsolete, the suture not at all elevated basally. *Legs* not very long, the femora only moderately but subequally clavate. Length 1.4 mm.; width 0.65 mm.

Pennsylvania (Westmoreland Co.). Mr. Schmitt.

The type described above is a male, but the female does not

differ perceptibly, and the only way in which the sexes in this part of the genus can be mutually distinguished is by an examination of the œdeagus; its acute tip in the male can generally be discovered by careful examination under sufficient optical enlargement.

10. **C. longicorne** n. sp.—Moderately stout, polished, dark castaneous, the elytra slightly paler and rufescent throughout; legs and antennæ dark rufous; pubescence dark, rather long, abundant and bristling anteriorly, longer, abundant and fine on the elytra. *Head* orbicular, moderately convex, subimpunctate, about as long as wide, the sides broadly parabolic behind the eyes, which are moderate in size and only slightly convex; neck a little less than ½ the maximum width; base of occiput a little less than vertical and rounded in profile. *Antennæ* very long and slender, distinctly more than ½ as long as the body, the basal joint more than twice as long as wide, cylindric, ½ thicker than the second, the latter 2½ times as long as wide, not quite as long as the next two and slightly thicker; three to six equal in width and slender, the seventh but slightly thicker, third ½, fourth ⅓, fifth ¾, sixth ⅘, longer than wide; seventh about twice as long as wide; eighth feebly obconic, fully ½ longer than wide and forming a gradual transition to the outer joints, the ninth slightly longer than wide; tenth as long as wide, both feebly obtrapezoidal; eleventh gradually pointed, but slightly thicker, ⅔ longer than wide and much shorter than the two preceding, not quite twice as thick as the second. *Prothorax* slightly longer than wide, conic, the sides feebly arcuate; apex scarcely ½ as wide as the base, which is broadly arcuate; disk evenly convex, not at all impressed, the base ⅖ wider than the head. *Elytra* scarcely ½ longer than wide, ⅔ wider than the prothorax, widest at basal ⅖, the sides arcuate; apex narrowly rounded; humeral plica obviously elongate and distinct; disk impunctate, scarcely at all impressed near the suture, the latter perfectly devoid of subbasal bead; two basal foveæ distinct, the subhumeral impression broad and distinct. *Legs* rather long, the femora strongly clavate, the posterior less strongly but abruptly so, with the clava occupying apical half. Length 1.7–1.9 mm.; width 0.75–0.8 mm.

Texas (Brownsville). Mr. Wickham.

The description applies to the two males before me, the single example which may be supposed to be the female being smaller, paler and more rufous in color, with the antennæ very slightly shorter and just visibly more strongly, but quite as gradually, incrassate toward tip. The abdomen is dark testaceous in nearly apical half, and is rather thickly pubescent.

11. **C. rubrum** n. sp.—Rather stout, polished and impunctate, pale rufous throughout; legs, antennæ and anterior parts scarcely darker than the elytra; abdomen pale, darker toward base; pubescence long and abundant, fine on the elytra but mingled with the usual stiff bristles anteriorly and pale

yellowish in color. *Head* only slightly wider than long, parabolic behind the eyes, the latter moderate in size and rather convex and prominent; occiput scarcely vertical and obtuse in profile. *Antennæ* long and slender, gradually incrassate toward tip, more than ½ as long as the body, the basal joint cylindric, twice as long as wide and nearly as long as the next two; second slightly thicker than the third and ⅘ longer than wide; three to six equal in thickness, slender, cylindric; seventh a little thicker; third ⅖, fourth ⅓, fifth ½, sixth ⅔, seventh ¾, longer than wide; eighth slightly thicker, feebly obconic, ⅔ longer than wide and distinctly longer than the seventh or ninth, the latter subequal to the tenth, but little longer than wide; eleventh elongate, gradually pointed, nearly as long as the two preceding but not thicker. *Prothorax* as long as wide, conic, the sides feebly arcuate; apex subtubulate, truncate and ½ as wide as the base, the latter broadly arcuate; disk even and not in the least impressed; base scarcely ½ wider than the head. *Elytra* nearly ½ longer than wide, twice as long as the prothorax and about ⅔ wider, ovoidal, widest near basal third, gradually narrowed behind, the apex narrow but somewhat obtuse; disk feebly impressed near the suture toward base; humeral plica distinct and elongate; subhumeral impression large and pronounced; suture not at all beaded. *Abdomen* pubescent. *Legs* moderately long, the femora strongly clavate, the posterior less strongly so, with the club occupying apical half. Length 1.65–1.8 mm.; width 0.65–0.75 mm.

Texas (Colorado River).

The description refers to three male examples, two other specimens taken at the same time, which are undoubtedly the female, being decidedly smaller in size, still paler and more ferruginous in color and with the antennæ scarcely ½ as long as the body, and more strongly and less gradually incrassate through the last four joints; the femora are equally strongly clavate.

This species is rather closely allied to *longicorne*, but may be distinguished by the paler coloration, rather less elongate antennæ, and shorter, stouter and more rhombic form.

12. **C. dentiger** n. sp.—Rather stout, polished and subimpunctate; piceous-black, the entire elytra rather pale rufo-testaceous; legs and antennæ rufous throughout; pubescence moderate in length and abundance, rather pale on the elytra. *Head* relatively large, slightly wider than long, semicircularly rounded behind the eyes, which are moderately developed and not noticeably prominent; pubescence coarse, abundant and flavate; clypeal tooth long and very conspicuous, parallel, convex, obtuse at apex. *Antennæ* rather short and stout, ⅖ as long as the body, the club decidedly abrupt but with its joints increasing in width; second subcylindric, almost as thick as the first and much thicker than the third, ⅔ longer than wide, as long as the next two; three to seven almost exactly equal and about as long as wide, the fifth rather more; eighth ½ wider than the seventh and ⅓ longer, oval, not quite as long as wide; ninth similar to the ei hth but a little larger, the tenth distinctly wider

than long; eleventh much shorter than the two preceding, the apex only very slightly oblique. *Prothorax* not quite as long as wide; strongly conic, the sides almost straight; apex fully ½ as wide as the base, the latter scarcely more than ¼ wider than the head; surface perfectly even. *Elytra* ⅔ longer than wide, much more than twice as long as the prothorax and nearly twice as wide, the sides rather more strongly arcuate just before the middle; apex rather narrowly rounded; humeral plica strong and somewhat elongate, the subhumeral impression conspicuous; basal foveæ moderate; subsutural impressions almost obsolete, the suture not at all elevated toward base. *Legs* rather short, the anterior and middle femora strongly clavate, the posterior moderately. Length 1.25 mm.; width 0.6 mm.

Iowa.

Dentiger may be known among its allies of the present group by its small size, relatively very large clypeal tooth, small prothorax and slightly transverse outer joints of the antennæ. The sex of the single specimen before me is not determinable, and in this example the pubescence is almost entirely rubbed from the elytra.

13. **C. extricatum** n. sp.—Moderately stout, polished and impunctate, the head piceous-black; pronotum black, paler at the apical margin, the elytra dark rufo-testaceous throughout; legs pale reddish throughout, the antennæ dark rufo-testaceous; pubescence long and moderately abundant, rather pale in color. *Head* somewhat large, semicircular behind the eyes, which are moderately developed and not very convex, slightly wider than long; clypeal tooth large and strongly developed, slightly reflexed, rounded at tip. *Antennæ* short, barely as long as the head and prothorax, the club very stout but not abrupt; second joint obconic, ⅗ longer than wide, wider than the following; three to six equal in width, cylindric; third and fourth equal and distinctly wider than long; fifth and sixth equal and distinctly longer, fully as long as wide; seventh ¼ thicker, cylindric, ⅓ wider than long; eighth ½ thicker than the seventh and ½ wider than long; ninth ⅖ thicker than the eighth, transverse; tenth still slightly thicker and strongly transverse; eleventh stout, obliquely pointed. *Prothorax* conic, as long as wide, the sides noticeably arcuate; apex more than ½ as wide as the base, the latter ⅓ wider than the head; surface perfectly even throughout. *Elytra* rather short, ⅖ longer than wide; obliquely and rather acutely pointed behind from before the middle, not quite twice as long as the prothorax and ¾ wider; sides arcuate; humeral plica large and moderately strong, the subhumeral impression large, elongate and conspicuous; outer fovea very feeble, the inner strong; subsutural impressions rather strong, elongate, the suture finely beaded basally. *Legs* moderately developed, the four posterior femora quite moderately clavate, the anterior strongly. Length 1.2 mm.; width 0.45 mm.

Florida.

This is the smallest species of the present section of the genus, and may be readily known by the stout and strongly transverse

penultimate joints of the antennæ. The unique type is probably a female.

14. **C. ludificans** n. sp.—Elongate-oval, very convex, highly polished and impunctate, black throughout, the elytra not in the least rufescent, the legs black; tibiæ scarcely piceous, the tarsi flavescent; antennæ brown; pubescence long, abundant and dark cinereous. *Head* distinctly wider than long, transversely oval, subcircular behind, the eyes moderate and but slightly convex; clypeal tooth moderate in size, broad and rounded. *Antennæ* much less than ½ as long as the body, the club abrupt, moderately thick and almost parallel; second joint about twice as long as wide and equal to the next two, the latter equal and only very slightly longer than wide; fifth and sixth subequal and nearly ⅓ longer than wide; seventh much more elongate and scarcely visibly thicker, cylindric, ⅔ longer than wide; eighth not distinctly longer than the seventh but ½ thicker, oval, fully as long as wide, almost similar to the ninth and tenth; eleventh obliquely pointed, much shorter than the two preceding combined. *Prothorax* rather small, scarcely as long as wide, strongly conic, the sides slightly arcuate, becoming feebly sinuate near the apex, the latter rather more than ½ as wide as the base, which is scarcely ⅓ wider than the head; surface perfectly even. *Elytra* elongate, gradually and acutely pointed behind, fully ½ longer than wide, much more than twice as long as the prothorax and very nearly twice as wide, the sides more strongly arcuate behind basal third; humeral plica and adjacent impression very short, feeble and inconspicuous; two basal foveæ approximate, deep and distinct; subsutural impressions almost completely obsolete, the suture perfectly devoid of raised margin toward base. *Legs* rather long, the anterior femora strongly, intermediate moderately and posterior feebly, clavate. Length 1.65 mm.; width 0.7 mm.

Iowa (Iowa City). Mr. Wickham.

The male type of this species differs from *femorale* in its larger size, much feebler elytral impressions, relatively smaller prothorax, larger clypeal tooth and in the absence of any sexual modification of the anterior femora, these being as usual sparsely clothed with decumbent hairs, becoming gradually subglabrous toward base on the upper surface.

In this specimen the œdeagus is fully exposed, and the chitinous copulatory organ appears to be of the usual type; it is wide, nearly flat, rapidly narrowed in ogive toward apex, the latter produced in a short acute and thickened spicule; at each side there is an acute denticle bearing a long double seta; on the under surface toward base there is a thick and oval plate, attached basally, with its edges thin and explanate; the efferent duct probably protrudes between these plates. In some species it may be noted that the acute apical spicule becomes wider, and sometimes transversely truncate at tip.

15. **C. gaudens** n. sp.—Black, highly polished and subimpunctate, the elytra faintly rufo-piceous and sometimes pale rufo-testaceous throughout from immaturity ; legs piceous, the femora blackish, the tarsi pale ; antennæ dark rufous ; pubescence moderately abundant, long, fine and dark on the elytra. *Head* distinctly wider than long, semicircularly rounded behind the eyes, which are moderately small and but slightly prominent ; clypeal tooth strong, elongate and rather narrow. *Antennæ* scarcely ½ as long as the body, the club rather abrupt but with its joints distinctly increasing in thickness and strongly beaded at base ; second nearly twice as long as wide, as long as the next two and slightly thicker, cylindro-obconic ; third, fourth and sixth equal and slightly longer than wide ; fifth a little longer, ¼ longer than wide ; seventh very slightly thicker than the preceding joints, cylindric, ¼ longer than wide ; eighth ⅓ thicker and distinctly longer than the seventh, ovoidal, rather longer than wide, as long as the ninth but a little narrower ; tenth scarcely as long as wide. *Prothorax* conic, not longer than wide, the apex rather more than ½ as wide as the base, the latter ⅓ wider than the head ; sides very feebly arcuate ; surface convex and perfectly even. *Elytra* oval, fully ½ longer than wide, rather more than twice as long as the prothorax and ¾ wider, the sides almost evenly arcuate ; apex evenly and not very narrowly rounded ; humeral plica very small, feeble and basal, the subhumeral impression very short and feeble, apparently feebly bifoveate at base, the other fovea distinct ; subsutural impressions wholly obsolete, the suture even and not at all elevated or beaded. *Legs* moderately developed, the femora all rather strongly clavate. Length 1.4–1.7 mm. ; width 0.6–0.7 mm.

Canada (Ottawa). Mr. W. H. Harrington.

The antennal and other characters detailed above are taken from the male, the female being quite similar but with the antennæ somewhat shorter, the third and fourth joints quadrate.

This species somewhat resembles *fossiger* in size and form, but may be known by the feeble subhumeral impression of the elytra and long clypeal tooth. It is represented before me by numerous specimens.

16. **C. nigripenne** n. sp.—Somewhat narrowly oval, highly polished and impunctate, dark red-brown, the elytra black becoming indefinitely pale at apex ; legs and antennæ rufous throughout ; pubescence long and abundant, pale in color, rather coarse on the elytra. *Head* orbicular, but slightly wider than long, semicircular behind the eyes, which are small and but slightly prominent ; clypeal tooth well developed, subtriangular, narrowly truncate at tip. *Antennæ* about ½ as long as the body, the club somewhat abrupt, with its joints increasing in thickness ; basal joint cylindric, more than twice as long as wide ; second obconic, ¾ longer than wide, thicker than the following joints ; three to six equal in thickness, cylindric ; third not quite as long as wide ; fourth and sixth subequal and slightly elongate, fifth still longer, ⅓ longer than wide ; seventh nearly ⅓ thicker than the sixth and a little longer

but not longer than wide ; eighth nearly ½ thicker than the seventh, slightly wider than long ; ninth similar to the eighth in form but larger ; tenth slightly wider and fully ⅓ wider than long ; eleventh stout, obliquely pointed. *Prothorax* well developed, rather longer than wide, conic, the sides distinctly arcuate ; apex fully ½ as wide as the base, the latter ⅓ wider than the head ; surface even or with a slight flattening along the median line toward base. *Elytra* evenly oval, fully ½ longer than wide, barely twice as long as the prothorax and not more than ½ wider, the sides evenly arcuate ; apex rather acute ; humeral plica very feeble and basal, the subhumeral impression almost wholly obsolete ; two basal foveæ distinct ; subsutural impressions rather strong, especially near the base and quite oblique ; suture feebly elevated toward base. *Legs* well developed, the femora all strongly clavate. Length 1.65 mm. ; width 0.6 mm.

Iowa (Iowa City). Mr. Wickham.

The single type before me is of undeterminable sex. This species is very distinct in coloration, and may be known besides by its narrow form, nearly obsolete humeral plica and impression, but distinct sutural impressions, and by the subtransverse penultimate joint of the antennæ.

17. **C. fossiger** Lec.—Proc. Acad. Nat. Sci., Phila., 1852, p. 152 (Scydmænus).

Moderately stout, polished and impunctate, black, the elytra red but blackish toward tip ; legs and antennæ rufous, the femora blackish ; abdomen faintly paler at tip ; pubescence moderately long and rather abundant, somewhat pale in color on the elytra. Head decidedly wider than long, broadly rounded behind the eyes, which are rather small but convex and somewhat prominent ; clypeal tooth very small, triangular. Antennæ about ½ as long as the body, the club abrupt, with its joints increasing feebly in thickness ; second slightly thicker than three to six, cylindric, ⅔ longer than wide ; three ¼, four ⅓, five nearly ½ and six ¼, longer than wide ; seven but very slightly thicker, cylindric, ⅖ longer than wide ; eighth a little longer than wide, as long as the tenth and a little narrower ; tenth as long as wide. Prothorax rather longer than wide ; apex somewhat more than ½ as wide as the base, the latter ⅓ wider than the head ; surface perfectly even throughout. Elytra ½ longer than wide, ¾ wider than the prothorax, the sides evenly arcuate ; apex not very narrowly rounded ; humeral plica and subhumeral impression pronounced ; foveæ small ; subsutural impressions almost completely obsolete. Legs well developed, the femora all strongly clavate. Length 1.65 mm. ; width 0.65–0.7 mm.

Massachusetts, Rhode Island, New York (Long Island), North Carolina (Asheville), Iowa (Iowa City) and Colorado. A common species, to be readily known by the black color, with ruby elytra becoming blackish toward tip, subobsolete sutural but well developed subhumeral impressions of the elytra and small clypeal tooth. The description is taken from the male; in the female the form is a trifle stouter, and the antennæ are a little shorter, the third joint being exactly quadrate, the fourth a little longer than wide, fifth a third longer. The antennæ are frequently dusky, with the last joint paler.

18. **C. novellum** n. sp.—Moderately stout, polished, impunctate, blackish-piceous, the elytra dark red throughout; antennæ dark brownish-red, the legs paler; vestiture long and abundant, erect, even and rather pale on the elytra. *Head* well developed, distinctly wider than long, subcircularly rounded behind the eyes, which are moderately large and quite convex; antennal tubercles scarcely visible, the front very obsoletely impressed; clypeus well developed, even, rectilinearly transverse at apex and with a very minute but acute and somewhat reflexed marginal tooth. *Antennæ* slender, about ½ as long as the body, the club slender and quite gradual in formation; second joint subcylindric, nearly ¾ longer than wide, as long as the next two and much thicker; three to six very nearly equal among themselves, cylindric or just visibly obconic and about ¼ longer than wide; seventh very slightly wider, cylindric, ⅕ longer than wide; eighth ⅓ wider than the seventh, rounded at apex, fully as long as wide or a little longer; ninth nearly ⅓ wider than the eighth, about as long as wide; tenth equal in width to the ninth, distinctly wider than long; eleventh scarcely visibly thicker, long, acutely and obliquely pointed, distinctly shorter than the two preceding. *Prothorax* conic, about as long as wide, the sides very feebly arcuate; apex rather more than ½ as wide as the base, the latter nearly ⅓ wider than the head; surface perfectly even. *Elytra* ⅔ longer than wide; fully twice as long as the prothorax and nearly ⅘ wider, each somewhat narrowly rounded at apex, widest before the middle, with the sides evenly arcuate; humeral plica long and strong, the subhumeral impression large and pronounced; inner fovea distinct, the outer feeble; subsutural impressions large, oblique, strong and coalescent, the suture very finely and indistinctly beaded and only at the base. *Legs* well developed; four posterior femora rather feebly, the anterior more strongly, clavate. Length 1.35 mm.; width 0.6 mm.

Mississippi (Starkville). Mr. H. E. Weed.

This species is quite isolated, even when compared with its immediate neighbors, because of its small size and short ventriculate hind body. It is allied more closely to *brevicorne* than any other species, differing strongly, however, in its long and pronounced humeral plica and attendant impression. The three specimens before me do not exhibit marked sexual peculiarities.

19. **C. brevicorne** Say—Narrative Long's Exped., Phila., 1824, vol. 2, p. 273 (Scydmænus).

Rather narrow, polished and impunctate, black, the elytra dark ruby-red, becoming black on the flanks and toward tip; legs and antennæ dark rufous; the femora blackish; pubescence long and rather abundant, darkish in color. Head distinctly wider than long, the eyes not very well developed and but moderately convex; clypeal tooth minute and triangular. Antennæ rather thick, not longer than the head and prothorax, the club abrupt, rather thick and with its joints gradually increasing in width; second joint slightly obconic, nearly twice as long as wide, as long as the next two together and distinctly thicker; third, fourth and sixth subequal and scarcely at all longer than wide; fifth very slightly elongate; seventh but little thicker, cylindric, as wide as long; eighth $\frac{1}{2}$ wider than the seventh and not quite as long as wide; ninth and tenth progressively slightly wider and quite distinctly shorter than wide; eleventh still thicker, obliquely pointed, not as long as the two preceding. Prothorax conic, the sides noticeably arcuate, not longer than wide; apex barely $\frac{1}{2}$ as wide as the base, the latter $\frac{2}{5}$ wider than the head; surface convex and perfectly even. Elytra rather less than $\frac{1}{2}$ longer than wide, twice as long as the prothorax and $\frac{3}{4}$ wider, the sides evenly arcuate; apex narrowly obtuse; humeral plica somewhat short but strong, the impression correspondingly abbreviated but rather distinct; foveæ small; subsutural impressions distinct, the suture very finely and faintly elevated near the base. Legs rather short and with somewhat conspicuous pubescence, the femora moderately strongly clavate, the intermediate and posterior equally strongly. Length 1.4 mm.; width 0.55 mm.

Pennsylvania (probably near Philadelphia). Closely allied to *fossiger* in general form, coloration and in the minute clypeal tooth, but differing in its smaller size, narrower form, stouter and more abbreviated antennæ and stronger subsutural impressions. Three specimens of indeterminate sex are before me.

There can be but little doubt that Say had before him this species in describing *brevicorne*. The species identified under that name by LeConte is however a widely different thing, not agreeing at all with Say's description, either in coloration of the body or nature of the pubescence; it will be described subsequently under the name *clavicorne*. Say states that *brevicorne*

resembles *clavipes*, but has the antennæ much shorter and stouter. Although the antennæ in the present species are not remarkably short or stout when compared with other members of Connophron, they evidently are when compared with *Euconnus clavipes*, where these organs are remarkably long and slender.

20. **C. tenebrosum** n. sp.—Rather stout, black, the elytra faintly rufo-picescent; legs blackish, the tarsi paler; antennæ dark rufous, paler distally; pubescence moderately sparse, very long and somewhat pale on the elytra; integuments highly polished and impunctate. *Head* oval, distinctly wider than long, arcuately rounded behind the eyes, the latter rather small and but slightly prominent; neck about ½ of the maximum width; clypeal tooth very minute, truncate at apex. *Antennæ* a little less than ½ as long as the body, rather gradually and moderately incrassate distally, the club not abrupt, its joints increasing in thickness to a slight degree; second joint cylindric, twice as long as wide and as long as the next two, which are subequal and only slightly longer than wide; fifth ⅔, sixth ½, longer than wide; seventh only very slightly thicker than the sixth, perfectly cylindric, ¼ longer than wide; eighth thicker, obconic, with the apex conoidal, rather longer than wide, a little narrower and longer than the ninth; tenth about as long as wide, the apex conic; eleventh well developed, obliquely pointed. *Prothorax* scarcely longer than wide, conic, the sides nearly straight; apex rather more than ½ as wide as the base, the latter nearly ½ wider than the head; surface perfectly even, without trace of impression. *Elytra* not quite ½ longer than wide, twice as long as the prothorax and nearly ⅕ wider, oval, the sides evenly arcuate; apex rather narrowly obtuse; humeral plica and subhumeral impression both long and pronounced; two basal foveæ small but deep and subperforate; subsutural impressions distinct, the suture strongly beaded basally. *Legs* well developed, the femora all strongly clavate. Length 1.65 mm.; width 0.65 mm.

Rhode Island (Boston Neck); Massachusetts.

The type is a male, as shown by the exposed tip of the œdeagus, which is a little more broadly obtuse than usual. This species resembles *fossiger* and *femorale* in its very minute clypeal tooth, but differs from the former in its entirely black color, strong subsutural impressions with strongly beaded suture, and in antennal structure, and, from the latter, in its simple anterior femora of the male, stouter form and other characters.

21. **C. femorale** n. sp.—Elongate-oval, polished and subimpunctate, black throughout with a piceous tinge, the legs dark rufo-piceous, the antennæ rufous; pubescence long and abundant, rather dark in color. *Head* oval, nearly ⅓ wider than long, subcircularly rounded behind the eyes, which are moderate in size and convexity; clypeal tooth extremely minute and inconspicuous. *Antennæ* slender, rather more than ½ as long as the body, the

club not very abrupt and with its joints increasing gradually in thickness ; second twice as long as wide, cylindric, very nearly as long as the next two and but slightly thicker ; third ⅓, fourth ⅖, fifth ½, sixth ⅓, longer than wide ; seventh but slightly thicker, cylindric, nearly ½ longer than wide ; eighth decidedly thicker, oval, narrowed toward base and distinctly longer than wide, rather longer than the ninth, which is fully as long as wide ; tenth a little wider than long ; eleventh almost as long as the two preceding, obliquely pointed. *Prothorax* scarcely longer than wide, conic, the sides very feebly arcuate ; apex fully ½ as wide as the base, the latter ⅓ wider than the head ; surface even. *Elytra* ½ longer than wide, more than twice as long as the prothorax and ¾ wider, oval, widest before the middle, rather narrowly rounded at apex, the sides somewhat more strongly arcuate near basal ⅖ ; humeral plica and subhumeral impression long and pronounced ; foveæ small but deep ; subsutural impressions feeble but distinct, the suture finely elevated basally. *Abdomen* sparsely clothed with rather long hairs. *Legs* well developed, the femora all strongly clavate but unequally so as usual. Length 1.4–1.5 mm. ; width 0.6 mm.

Iowa (Iowa City) ; Michigan—Mr. J. Croissandeau.

The type described is a male, and in this sex the anterior femora are very strongly swollen, with their anterior side glabrous in basal half, asperately and sparsely punctate about the middle of the length, the asperities bearing short hairs, and thence clothed with the usual long sparse hair to the apex. The female is slightly shorter and stouter, with the antennæ a little less elongate, and with the club more abrupt but not stouter, the basal joint, especially, shorter, the second fully twice as long as wide, the third only a little longer than wide, the eighth not at all elongate.

This species resembles *fossiger*, especially when the elytra become slightly rufescent from immaturity, but it may be known at once by the sexual characters of the male, and by the still more minute clypeal tooth. Numerous specimens.

22. **C. procerum** n. sp.—Narrowly fusiform, polished and impunctate, uniform dark rufo-testaceous throughout, the legs and antennæ concolorous; pubescence long, moderately abundant, pale yellowish in color, rather coarse on the elytra. *Head* well developed, nearly as long as wide, subcircular or slightly parabolic behind, the eyes moderate in size, not very convex ; clypeal tooth very minute, swollen, obtusely rounded. *Antennæ* nearly ½ as long as the body, stout, the club slightly abrupt and with its joints increasing just visibly in width ; second joint ⅕ as long as the first, and, at apex, nearly as thick, strongly obconic, ½ longer than wide, as long as the next two ; three to six distinctly narrower than the apex of the second and cylindric, the third distinctly shorter than wide; four and five fully as long as wide; six a little shorter, scarcely as long as wide ; seventh ¼ thicker and a little longer than the sixth, scarcely as long as wide ; eighth fully ½ thicker than the seventh, not as long

as wide ; ninth similar to the eighth but a little larger ; tenth distinctly wider than long, the eleventh stout, obliquely pointed. *Prothorax* conic, the sides arcuate, rather longer than wide, the apex more than ½ as wide as the base, the latter ¼ wider than the head ; surface perfectly even. *Elytra* elongate-oval, gradually and obliquely pointed behind, ½ longer than wide, barely twice as long as the prothorax and ½ wider, narrowed but little from before the middle to the humeri, the humeral plica very feeble ; subhumeral impression almost completely obsolete ; foveæ feeble ; subsutural impressions very feeble and near the base, the suture finely elevated basally. *Legs* rather long, the thighs moderately strongly clavate, the posterior still less so. Length 1.45 mm. ; width 0.5 mm.

Florida (Lake Monroe).

The single specimen before me is of undetermined sex, but the species will be readily identified by its narrow form, feeble humeral modifications of the elytra, uniform pale coloration, minute clypeal tooth and other characters as mentioned above.

23. **C. elongatum** n. sp.—Elongate and fusiform, polished and subimpunctate, pale rufo-testaceous, the elytral suture finely blackish ; legs and antennæ paler, rufo-ferruginous ; pubescence long, moderately abundant, pale in color and rather coarse on the elytra. *Head* rather small, slightly wider than long, subparabolic behind the eyes, which are small and only slightly prominent ; clypeal tooth rather well developed, elongate and narrow. *Antennæ* about ½ as long as the body, the club not very abrupt, the three outer joints parallel ; second feebly obconic, ¾ longer than wide, subequal to the next two but slightly thicker ; third and fourth subequal and about as long as wide ; fifth and sixth very nearly equal and about ¼ longer than wide ; seventh only slightly thicker than the sixth, cylindric, with the sides feebly arcuate, ⅓ longer than wide ; eighth oval, ⅖ thicker than the seventh and scarcely longer, exactly intermediate in width between the seventh and ninth, the latter equal in length to the eighth but distinctly thicker, as long as wide, similar to the tenth ; eleventh not thicker, elongate, feebly and obliquely pointed. *Prothorax* conic, the sides arcuate, not longer than wide, the apex ½ as wide as the base, the latter ⅓ wider than the head ; surface with a coarse, transverse and feeble impression near the basal margin. *Elytra* barely ½ longer than wide, twice as long as the prothorax and about ⅗ wider, obliquely rounded and rather acute posteriorly, widest near basal third ; humeral plica small but elongate and strong, the subhumeral impression distinct but not very large ; outer basal fovea feeble, the inner much larger and strong ; subsutural impressions feeble, the suture beaded toward base. *Legs* rather long, the four anterior femora moderately, the posterior less strongly, clavate. Length 1.75 mm. ; width 0.7 mm.

Florida.

The unique type is a male, with the apex of the produced portion of the copulatory spicule rather broadly truncate. In this

example the surface of the abdomen through the first four segments is clothed with long and erect hairs, and the fifth segment is notably large and convex.

This species is distinct by reason of its form, color and transversely impressed pronotum, which latter character is very unusual in this portion of the genus, although common among the allies of *capillosulum*.

24. **C. clavicorne** n. sp.—*Scyd. brevicornis* Lec. nec Say.: Proc. Acad. Nat. Sci., Phila., 1852, p. 153.—Rather stout, suboval, polished and subimpunctate, pale rufo-testaceous throughout; legs and antennæ concolorous; pubescence very abundant, coarse, pale and conspicuous, densely bristling on the head and prothorax, rather short and subdecumbent on the elytra. *Head* moderate in size, semicircular behind the eyes, which are somewhat small and scarcely at all prominent; clypeal tooth well developed, elongate and slender. *Antennæ* stout, rather shorter than the head and prothorax, strongly clavate, the club gradual in formation; second joint slightly obconic, ½ longer than wide and as long as the next two; three to six equal in width and slightly narrower; third and sixth distinctly, fourth slightly, wider than long; fifth almost as long as wide; six to nine increasing evenly and rapidly in width; seventh ⅓, eighth ⅖, ninth and tenth fully ½, wider than long, the last two subequal; eleventh not thicker, conoidal, rapidly pointed, the apex not distinctly oblique. *Prothorax* conic, the sides nearly straight, not quite as long as wide; apex rather more than ½ as wide as the base, the latter about ⅓ wider than the head; surface perfectly even. *Elytra* stout, oval, widest near the middle, obtusely rounded behind, ⅓ longer than wide, twice as long as the prothorax and ⅘ wider, the sides almost evenly arcuate; humeral plica short but distinct, oblique, the subhumeral impression short and moderately distinct; outer fovea strong; subsutural impressions almost obsolete, the suture at most very minutely beaded toward base. *Legs* rather well developed, the femora strongly clavate, the posterior slightly less strongly so than the others. Length 1.35–1.55 mm.; width 0.55–0.6 mm.

Pennsylvania and New York to Iowa (Iowa City).

The description is drawn from the female, but the male differs but slightly, being a little smaller and darker in color, the elytra uniform dark piceous-brown and with longer sparse erect setæ more evidently interspersed among the coarse recurved hairs; the antennal differences seem to be very slight.

This species is said by LeConte to inhabit the nests of a small black ant, but I have seen it associated also with a large brown ant; it is probably not truly myrmecophilous, but associates itself occasionally with ants of various species, as in the case of a very large number of Coleoptera of widely diverse families.

In describing *Scydmænus brevicornis*, Say states that the elytra

are bright rufous, blackish at tip, and with long hairs, which characters are quite foreign to the present species.

25. **C. abducens** n. sp.—Narrowly suboval, polished and impunctate, pale rufo-testaceous throughout, the legs and antennæ still paler and more ferruginous; pubescence rather abundant, pale in color, coarse, stiff and recurved on the elytra. *Head* moderate in size, subparabolically rounded behind the eyes, which are rather small; clypeal tooth somewhat well developed, rounded at tip. *Antennæ* short and stout, about as long as the head and prothorax, the club very stout and almost 3-jointed; second joint obconic, only slightly shorter than the first, about ½ longer than wide, as long as the next two and decidedly thicker; three to six equal in width, subequal among themselves and not as long as wide; seventh only just visibly thicker and nearly ⅓ wider than long; eighth about ⅓ thicker than the seventh and nearly ⅓ wider than long; ninth and tenth abruptly much wider than the eighth, subequal and strongly transverse; eleventh stout and somewhat obliquely pointed. *Prothorax* rather small and strongly conic, the sides feebly arcuate, not quite as long as wide; apex narrow, ½ as wide as the base, the latter ⅓ wider than the head; surface perfectly even. *Elytra* rather short, ⅔ longer than wide, somewhat rapidly narrowed and acutely rounded behind, distinctly more than twice as long as the prothorax and about ¾ wider; sides rather strongly arcuate before the middle; humeral plica, subhumeral and subsutural impressions almost obsolete, the basal foveæ small, subequal. *Legs* rather short but not stout, the femora subequally and only moderately clavate. Length 1.2 mm.; width 0.45 mm.

Pennsylvania (locality unknown).

A small species, which may be known by its pale coloration, small and strongly conical prothorax, stiff and recurved pubescence, and very stout antennal club, which is a transition toward the purely 3-jointed form, and conclusive evidence that the possession of three or four joints in the club is not even of subgeneric importance; the group of four species here separated on that ground is, in fact, scarcely natural, and should rather be considered a taxonomic convenience than otherwise. In the present species the eighth joint is intermediate in width between the seventh and ninth, although the steps on both sides are great and abrupt.

26. **C. luteipes** n. sp.—Rather ventricose, highly polished and impunctate, uniform piceous-black throughout, the legs and antennæ pale flavo-testaceous; pubescence rather abundant, uniform, coarse and recurved on the elytra, pale in color. *Head* moderate in size, quite distinctly wider than long, circularly rounded behind, the eyes small and but slightly convex; clypeal tooth distinct, slender, gradually and finely pointed and aciculate. *Antennæ* quite distinctly longer than the head and prothorax, rather slender, the club gradual

in formation; second joint obconic, ½ longer than wide, barely as long as the next two but thicker; three to six cylindric, almost exactly equal among themselves and barely as long as wide; seventh ¼ thicker, distinctly wider than long; eighth ⅓ thicker than the seventh, ⅕ wider than long; ninth ⅓ thicker than the eighth and fully ⅓ wider than long; tenth but little thicker than the ninth, ⅖ wider than long, the eleventh stout, ogival at tip and not perceptibly oblique. *Prothorax* rather small, rapidly conic, not quite as long as wide, the sides feebly arcuate; apex ½ as wide as the base, the latter fully ⅖ wider than the head; surface perfectly even and convex throughout. *Elytra* oval, gradually and rather acutely pointed behind, ⅖ longer than wide, more than twice as long as the prothorax and ⅘ wider, widest at about basal third, the sides broadly and evenly arcuate; humeral plica distinct, gradually evanescent at some distance from the base, the subhumeral impression somewhat narrow but long and distinct; foveæ distinct but small; suture not at all elevated, the impressions wholly obsolete. *Legs* not very long, the femora only moderately but subequally clavate. Length 1.25 mm.; width 0.55 mm.

Pennsylvania (Westmoreland Co.). Mr. Schmitt.

Readily indentiafible in the small group to which it is assigned, by the somewhat ventricose elytra, uniform black or piceous-black color, with pale legs, slender and sharply pointed clypeal tooth and other characters. The sex of the types cannot be discovered without dissection.

27. **C. lætulum** n. sp.—Narrow and elongate-oval, highly polished and impunctate, piceous-black, the elytra scarcely visibly rufescent; legs and antennæ pale rufo-ferruginous throughout; pubescence rather abundant, pale in color, coarse and recurved on the elytra, where it is intermingled with sparse erect tactile setæ. *Head* rather large, slightly wider than long, subcircularly rounded behind, the eyes small and not prominent; clypeal tooth well developed, narrow and elongate. *Antennæ* about ½ as long as the body, not very stout, the club rather abrupt, its joints increasing just visibly in width; second joint very feebly obconic, rather more than ½ longer than wide, thicker and somewhat longer than the next two; three to six equal in thickness; third, fourth and sixth equal and quite distinctly wider than long; fifth as long as wide; seventh ¼ wider than the sixth and ¼ wider than long; eighth ⅖ thicker than the seventh, ⅓ wider than long, narrowed toward apex and widest at the middle; ninth and tenth slightly wider than the eighth and about ⅓ wider than long, eleventh somewhat stouter, obliquely pointed. *Prothorax* about as long as wide, feebly conic, the sides slightly arcuate; apex ⅔ as wide as the base, the latter barely ⅕ wider than the head; surface perfectly even. *Elytra* narrowly oval, gradually and obtusely pointed behind, widest only slightly before the middle, ½ longer than wide, rather more than twice as long as the prothorax and ⅔ wider; sides almost evenly arcuate; humeral plica very short and basal, not very distinct, the subhumeral impression extremely feeble; foveæ distinct, the outer large and transverse; subsutural impressions obsolete, the suture not beaded basally. *Legs* rather long, the

middle and posterior femora moderately, the anterior more strongly, clavate. Length 1.25 mm.; width 0.5 mm.

New York (Hudson River Val.). Mr. H. H. Smith.

A small but distinct species, which may be easily identified by its uniformly blackish color with pale legs, narrow form of body, somewhat short and recurved pubescence of the elytra and comparatively large head. The single specimen before me is not absolutely identifiable as to sex, but is apparently a male.

28. **C. furtivum** n. sp.—Narrowly and almost evenly elongate-oval, polished and impunctate, uniform pale yellowish-testaceous throughout, the legs and antennæ concolorous; pubescence rather abundant, pale in color, moderate in length, coarse inclined and posteriorly recurved on the elytra. *Head* moderate in size, nearly as long as wide, semicircular behind the eyes, which are small and but slightly prominent; clypeal tooth strongly developed, parallel, broadly rounded at tip. *Antennæ* fully ½ as long as the body, slender, the club long, slender and feebly differentiated, its joints increasing perceptibly in width throughout; second feebly obconic, very nearly as long as the first, ¾ longer than wide, as long as the next two and but slightly thicker; three to six equal in thickness and cylindric; three and four equal and as long as wide; five and six equal and about ¼ longer than wide; seventh slightly thicker and as long as wide; eighth ⅖ thicker than the seventh, subconic at apex and fully as long as wide; eight to eleven increasing uniformly in thickness, nine and ten similar to eight in form, as long as wide; eleven an elongate ogive in form, scarcely oblique at apex. *Prothorax* feebly conic, the sides slightly arcuate, not quite as long as wide; apex about ⅗ as wide as the base, the latter nearly ⅓ wider than the head; surface perfectly even. *Elytra* evenly elongate-oval, fully ½ longer than wide, distinctly more than twice as long as the prothorax and ⅘ wider, the sides very evenly arcuate; apex narrowly obtuse; humeral plica and subhumeral impression rather short and feeble; basal foveæ distinct; subsutural impressions obsolete, the suture not beaded. *Legs* well developed; four posterior femora very moderately clavate, the anterior rather strongly. Length 1.4 mm.; width 0.6 mm.

Northern Illinois. Mr. F. M. Webster.

The sex of the single type before me is not clearly determinable without dissection. The species may be known at once among its few allies with coarse recurved elytral pubescence, by its elongate and slender antennæ; its pale coloration may possibly be in part due to immaturity.

Only the three last of the six following species really form a natural group, the three first, which belong structurally with *furtivum* and the preceding species, being associated solely on account of their very small size for convenience in identification.

29. **C. comptum** n. sp.—Moderately stout, highly polished and subimpunctate, pale brownish-testaceous and unicolorous throughout, the legs and antennæ concolorous; pubescence somewhat abundant, coarse, pale in color, rather short and recurved on the elytra. *Head* moderate in size, slightly wider than long, subcircular behind the eyes, which are rather distinct and noticeably convex; clypeal tooth small but very obvious, obtusely rounded and tumid. *Antennæ* slender, evidently longer than the head and prothorax, the club only moderately thick, gradual in formation; second joint only slightly shorter, though distinctly narrower, than the first, feebly obconic, rather longer than the next two and fully ½ longer than wide; three to six almost exactly equal among themselves, cylindric and ⅕ wider than long; seventh scarcely ¼ wider, about ¼ wider than long, cylindric; eighth nearly ½ wider than the seventh, ⅓ wider than long, rounded in apical third; ninth ¼ wider than the eighth, only ¼ wider than long; tenth slightly wider than the ninth and much more transverse, ⅖ wider than long; eleventh oval, much shorter than the two preceding and rather thicker, very obtusely ogival at apex and slightly oblique. *Prothorax* conic, the sides very feebly arcuate, nearly as long as wide; apex perceptibly more than ½ as wide as the base, the latter nearly ⅖ wider than the head; surface perfectly even throughout. *Elytra* ample, more than ⅖ longer than wide, fully twice as long as the prothorax and ⅘ wider, somewhat acutely rounded behind, widest and with the sides broadly and evenly arcuate well before the middle; humeral plica and attendant impression small and rather feeble; foveæ distinct; subsutural impressions almost obsolete, the suture not beaded toward base. *Legs* moderate, the femora distinctly clavate, the posterior more feebly. Length 1.05–1.1 mm.; width 0.45–0.5 mm.

Pennsylvania (Westmoreland Co.). Mr. Schmitt.

Sexual characters cannot be detected in the specimens at hand and are probably very slight. The species can only be confounded with *humile* and *pallidum*, but may be known from both by the relatively larger and longer elytra and less strongly clavate antennæ, and, from the latter, also by its decidedly larger size.

30. **C. humile** n. sp.—Subrhomboidal, not very stout, polished, the elytra sparsely subpunctulate, bright rufo-testaceous throughout, the legs and antennæ paler but brownish; pubescence abundant, coarse, pale in color, rather short and recurved on the elytra. *Head* moderate in size, slightly wider than long, convex, semicircularly rounded behind, the eyes rather small and only slightly convex; clypeal tooth small, broadly triangular, the clypeus carinulate along the middle from base to the apex of the tooth. *Antennæ* stout, not longer than the head and prothorax, the club strong but not abrupt; second joint as thick as the first but shorter, obconic, ⅓ longer than wide, much thicker than three to six, which are cylindric and almost exactly equal among themselves, ½ wider than long and compactly joined; seventh scarcely ¼ wider, ½ wider than long; eighth ⅓ wider than the seventh, abruptly narrowed only at the extreme apex and ⅓ wider than long; joints eight to ten

increasing uniformly in width, almost similar in form; ninth ½, tenth ⅔, wider than long; eleventh still stouter, oval, as long as the two preceding, ogival and feebly oblique at apex. *Prothorax* conic, the sides very feebly arcuate, about as long as wide; apex scarcely more than ½ as wide as the base, the latter ⅔ wider than the head; surface perfectly even throughout. *Elytra* ⅓ longer than wide, barely twice as long as the prothorax and about ¾ wider, widest and with the sides rather more arcuate well before the middle; apex somewhat acute; humeral plica narrow and pronounced, moderate in length, the subhumeral impression rather large and conspicuous; foveæ distinct; subsutural impressions almost obsolete, the suture not at all beaded toward base. Under surface pale throughout. *Legs* moderate, the four anterior femora moderately, the posterior rather feebly, clavate. Length 1.0 mm.; width 0.45 mm.

District of Columbia.

The type and only specimen known to me is a female. The species may be known among its immediate neighbors by the strongly clavate antennæ, wholly unimpressed pronotum and other characters.

31. **C. pallidum** n. sp.—Narrowly suboval, polished and impunctate, rufo-testaceous throughout, the antennæ concolorous, the legs still paler and more brownish; pubescence only moderately abundant, coarse, pale in color, rather short and recurved on the elytra. *Head* moderate, slightly transverse, subcircular behind the rather inconspicuous eyes; clypeus not visibly ridged along the middle, the tooth very minute, acutely triangular. *Antennæ* slender, rather longer than the head and prothorax, the club strong but not abrupt, its joints increasing in width; second joint subcylindric, distinctly shorter and narrower than the first, ½ longer than wide and subequal in length to the next two; three to six distinctly narrower, subequal among themselves and not quite as long as wide; seventh about ⅓ wider than the sixth, nearly ⅓ wider than long; eighth nearly ½ wider than the seventh, ⅖ wider than long, rounded at apex from the middle; ninth and tenth subsimilar, about ⅓ wider than the eighth, ½ and ⅗ wider than long respectively; eleventh short, not longer than wide, much shorter and somewhat stouter than the two preceding, obtusely, rapidly ogival and scarcely at all oblique at apex; joints eight to eleven almost uniformly increasing in width. *Prothorax* conic, the sides almost straight, not longer than wide; apex ⅗ as wide as the base, the latter ⅖ wider than the head; surface perfectly even throughout. *Elytra* nearly ⅖ longer than wide, barely twice as long as the prothorax and nearly ⅘ wider, rather acutely rounded behind, widest near basal third, the sides almost evenly arcuate; humeral plica small, narrow and inconspicuous, the subhumeral impression small and feeble; foveæ small; subsutural impressions very feeble, the suture not or scarcely elevated near the base. *Legs* moderate, the anterior femora clavate, the posterior four quite feebly so. Length 0.9 mm.; width 0.35 mm.

Pennsylvania (Westmoreland Co.). Mr. Schmitt.

I have not been able to distinguish any sexual differences in the specimens before me. This species is closely allied to *humile*, but may be distinguished by its narrow form, sparser pubescence, less developed humeral plica and impression, more slender antennæ and non-carinate clypeus.

32. **C. angusticolle** n. sp.—Moderately stout, the hind body somewhat inflated, polished, impunctate, pale rufo-testaceous throughout, the elytra still paler, the legs more luteous; pubescence abundant but short, coarse and recurved on the elytra, where there are also longer sparse erect setæ in addition, pale in color. *Head* small, not quite as long as wide, almost semicircularly rounded behind the eyes, which are distinct and rather convex; clypeal tooth very minute, narrow and acute. *Antennæ* slender, much longer than the head and prothorax, the club slender but rather abrupt and almost parallel; second joint nearly as long as, and but slightly narrower than the first, feebly obconic, nearly ¾ longer than wide and about as long as the next two; three to six equal in width and slightly narrower, cylindric; third not quite as long as wide; fourth quadrate; fifth and sixth equal and longer, ¼ longer than wide; seventh nearly ⅓ thicker than the sixth, not as long as wide, cylindric; eighth nearly ½ wider than the seventh, rounded apically, scarcely as long as wide; ninth and tenth equal, slightly thicker, about ¼ wider than long; eleventh unusually elongate, fully as long as the preceding two and rather thicker, gradually and acutely pointed and but slightly oblique at tip. *Prothorax* feebly conic, the sides virtually straight, as long as wide and apparently longer; apex ⅔ as wide as the base, the latter ⅓ wider than the head; surface transversely and distinctly impressed near the basal margin, the impression interrupted at the middle as usual. *Elytra* ⅔ longer than wide, about twice as long as the prothorax and fully ⅘ wider, rather acute at apex and widest near basal third; sides evenly arcuate; humeral plica strong, moderate in length; subhumeral impression large; foveæ distinct; subsutural impressions small but evident, oblique, the suture elevated near the base. Under surface pale throughout, the abdomen more fulvous. *Legs* slender, the four posterior femora feebly, the anterior more strongly, clavate; tarsi slender. Length 1.1 mm.; width 0.45 mm.

Texas (Colorado River).

The antennal tubercles in this species are quite pronounced, and, in the depression between them and at some distance behind the line of the antennæ, there is in the male a small elongate-oval area which is finely and closely punctate. The description applies to the male, but the female does not differ even in antennal structure. Two specimens.

33. **C. frontale** n. sp.—Rather narrowly subrhomboid-oval, polished and impunctate, dark rufo-piceous in color, the elytra occasionally a little paler and more rufous; antennæ slightly, the legs much paler luteo-testaceous; pu-

bescence abundant, somewhat long, suberect and slightly coarse on the elytra, rather pale in color. *Head* well developed, a little wider than long, circularly rounded behind the eyes, which are somewhat small and but slightly convex; clypeal tooth very minute, acute. *Antennæ* nearly ½ as long as the body, slender, the club strongly developed and elongate but not very abrupt in formation; second joint obconic, fully ½ longer than wide, as long as the next two; three to six equal in width, slender, obconic, the third wider than long; fourth as long as wide; fifth and sixth nearly equal and decidedly longer, about ¼ longer than wide; seventh fully ⅓ thicker than the preceding and more roughly sculptured, cylindric and almost as long as wide; eighth ⅖ thicker than the seventh, about as long as wide; ninth and tenth subequal, a little thicker than the eighth and slightly wider than long; eleventh scarcely thicker, elongate, almost as long as the two preceding, the point ogival and slightly oblique. *Prothorax* rapidly conic, the sides scarcely at all arcuate, not quite as long as wide; apex ½ as wide as the base, the latter ⅓ wider than the head; surface just visibly and very obsoletely impressed transversely near the basal margin. *Elytra* oval, not very acute behind, scarcely more than ⅓ longer than wide, barely twice as long as the prothorax and about ⅔ wider, widest and with the sides somewhat more arcuate near basal ⅖; humeral plica rather short but distinct, the subhumeral impression small and basal; foveæ distinct; subsutural impressions small and very feeble, the suture feebly elevated very near the base. *Legs* slender, the two anterior femora distinctly, the four posterior rather feebly, clavate. *Abdomen* black, the remainder of the under surface dark rufo-testaceous. Length 1.0 mm.; width 0.4 mm.

Rhode Island (Boston Neck).

The male, from which the above characters are taken, differs but little from the female, except that the penultimate joints of the antennæ appear to be a little more transverse in the latter. Between the antennal tubercles in the male there is a subtriangular patch at the anterior margin, which is densely and strongly punctate and more closely pubescent.

This species is abundant under fallen leaves in rather moist woods, and may be known by its small size, minute clypeal tooth and male sexual characters. The erect vestiture of the elytra is nearly similar to that of the large species allied to *flavitarse*. There is no distinguishable structural variation, even in size, in the ample series before me.

34. **C. frustum** n. sp.—Narrowly subrhomboidal, polished and impunctate, dark piceous-brown, the elytra paler and brighter rufous throughout; legs and antennæ pale, rufo-testaceous; pubescence rather abundant, somewhat long, suberect and pale in color on the elytra. *Head* rather small, very nearly as long as wide, subparabolic behind the eyes, which are rather well developed and slightly prominent; clypeal tooth very minute, broad and obtusely rounded. *Antennæ* rather slender, fully as long as the head and pro-

thorax, the club slender but abruptly formed and nearly parallel ; second joint much shorter and distinctly narrower than the first, very feebly obconic, fully ½ longer than wide, rather longer and distinctly wider than the next two ; three to six equal in width and cylindric ; third distinctly wider than long ; fourth about as long as wide ; fifth and sixth longer, subequal and about ⅕ longer than wide ; seventh scarcely more than ⅕ thicker than the sixth and fully as long as wide, cylindric ; eighth fully ½ thicker than the seventh, about as long as wide, conic in apical half ; ninth only slightly wider than the eighth, nearly ⅓ wider than long ; eleventh distinctly shorter than the two preceding and somewhat thicker, acutely and somewhat obliquely pointed. *Prothorax* feebly conic, the sides nearly straight, almost as long as wide ; apex more than ½ as wide as the base, the latter ⅖ wider than the head ; surface scarcely perceptibly impressed transversely near the basal margin. *Elytra* ⅖ longer than wide, scarcely twice as long as the prothorax and ⅔ wider, not very acute at apex, widest and with the sides rather more arcuate near basal third or fourth ; humeral plica and subhumeral impression small and feeble, the foveæ subobsolete ; subsutural impressions narrow and feeble, the suture slightly elevated toward base. Under surface pale testaceous throughout. *Legs* slender; four posterior femora feebly, the anterior more distinctly, clavate. Length 1.0 mm.; width 0.35 mm.

Florida.

This species is closely allied to *frontale*, but differs in its narrower form, paler color, smaller head with relatively larger eyes, and in some other details of structure. The male, which serves as the type of the description, has the anterior margin of the front finely and closely punctured and pubescent from side to side between the antennæ, the punctures not so large as in *frontale*, and not confined so distinctly to a posteriorly angulate area.

35. **C. integrum** n. sp.—Rather stout, black, the elytra sometimes with a feeble piceous tinge, polished, impunctate; legs and antennæ dark rufotestaceous; pubescence abundant, coarse and pale, rather long and suberect on the elytra. *Head* well developed, wider than long, circularly rounded, the eyes moderate in size but convex and prominent; antennal tubercles subobsolete, the front very feebly impressed; clypeus not carinate, evenly transverse and rectilinear at apex. *Antennæ* long, slender, more than ½ as long as the body, the club long, slender and only slightly abrupt; second joint feebly obconic, ⅗ longer than wide, as long as the next two and much thicker; three to six equal in width, cylindric; third and sixth scarcely as long as wide; fourth and fifth equal and fully as long as wide; seventh ¼ wider but not much longer than the sixth, slightly wider than long; eighth ⅓ wider than the seventh, about as long as wide; ninth and tenth ⅕ wider than the eighth, about as long as wide and ¼ wider than long respectively; eleventh long and very gradually and acutely pointed, subequal to the two preceding. *Prothorax* conic, the sides distinctly arcuate, not as long as wide; apex nearly ⅗ as wide as the base, the latter ¼ wider than the head; surface even. *Elytra* ⅖ longer

than wide, 2½ times longer than the prothorax and about ¾ wider, narrowly parabolic at apex, widest at basal ⅖; sides evenly arcuate; humeral plica long and strong, the subhumeral impression large and deep; foveæ large and strong; subsutural impressions narrow but deep, at basal fifth or sixth, the suture finely beaded basally, the bead expanded at base. *Legs* moderate; anterior femora strongly, the intermediate moderately, the posterior still less, clavate; tarsi rather slender. Length 1.25 mm.; width 0.55 mm.

Ohio; Illinois.

As in many other species, the scars left by fallen hairs on the elytra are quite distinct, but not exactly in the nature of punctures. The abdomen is black with the apex pale. Sexual marks are not discoverable.

Integrum is a distinct species in the present group because of its larger size, black color and long antennæ, but it resembles a small *femorale* to some extent. The pronotum seems in certain lights to exhibit feeble traces of the bisected transverse impression so usual in this peculiar group of small obscure species, but it is too faint to be at all decisive.

36. **C. occidens** n. sp.—Somewhat stout, polished and subimpunctate, dark piceous, the elytra paler and more rufous; antennæ slightly, the legs much, paler; pubescence abundant, rather pale, long, somewhat fine and suberect on the elytra. *Head* slightly wider than long, circularly rounded behind the eyes, which are moderate and but slightly prominent; antennal tubercles obsolete, the front not impressed; clypeus very short, not carinate, asperulate, the apical margin evenly and transversely rectilinear. *Antennæ* but slightly longer than the head and prothorax, slender, the club narrow and rather gradually formed; second joint but slightly narrower at base, stout, nearly as wide as the first but much shorter, ⅓ longer than wide, not quite as long as the next two and much thicker; three to six equal in width; third distinctly shorter than wide; fourth as long as wide; fifth and sixth very slightly longer and equal; seventh only just visibly wider, fully as long as the sixth and about as long as wide; eighth ⅖ wider than the seventh, rounded at apex, as long as wide; ninth and tenth subequal in width, neary ⅓ wider than the eighth, almost as long as wide and ¼ wider than long respectively; eleventh not thicker, elongate, very nearly as long as the two preceding, gradually and acutely conic and oblique from near basal third. *Prothorax* conic, the sides feebly arcuate, fully as long as wide; apex ⅗ as wide as the base, the latter ¼ wider than the head; surface perfectly even and unimpressed. *Elytra* ⅔ longer than wide, twice as long as the prothorax and ¾ wider; sides broadly and evenly arcuate; humeral plica narrow, oblique and rather short but strong; subhumeral impression short and shallow; inner fovea distinct, the outer very feeble; subsutural impressions obsolete, the suture not elevated or beaded. *Legs* well developed, the tarsi slender; four anterior femora rather strongly, the posterior feebly, clavate. Length 1.2 mm.; width 0.55 mm.

California (San Bernardino Co.). Mr. H. C. Fall.

The basal segment of the abdomen is simple and normal throughout, and the single type before me is a male, as shown by the protruded tip of the copulatory spicule, but there are no external sexual marks.

The individual lenses of the eyes are very feeble and widely separated posteriorly, but convex and subcontiguous anteriorly. The gradually acutely conical apex of the eleventh antennal joint is a peculiarity which I have not noticed elsewhere.

37. **C. anale** Lec.—Proc. Acad. Nat. Sci., Phila., 1852, p. 153 (Scydmænus).

Rather narrowly suboval, polished and impunctate, dark rufotestaceous, the antennæ concolorous and the legs rather paler; pubescence abundant, suberect but rather short, coarse, pale, mingled with longer remote setæ and conspicuous on the elytra. Head but slightly wider than long, subcircularly rounded behind, the eyes rather small but convex; antennal prominences almost obsolete, the front scarcely impressed; clypeus simple, evenly rectilinear at apex. Antennæ slender, about $\frac{1}{2}$ as long as the body, the club narrow, somewhat incrassate and but slightly abrupt; second joint stout, obconic, $\frac{2}{5}$ longer than wide; three to six equal in width; third not as long as wide; fourth quadrate; fifth fully $\frac{1}{4}$, and sixth just visibly, longer than wide; seventh scarcely longer than the sixth and only just visibly wider, very slightly elongate; eighth $\frac{2}{5}$ wider, a little longer than wide; ninth and tenth not distinctly wider, rather longer than wide and as long as wide respectively; eleventh rather stouter and obliquely pointed but not quite as long as the two preceding. Prothorax rather feebly conic, the apex about $\frac{3}{5}$ as wide as the base, which is not more than $\frac{1}{4}$ wider than the head; surface without trace of basal impression. Elytra $\frac{2}{5}$ longer than wide, rather more than twice as long as the prothorax and not more than $\frac{3}{4}$ wider, oval, narrowly parabolic at apex; humeral plica short and narrow, the impression small; foveæ small; subsutural impressions obsolete, the suture perfectly simple and not in the least beaded toward base. Abdomen with the basal segment perfectly normal and unmodified. Legs moderate, the femora rather strongly clavate; tarsi slender and filiform. Length 1.15 mm.; width 0.48 mm.

Louisiana and Texas (Austin). This species, together with *ventricosum* and *digressum*, is quite aberrant, for, with the per-

fectly simple first segment, broadly obtuse abdominal process and subequal four basal joints of the tarsi, characterizing the greater number of species, the male has the terminal tibial spur, which is so essentially characteristic a feature in the *capillosulum* group, and, except in these three species, unknown elsewhere in the genus.

The description above given is taken from a Louisiana female, and the series from Austin, Texas, before me, agrees fairly well; in this series the male differs from the female in being slightly stouter. The spur of the hind tibiæ in the male is slender and not quite half as long as the tarsus. As in many other species the abdomen is dusky, becoming paler toward tip.

38. **C. ventricosum** n. sp.—Rather stout and conspicuously ventricose, polished, impunctate, pale rufo-testaceous throughout the body, legs and antennæ; pubescence moderate in abundance, coarse, suberect, pale, rather recurved and mingled with longer and more erect sparse setæ on the elytra. *Head* orbicular, nearly as long as wide, subcircular behind, the eyes quite small and only slightly convex; front not appreciably concave; clypeus short, asperulate, with the apical margin perfectly simple and rectilinear. *Antennæ* slender, with a narrow and rather gradually formed club, distinctly longer than the head and prothorax; second joint large though slightly shorter and thinner than the first, feebly obconic, $\frac{3}{5}$ longer than wide, rather longer than the next two and much thicker; three to six equal in width; third distinctly shorter than wide; sixth quadrate; fourth slightly, and fifth distinctly, longer than wide; seventh about $\frac{1}{5}$ wider and longer than the sixth, swollen at apex, as long as wide; eighth scarcely $\frac{2}{5}$ wider, fully as long as wide; ninth and tenth almost exactly equal, nearly $\frac{1}{5}$ wider than the preceding and about as long as wide; eleventh stouter, very obliquely pointed, not quite as long as the two preceding. *Prothorax* rather small, feebly conic, the sides distinctly arcuate, not quite as long as wide; apex fully $\frac{3}{5}$ as wide as the base, which is not more than $\frac{1}{4}$ wider than the head; surface perfectly even and convex. *Elytra* inflated, $\frac{1}{3}$ longer than wide, a little more than twice as long as the prothorax and very nearly twice as wide, widest only slightly before the middle; sides arcuate; humeral plica small but distinct, the adjacent impression rather small but very evident; foveæ distinct; subsutural impressions subobsolete, the suture completely unmodified at any part. *Abdomen* dusky, pale at apex, the first segment perfectly normal. *Legs* well developed; femora rather strongly clavate, particularly the anterior pair; hind tarsi long and slender, with the joints decreasing very slowly in length to the fourth. Length 1.25 mm.; width 0.5 mm.

Texas (Columbus and Galveston).

The male, which serves for the above description, has a slender, simple and straight spur projecting obliquely from the apex of

the hind tibiæ and not quite half as long as the tarsus. The remarks given under the description of *anale*, as to the aberrant nature of this spur in the present section of the genus, apply equally here.

Ventricosum is closely related to *anale*, but differs in its more inflated elytra and sparser elytral vestiture. Three specimens.

39. **C. hirtellum** Lec.—Proc. Acad. Nat. Sci., Phila., 1852, p. 152, (Scydmænus).

Suboval, moderately stout, polished and subimpunctate, pale rufo-ferruginous throughout, the legs and antennæ concolorous; pubescence rather abundant, pale, short, coarse and recurved on the elytra. Head transversely oval, subcircular behind, the eyes not prominent; clypeus not elevated along the middle, the anterior margin even and rectilinear. Antennæ quite distinctly longer than the head and prothorax, the club strong but not very abrupt; second joint obconic, much shorter and thinner than the first, $\frac{1}{2}$ longer than wide, as long as the next two and but slightly thicker; three to six almost exactly equal, quadrate; seventh a little wider, not quite as long as wide; eighth nearly $\frac{1}{2}$ wider than the seventh, scarcely $\frac{1}{4}$ wider than long; ninth and tenth similar in form to the eighth but a little wider; eleventh rather stouter, almost as long as the two preceding, obtusely ogival and but slightly oblique at apex; antennæ throughout clothed with unusually coarse sparse hairs. Prothorax strongly conic, not quite as long as wide, the sides feebly arcuate; apex $\frac{3}{5}$ as wide as the base, the latter $\frac{2}{3}$ wider than the head; surface even. Elytra $\frac{2}{5}$ longer than wide, distinctly more than twice as long as the prothorax and $\frac{4}{5}$ wider, widest before the middle, the sides evenly arcuate from base to apex, the latter not acute; humeral plica and impression rather small; subsutural impressions obsolete, the suture simple. Legs well developed, the anterior femora strongly, the four posterior less strongly, clavate. Length 1.35 mm.; width 0.6 mm.

Georgia and Alabama. The specimen above described is a male and the œdeagus is completely extended. This is large and bulbous at base, turned strongly upward, the apex becoming laminate and produced at the middle in a slender corneous process, which is minutely but abruptly dilated at tip, the latter truncate; there are also two shorter lateral lobes which are acute and directed obliquely inward to a slight extent, each bearing at apex a long and excurvate seta which projects beyond the central spicule.

This species may be distinguished in the present group by its somewhat large size, ample elytra and other characters.

40. **C. decorum** n. sp.—Somewhat stout, polished, subimpunctate, pale brownish-testaceous throughout, the legs and antennæ similar in color but paler from diaphaneity; pubescence abundant, pale in color, rather coarse, only moderate in length and recurved on the elytra. *Head* rather well developed, much wider than long, subcircularly rounded behind the eyes, which are moderate in size but somewhat convex and distinct; clypeus carinate along the middle but devoid of any trace of marginal tooth. *Antennæ* but little longer than the head and prothorax, slender, the club rather strong but gradual in formation, the eighth joint intermediate; second joint rather narrow, much shorter and thinner than the first, ⅔ longer than wide, cylindric, narrowed at base, rather longer than the next two; three to six equal in width; third and fourth equal and about as long as wide, slightly narrower than the second; fifth a little longer, barely longer than wide; sixth quadrate; seventh only very slightly wider, cylindric, as long as wide; eighth nearly ½ wider than the seventh, rounded in apical ⅔, very nearly as long as wide; ninth ⅓ wider than the eighth, ¼ wider than long, fully as wide as the tenth, which is ⅓ wider than long; eleventh scarcely thicker, not quite as long as the two preceding, obtuse and but slightly oblique at apex. *Prothorax* strongly conic, the sides somewhat arcuate; apex a little more than ½ as wide as the base, the latter nearly ⅓ wider than the head; surface perfectly even and convex throughout. *Elytra* scarcely ⅖ longer than wide, twice as long as the prothorax and ⅘ wider, not very acute at apex, widest before the middle but with the sides very broadly and evenly arcuate; humeral plica short and feeble, the subhumeral impression very small and inconspicuous; inner fovea small but distinct, the outer indefinite; subsutural impressions completely obsolete, the suture not beaded basally. *Legs* rather short, the anterior femora distinctly, the four posterior quite feebly, clavate. Length 1.2 mm.; width 0.5 mm.

Pennsylvania (Westmoreland Co.). Mr. Schmitt.

The sex of the type is not discoverable at present, but the species may be readily known by its uniform pale coloration, carinate clypeus, unimpressed pronotum and other characters. Two specimens.

Decorum is allied rather closely to *hirtellum* but differs in its smaller size, more slender antennæ with relatively fully as stout but shorter and more gradually formed club, shorter elytra and more slender legs.

41. **C. digressum** n. sp.—Moderately stout and somewhat ventricose, polished, impunctate, dark rufo-testaceous, the elytra and legs but slightly paler; tarsi flavate as usual; pubescence abundant but quite short, coarse, recurved, pale and conspicuous on the elytra, where it is even and not mixed with longer setæ. *Head* well developed, orbicular, but slightly wider than long,

subcircular behind, the eyes rather small and not prominent; front not at all impressed; clypeus feebly asperulate, perfectly even and transversely rectilinear at apex. *Antennæ* slender, the club narrow and quite gradual in formation, distinctly longer than the head and prothorax; second joint distinctly obconic, much shorter and slightly narrower than the first, ½ longer than wide, as long as the next two and much thicker; three to six equal in thickness; third and fourth subequal and distinctly shorter than wide; fifth slightly elongate, the sixth quadrate; seventh only very slightly wider and distinctly wider than long; eighth scarcely ⅖ wider than the seventh, about as long as wide; ninth and tenth nearly ⅕ wider, ⅕ and ¼ wider than long respectively, eleventh very gradually, conically and obliquely pointed, rather stouter than the two preceding and nearly as long, paler in color. *Prothorax* rather feebly conic, the sides slightly arcuate, not as long as wide; apex fully ⅗ as wide as the base, the latter scarcely more than ¼ wider than the head; surface perfectly even and without trace of impression. *Elytra* scarcely ⅓ longer than wide, much more than twice as long as the prothorax and fully ⅘ wider, widest well before the middle, the sides broadly arcuate; humeral plica moderate in length, distinct; subhumeral impression rather well developed; foveæ small; subsutural impressions subobsolete, the suture very faintly beaded near the immediate base. *Abdomen* perfectly simple at base, the process broadly obtuse. *Legs* rather slender, the femora moderately clavate, the anterior pair more strongly; tarsi slender, with the joints decreasing very gradually in length. Length 1.2 mm.; width 0.55 mm.

California (Pomona, Los Angeles Co.). Mr. H. C. Fall.

The single male type before me has a somewhat slender and contorted spur projecting obliquely from the tip of the hind tibiæ, and distinctly less than half as long as the tarsus. This species is related to *anale* and *ventricosum*, but differs from both in the shorter and more recurved pubescence of the elytra unmixed with longer erect hairs.

42. **C. setiger** n. sp.—Moderately stout, polished and impunctate, rufotestaceous, the elytra paler and brighter red though obscure at base; legs and antennæ paler testaceous; pubescence abundant, coarse, pale in color and conspicuous, moderately long but recurved on the elytra, where there are long sparse and erect tactile setæ interspersed, which are conspicuous on the flanks. *Head* rather small, nearly as long as wide, parabolic behind the eyes, which are somewhat small and but feebly convex; antennal tubercles large and feeble; the front very feebly impressed; clypeus flat, somewhat asperately punctulate, evenly transverse and rectilinear at apex. *Antennæ* slender, very nearly ½ as long as the body, the club narrow but somewhat abrupt; second joint feebly obconic, ½ longer than wide, as long as the next two and much thicker; three to six equal in width and cylindric; third and fourth equal and nearly as long as wide; fifth fully as long as wide; sixth distinctly wider than long; seventh ¼ wider, cylindric, not quite as long as wide; eighth ⅖ wider than the seventh, cylindric, as long as wide; ninth and tenth conic at

apex, ⅓ wider than the eighth, as long as wide and ¼ wider than long respectively; eleventh long, gradually pointed, nearly as long as the two preceding. *Prothorax* conic, the sides nearly straight, about as long as wide; apex ½ as wide as the base, the latter ⅖ wider than the head; surface perfectly even and convex. *Elytra* ⅖ longer than wide, more than twice as long as the prothorax and ⅘ wider, acutely rounded at apex, widest near basal third; sides almost evenly arcuate; humeral plica long, strong and conspicuous, the subhumeral impression rather narrow but deep and unusually long, extending by varying reflection through almost basal fourth; inner fovea strong, the outer obsolete; subsutural impressions narrow and feeble, the suture very feebly elevated basally, the bead not expanded at base. *Legs* rather slender, the femora all moderately clavate. Length 1.15 mm.; width 0.5 mm.

Texas (Houston).

The bright coloration, conspicuous pale pubescence, with the long sparse setæ of the elytra and elongate subhumeral impression, are characters which will render the identification of this species quite certain. The sex of the unique example before me is not apparent.

43 **C. divisum** Schz.—Proc. Am. Phil. Soc., XVII, 1878, p. 357 (Scydmænus).

Moderately stout, polished, the anterior parts impunctate; elytra with coarse and sparse punctures in about basal half, except broadly along the summit of the flanks, where they disappear; body dark rufo-testaceous in color, the legs paler and brownish; antennæ dark red-brown; pubescence moderately abundant, coarse and pale, rather long and suberect on the elytra. Head well developed, wider than long, the eyes large and prominent; front obtusely impressed between the large and feeble antennal tubercles; clypeus not modified, the apical margin even and transversely rectilinear. Antennæ a little longer than the head and prothorax, rather stout, the club elongate, subparallel and not very abrupt; second joint obconic, ½ longer than wide, not as long as the next two but thicker; three to six equal in width and cylindric; three, four and six equal, slightly longer than wide; fifth still longer, ¼ longer than wide; seventh ¼ thicker and more roughly sculptured, fully as long as wide; eighth nearly ½ wider than the seventh, almost as long as wide; ninth and tenth equal in width and but slightly thicker than the eighth, ⅕ and ⅓ wider than long respectively; eleventh large, thicker, rather longer than the two preceding, gradually oblique-

and very acutely pointed. Prothorax conic, distinctly shorter than wide; apex $\frac{3}{5}$ as wide as the base, the latter $\frac{1}{3}$ wider than the head; surface feebly, transversely impressed near the basal margin. Elytra $\frac{2}{5}$ longer than wide, twice as long as the prothorax but scarcely $\frac{3}{5}$ wider, the sides broadly, evenly arcuate; humeral plica rather short but strong, the impression short and deep; foveæ distinct; subsutural impressions narrow and feeble, the suture very feebly, finely and imperfectly beaded basally, the head not expanded at base. Legs moderate, the femora rather strongly and subequally clavate. Length 1.15 mm.; width 0.5 mm.

Florida (Enterprise)—Mr. Schwarz. The sex of the specimen described above is not determinable. This species though allied in general structure to *innocuum* and *conifer*, may be separated at once, not only from them but every other species of the genus, by the peculiar coarse punctuation of the elytra.

44. **C. testaceipes** n. sp.—Rather stout, polished and impunctate, black throughout or with a slight piceous tinge; legs and antennæ pale, rufo-testaceous; pubescence rather abundant, short, coarse, pale and recurved on the elytra. *Head* well developed, much wider than long, broadly rounded behind, the eyes unusually large and prominent, extending behind the middle; front distinctly impressed between the antennal tubercles; clypeus not at all carinate, evenly rectilinear at apex. *Antennæ* distinctly longer than the head and prothorax, somewhat slender but with the club strong, subparallel and slightly abrupt; second joint feebly obconic, $\frac{2}{3}$ longer than wide, much thicker and slightly longer than the next two, only slightly thinner than the first; next four smooth, equal in width, cylindric; third and fourth equal and as long as wide; fifth just visibly longer; sixth quadrate; seventh slightly rough, cylindric, fully $\frac{1}{4}$ wider than the sixth and not as long as wide; eighth fully $\frac{2}{5}$ wider than the seventh, rounded in nearly apical half, almost as long as wide; ninth and tenth equal, barely $\frac{1}{4}$ wider than the eighth and but slightly wider than long; eleventh somewhat thicker, as long as the preceding two, pointed. *Prothorax* small, conic, not quite as long as wide, the sides feebly arcuate; apex about $\frac{1}{2}$ as wide as the base, the latter scarcely $\frac{1}{3}$ wider than the head; surface distinctly impressed transversely near the basal margin, the impression subinterrupted in the middle as usual. *Elytra* $\frac{1}{3}$ longer than wide, more than twice as long as the prothorax and nearly twice as wide, widest at basal $\frac{2}{5}$; sides evenly arcuate, the apex acutely rounded; humeral plica long and strong, the subhumeral impression strong and well developed; foveæ distinct; subsutural impressions narrow but long, strong and parallel, the suture strongly beaded basally. *Legs* well developed, the tarsi slender, with the first four joints of the posterior subequal; anterior femora strongly, the other four feebly, clavate. Length 1.0 mm.; width 0.45 mm.

Pennsylvania (Westmoreland Co.). Mr. Schmitt.

This distinct form somewhat resembles *castaneum* and *triviale*, but is stouter and with the basal segment of the abdomen almost perfectly normal at apex. It differs from both in its large and prominent eyes, obese form and black color, and, from *triviale*, also in the strong humeral plica and impression. The type is probably a male.

45. **C. inerme** n. sp.—Stout, highly polished and subimpunctate, piceous-black, the elytra rufous throughout; legs and antennæ pale, testaceous; pubescence rather abundant, pale, coarse, moderately long, even in length and but slightly recurved on the elytra. *Head* only moderate in size, strongly transverse, subcircular behind the eyes, which are large and prominent, extending distinctly behind the middle; front impressed between the rather approximate antennal prominences; clypeus even, the apical edge perfectly even and very feebly sinuate throughout the width. *Antennæ* a little longer than the head and prothorax, slender, the club long, narrow and rather gradually formed; second joint feebly obconic, ½ longer than wide, as long as the next two and thicker; three to six equal in width, cylindric and smooth; three, four and six equal and fully as long as wide, the fifth a little longer; seventh ¼ wider, as long as wide; eighth nearly ⅗ wider than the seventh, almost as long as wide; ninth and tenth equal, scarcely perceptibly wider than the eighth and nearly as long as wide; eleventh rather stouter, gradually and very obliquely pointed, very nearly as long as the two preceding. *Prothorax* small, conic, the sides feebly arcuate, distinctly shorter than wide; apex ⅔ as wide as the base, the latter ¼ wider than the head; surface feebly and transversely biimpressed near the basal margin. *Elytra* fully ⅓ longer than wide, 2½ times as long as the prothorax and nearly twice as wide; sides evenly arcuate; humeral plica and adjacent impression long, strong and very conspicuous; foveæ distinct; subsutural impressions evident, the suture strongly beaded toward base. *Legs* slender; anterior femora rather strongly, the intermediate less and the posterior feebly, clavate; tarsi slender, the first four joints of the posterior subequal. Length 1.0 mm.; width 0.45 mm.

Massachusetts.

The first abdominal segment in the unique type is rather thickly but simply pubescent, with the posterior margin broadly arcuate and overlapping the second but without a visible fringe or coriaceous margin; the sex is not determinable.

In its general form, large eyes and small prothorax this species closely resembles *testaceipes*, differing in the coloration of the body, in its slightly more slender and less incrassate antennal club, and rather sparser and longer elytral vestiture.

46. **C. innocuum** n. sp.—Stout polished and impunctate, blackish-piceous, the elytra paler and dark rufo-testaceous throughout; legs and antennæ still paler, testaceous; pubescence rather abundant, pale, coarse, sub-

erect and somewhat long on the elytra. *Head* wider than long, moderate in size, subparabolic behind the eyes, which are well developed and prominent; antennal prominences distinct, the front feebly depressed between them; clypeus not carinate, evenly rectilinear at apex. *Antennæ* a little longer than the head and prothorax, slender, the club long, subparallel and to some degree gradual in formation; second joint about as thick as the first but shorter, obconic, fully ½ longer than wide, as long as the next two and much thicker; three to six equal in diameter, cylindric; third fully as long as wide; fourth a little shorter; fifth barely as long as wide, the sixth distinctly wider than long; seventh nearly ⅓ wider than the sixth, cylindric, wider than long; eighth ⅖ wider than the seventh; ninth and tenth but little wider than the eighth; eight to ten subsimilar in form and about ⅓ wider than long; eleventh scarcely thicker, as long as the two preceding, obliquely and acutely pointed. *Prothorax* strongly conic, the sides somewhat arcuate, very nearly as long as wide; apex ½ as wide as the base, the latter ⅖ wider than the head; surface very feebly, transversely impressed near the basal margin. *Elytra* short, about ¼ longer than wide, twice as long as the prothorax and scarcely ¾ wider, almost evenly oval, widest only slightly before the middle; sides strongly and almost evenly arcuate throughout; apex rather obtuse; humeral plica long and strong, the impression well developed; foveæ distinct; subsutural impressions long and distinct, the suture broadly beaded toward base. *Legs* slender, the four anterior femora moderately, the posterior feebly, clavate; tarsi slender. Length 1.0 mm.; width 0.45 mm.

Central Illinois. Mr. F. M. Webster.

The first ventral segment is almost normal, having merely a slightly more developed coriaceous hind margin than the succeeding segments. The sex of the single type is not determinable.

This species differs from *castaneum* in its shorter elytra, more elongate and larger prothorax, still larger and more coarsely faceted eyes, smaller head impressed between the antennal prominences, and in numerous other characters of minor importance. The eyes are not so large as in *testaceipes*, and the prothorax is relatively much larger than in that species or *inerme;* the body is much more obese than in *triviale*.

47. **C. conifer** n. sp.—Rather stout, polished, subimpunctate, dark rufopiceous, the elytra bright red; legs and antennæ pale brownish-testaceous; pubescence abundant, pale, coarse, long and suberect on the elytra. *Head* well developed, wider than long, broadly parabolic behind the eyes, which are somewhat large and prominent, extending slightly behind the middle; front impressed between the antennal prominences; clypeus flat and simple, the apical edge perfectly even and just visibly sinuate throughout. *Antennæ* rather longer than the head and prothorax, the club long and subparallel but somewhat abrupt; second joint thick, obconic, ⅖ longer than wide, barely as long

as the next two and decidedly thicker; three to six equal in width and cylindric, about as long as wide, the fifth very little longer; seventh scarcely ¼ wider, quadrate; eighth ½ wider than the seventh, conic in apical ⅔, fully as long as wide; ninth and tenth equal, ¼ wider than the eighth, very nearly as long as wide; eleventh rather thicker, oval, gradually and obliquely pointed, nearly as long as the two preceding. *Prothorax* strongly conic, the sides almost straight; apex ½ as wide as the base, the latter ⅓ wider than the head; surface narrowly and obsoletely impressed transversely near the basal margin. *Elytra* ⅔ longer than wide, fully twice as long as the prothorax and about ¾ wider, oval, widest at basal ⅔ but with the sides broadly and very evenly arcuate; apex narrowly rounded; surface feebly and sparsely punctulate; humeral plica and adjacent impression long and strongly developed; foveæ distinct, rather approximate; subsutural impressions narrow and quite distinct but very near the base, the included part of the suture very feebly elevated but not at all beaded. *Legs* rather stout, the four anterior femora moderately strongly and equally, the two posterior less strongly, clavate; tarsi moderately stout, the first four joints of the posterior equal. Length 1.0 mm.; width 0.45 mm.

Florida.

The first abdominal segment is simple, but with the coriaceous hind margin somewhat distinct. The sex of the type example is indeterminate.

This species resembles *innocuum*, but differs in its longer and more erect elytral pubescence, still larger eyes and in the complete absence of the coarse and conspicuous sutural bead of that species.

48. **C. castaneum** n. sp.—Moderately stout, polished and impunctate, dark castaneous to blackish throughout, the legs and antennæ pale and brownish-testaceous; pubescence abundant, pale in color, rather coarse but short and recurved on the elytra. *Head* moderate, wider than long, circularly rounded behind the eyes, which are rather well developed and convex but anterior as usual; antennal prominences completely obsolete, the front not in the least impressed; clypeus perfectly even, the apical margin transverse and rectilinear. *Antennæ* distinctly longer than the head and prothorax, the club strong but somewhat gradual in formation; second joint but slightly smaller than the first, thicker and rather longer than the next two, cylindric and ⅗ longer than wide; three to six equal in width; third and fourth equal and distinctly wider than long; fifth and sixth subequal and slightly longer but not quite as long as wide; seventh ⅓ thicker than the sixth, cylindric, ⅓ wider than long; eighth ½ wider than the seventh, slightly wider than long; ninth nearly ¼ wider than the eighth, about as wide as the tenth, these ¼ and ⅓ wider than long respectively; eleventh rather thicker, distinctly shorter than the two preceding, obtusely ogival and slightly oblique at apex. *Prothorax* rather small, conic, distinctly shorter than wide, the sides nearly straight; apex ⅗ as wide as the base, the latter ¼ wider than the head; sur-

face feebly, transversely impressed near the basal margin. *Elytra* scarcely more than ⅓ longer than wide, distinctly more than twice as long as the prothorax and about ⅕ wider, widest well before the middle, the sides evenly arcuate; apex rather acute; humeral plica long and strong, the subhumeral impression correspondingly distinct; foveæ distinct; subsutural impressions feeble but evident, suture somewhat beaded toward base. *Legs* well developed, the two anterior femora strongly, the other four feebly, clavate. Length 1.0–1.1 mm.; width 0.4–0.45 mm.

Pennsylvania (Westmoreland Co.). Mr. Schmitt.

The basal segment of the abdomen is broadly arcuate at apex and somewhat elevated above the general level as in the second subdivision of the genus, with which however the present species cannot be placed because of tarsal structure. In the type, assumed to be the male, this segment is densely clothed with long submembranous hairs throughout. The female is smaller, darker and more slender than the male and has the pubescence of the first segment normal.

This species may be known by its small and transversely impressed pronotum, strong humeral plica and abdominal structure.

49. **C. triviale** n. sp.—Rather narrowly suboval, polished, subimpunctate, dark rufo-testaceous throughout, the legs and antennæ still paler; pubescence moderately abundant, pale, rather coarse, moderate in length and recurved on the elytra. *Head* slightly wider than long, subparabolic behind the eyes, which are rather small and but slightly prominent; antennal prominences very feeble, the surface not noticeably impressed between them; clypeus not carinate, short, rectilinearly truncate. *Antennæ* a little longer than the head and prothorax, rather slender, the club long but slender and quite gradual in formation; second joint feebly obconic, as long as the next two and thicker, ½ longer than wide; next four equal in width; third and fourth equal and slightly wider than long; fifth and sixth equal and very nearly as long as wide; seventh scarcely ¼ wider, cylindric, very little wider than long; eighth ⅖ wider than the seventh, rounded at the sides, conoidal only at apex, very nearly as long as wide; ninth and tenth almost exactly equal, ⅓ wider than the eighth, less than ⅓ wider than long; eleventh rather stouter, elongate, gradually and acutely pointed and slightly oblique at apex, as long as the two preceding. *Prothorax* conic with slightly arcuate sides, not quite as long as wide; apex ⅗ as wide as the base, the latter about ⅓ wider than the head; surface feebly, transversely impressed near the basal margin. *Elytra* almost evenly oval and widest only slightly before the middle, barely ⅖ longer than wide, obviously more than twice as long as the prothorax and ¾ wider; sides evenly arcuate; apex rather narrowly rounded; humeral plica short and basal, the impression correspondingly short; foveæ distinct; subsutural impressions narrow, long and rather distinct, the suture beaded basally, the bead rapidly expanded at base. *Legs* slender, the anterior femora

rather strongly, the other four feebly, clavate; tarsi slender. Length 0.95 mm.; width 0.35 mm.

Pennsylvania (Westmoreland Co.). Mr. Schmitt.

The first abdominal segment in the type is large, arcuate at apex and extends slightly over the second segment as in the second section of the genus; it is sparsely and inconspicuously pubescent, but the apical margin is fringed with a laminate porrect and membranous border which seems to be split into narrow scale-like pieces. The first four tarsal joints are subequal in length. The sex of the type is undetermined.

This species is allied to *castaneum*, differing in its rather smaller size, paler color, more slender antennal club, and especially in abdominal structure and in its much shorter and less conspicuous humeral plica and impression.

50. **C. osculans** n. sp.—Narrowly suboval, highly polished and impunctate, pale flavo-testaceous throughout the body, legs and antennæ; pubescence only moderately abundant, coarse, pale, short, even and recurved on the elytra. *Head* rather small, but slightly wider than long, broadly rounded at base, the tempora obtusely subangulate; eyes moderately large, slightly prominent, not extending to the middle; antennal prominences strong, rather approximate, separated by a pronounced depression; clypeus even, transversely rectilinear at apex. *Antennæ* slender, longer than the head and prothorax, the club slender and very gradual in formation; second joint subcylindric, about ½ longer than wide, as long as the next two and slightly thicker; three to six equal in width, cylindric; three, four and five equal and quadrate; six perceptibly shorter, not as long as wide; seventh much larger, ⅖ wider and longer than the sixth, not as long as wide, forming an even transition to the eighth, which is ⅖ wider than the seventh and nearly as long as wide, conic at apex; ninth and tenth equal in width and nearly ⅓ wider than the eighth, ¼ and ⅓ wider than long respectively; eleventh nearly as long as the two preceding and rather thicker, gradually pointed in a slightly oblique ogive. *Prothorax* conic with feebly arcuate sides, not quite as long as wide; apex ⅗ as wide as the base, the latter ⅓ wider than the head; surface feebly, transversely biimpressed near the basal margin. *Elytra* ⅖ longer than wide, twice as long as the prothorax and nearly ¾ wider, rather acutely rounded at apex, widest only slightly before the middle, the sides rather more strongly arcuate there than toward base and apex; humeral plica narrow but strong and somewhat elongate, the impression well marked but small; foveæ approximate, rather deep; subsutural impressions distinct, the suture strongly beaded basally, the bead expanded at base. *Legs* moderate; anterior femora rather strongly, the intermediate less and the posterior feebly, clavate; tarsi slender. Length 0.8 mm.; width 0.35 mm.

Rhode Island (Boston Neck).

The sex of the single individual before me cannot be determined at present. The pale color of the type may be in part due to immaturity.

This species may be readily known by its minute size, very gradual antennal club and small head with deep frontal impression, as well as by its impressed pronotum.

51. **C. pyramidale** Lec.—"New Species Col.," Sm. Misc. Col. 167, p. 27 (Scydmænus).

Narrowly suboval, polished, subimpunctate, the elytra sparsely and obsoletely punctulate; integuments pale brownish-testaceous throughout, the legs and antennæ concolorous; pubescence abundant, pale, coarse, short, recurved and nearly even on the elytra. Head well developed, semicircular behind the eyes, which are only moderate in size and not prominent; front not impressed; clypeus even, the apical margin transversely rectilinear. Antennæ scarcely longer than the head and prothorax, stout, the club strong but gradually formed; second joint cylindric, nearly $\frac{1}{2}$ longer than wide, longer than the next two but not visibly thicker; three to six equal and transverse, nearly twice as wide as long; seventh a little wider and fully twice as wide as long; eighth scarcely $\frac{1}{2}$ wider than the seventh, $\frac{3}{4}$ wider than long; ninth and tenth equal, nearly $\frac{2}{5}$ wider than the eighth and $\frac{3}{4}$ wider than long; eleventh somewhat thicker, pointed, scarcely as long as the two preceding. Prothorax strongly conic; apex scarcely more than $\frac{1}{2}$ as wide as the base, the latter nearly $\frac{2}{5}$ wider than the head; surface obviously and transversely impressed near the basal margin. Elytra $\frac{2}{5}$ longer than wide, fully twice as long as the prothorax and about $\frac{2}{3}$ wider, acutely rounded at apex, widest behind basal third; humeral plica rather short but strong, the adjacent impression distinct but small and narrow; inner fovea alone visible; subsutural impressions very narrow and almost obsolete, the suture very finely elevated basally, the bead not at all expanded at base. Legs slender, the femora only moderately and subequally clavate. Length 0.8 mm.; width 0.3 mm.

Alabama and Florida. A very minute species, recognizable by the short antennal joints, feebly punctulate elytra, subobsolete impressions near the elytral suture and other characters. The sex of the individual described is not known.

52. **C. oregonense** n. sp.—Rather narrowly subrhomboid-oval, polished and subimpunctate, pale rufo-testaceous throughout, the legs and antennæ

concolorous; elytral suture narrowly blackish; pubescence rather abundant, coarse, pale, very short and closely recurved on the elytra, without longer bristles. *Head* well developed, much wider than long, circularly rounded behind; eyes rather large, convex and prominent, extending to the middle; antennal prominences subobsolete; clypeus simple, asperulate, with an evenly rectilinear and transverse apical margin. *Antennæ* slender, much longer than the head and prothorax, the club narrow and gradual in formation; second joint obconic, fully ½ longer than wide, fully as long as the next two and much thicker; three to six almost equal among themselves, cylindric and about as long as wide, the third very slightly the shortest; seventh ⅕ thicker, subglobular, about as long as wide; eighth nearly ½ thicker than the seventh, conic in apical third, subglobular, about as long as wide; ninth and tenth equal in form and size, about ¼ wider than the eighth, scarcely ⅕ wider than long; eleventh large, decidedly stouter, fully as long as the two preceding, oval, gradually and acutely ogival and oblique toward tip. *Prothorax* feebly conic, with the sides nearly straight, about as long as wide; apex truncate and fully ⅔ as wide as the base, the latter scarcely more than ⅕ wider than the head; surface very obsoletely biimpressed transversely near the basal margin. *Elytra* almost ½ longer than wide, distinctly more than twice as long as the prothorax and nearly ¾ wider, widest and with the sides somewhat more arcuate near basal third; apex narrowly subtruncate and rounded; humeral plica narrow but somewhat long and strong, the adjacent impression rather narrow and small but distinct; inner fovea feeble, the outer almost obsolete; subsutural impressions narrow but rather distinct, the suture feebly and finely elevated basally but not distinctly beaded. *Legs* well developed; anterior femora rather strongly, the other four distinctly less although somewhat strongly, clavate; tarsi filiform. Length 1.15 mm.; width 0.4 mm.

Oregon (Huntington). Mr. Wickham.

The first ventral segment is large but simple and not fringed, the apical margin broadly arcuate and widely overlapping the second segment. No sexual characters are observable in the unique type. The species may be recognized by its very short elytral pubescence, subobsolete transverse pronotal impression and antennal structure.

Although inhabiting a Pacific State, this species cannot be regarded as belonging to the true Pacific coast faunal region, as the town of Huntington is on the extreme eastern border.

53. **C. nimbatum** n. sp.—Narrow with subinflated hind body, polished, impunctate, rufo-testaceous, the elytra slightly brighter red; legs and antennæ pale brownish-testaceous; pubescence moderately abundant, pale, coarse, short, even and recurved on the elytra. *Head* rather small, rounded behind the eyes, which are moderate in size but somewhat prominent, extending about to the middle; antennal prominences somewhat distinct, the front broadly impressed; clypeus flat, the apical edge perfectly even and transversely rec-

tilinear. *Antennæ* slender, longer than the head and prothorax, the club narrow but somewhat abrupt in formation ; second joint subcylindric, ⅗ longer than wide, rather longer than the next two and distinctly thicker; three to six equal in width, smooth and cylindric; three, four and six equal and very nearly as long as wide ; fifth a little longer than wide ; seventh scarcely more than ¼ wider than the sixth and but little longer, not quite as long as wide ; eighth full ½ wider than the seventh, nearly as long as wide, conic at apex ; ninth and tenth subequal, ¼ wider than the eighth, about ⅓ wider than long ; eleventh decidedly thicker, fully as long as the two preceding, obliquely pointed in ogive at apex. *Prothorax* narrow, fully as long as wide, parallel and feebly arcuate at the sides in basal half, then gradually and arcuately narrowed to the apex, which is fully ¾ as wide as the base, the latter ¼ wider than the head ; surface finely and transversely biimpressed near the basal margin. *Elytra* nearly ⅖ longer than wide, barely twice as long as the prothorax and ⅘ wider, widest before the middle, the sides evenly arcuate ; humeral plica narrow but long and strong, the subhumeral impression rather narrow but deep ; inner fovea somewhat distinct ; subsutural impressions narrow but evident, the suture only very narrowly and feebly beaded basally, the bead not expanded at base. *Legs* as usual; anterior femora distinctly, the four posterior more feebly, clavate. Length 0.9 mm.; width 0.35 mm.

Rhode Island (Boston Neck).

A very small but peculiar species, which may be identified by the narrow and subparallel prothorax, this being apparently longer than wide. A single specimen of undetermined sex.

54. **C. parcum** n. sp.—Narrowly suboval, highly polished and impunctate, black, the elytra dark rufous, blackish posteriorly; prothorax slightly pale at apex; legs and antennæ pale testaceous; pubescence not very abundant, rather coarse, long, feebly curved, suberect and decidedly sparse on the elytra, but pale in color and distinct. *Head* moderately developed, distinctly wider than long, subparabolic behind the eyes, which are small and inconspicuous although somewhat convex; depression between the antennal prominences rather strong; clypeus not at all carinate, the apex perfectly even, transverse and rectilinear. *Antennæ* somewhat longer than the head and prothorax, moderately stout, the club rather feeble, somewhat gradual in formation; second joint but slightly thinner than the first, cylindric, as long as the next two and much thicker, ⅖ longer than wide; three to six equal in width; third nearly as long as wide; fourth and sixth just visibly shorter; fifth fully as long as wide; seventh only ¼ wider than the sixth, a little wider than long; eighth ⅖ wider than the seventh, slightly wider than long, broadly rounded only at apex; ninth ¼ wider than the eighth, scarcely ¼ wider than long; tenth subequal in width but more transverse, ⅖ wider than long; eleventh elongate, scarcely thicker, as long as the two preceding, gradually acutely and obliquely pointed. *Prothorax* very feebly conic, nearly as long as wide, with the sides broadly arcuate; apex ¾ as wide as the base, the latter scarcely ¼ wider than

the head; surface with feeble traces of a transverse impression near the basal margin. *Elytra* $\frac{2}{3}$ longer than wide, scarcely twice as long as the prothorax and about $\frac{3}{4}$ wider, widest slightly before the middle, the sides broadly arcuate; humeral plica very narrow but elongate and distinct, the impression rather well developed; foveæ distinct; subsutural impressions obsolete, the suture not or scarcely beaded basally. *Legs* rather long; anterior femora strongly, the four posterior feebly, clavate. Length 0.85 mm.; width 0.35 mm.

Pennsylvania (Westmoreland Co.). Mr. Schmitt.

No sexual marks can be discovered in the two examples before me; there will, however, be no trouble in identifying this distinct species, because of its small size, coloration of the body and peculiar form of the prothorax.

55. **C. clavatum** Lec.—Proc. Acad. Nat. Sci., Phila., 1852, p. 153 (Scydmænus).

Narrow and elongate, polished, sparsely subpunctulate, rufotestaceous, the legs and antennæ pale; head and pronotum slightly darker; pubescence rather abundant, coarse, pale, short, recurved and interspersed with longer remote erect setæ on the elytra. Head large, but slightly wider than long, the eyes small; clypeus with a minute discal tubercle at the anterior margin, the latter transverse. Antennæ about as long as the head and prothorax, slender, the club rather strong, subparallel and abrupt to some extent; second joint rather longer than the next two and distinctly thicker, $\frac{3}{5}$ longer than wide; three to six almost equal, cylindric, distinctly wider than long, the fifth almost as long as wide; seventh $\frac{1}{3}$ wider, cylindric, $\frac{1}{3}$ wider than long; eighth $\frac{2}{5}$ wider and longer than the seventh, a little wider than long; ninth and tenth subequal, $\frac{1}{4}$ wider than the eighth, about $\frac{2}{5}$ wider than long; eleventh almost as long as the two preceding and somewhat thicker, ogival and slightly oblique at tip. Prothorax fully as long as wide, the sides arcuate and converging anteriorly, parallel toward base; apex $\frac{3}{4}$ as wide as the base, the latter only very slightly wider than the head; surface transversely and strongly impressed near the base, the impression narrowly interrupted at the middle. Elytra $\frac{1}{2}$ longer than wide, twice as long as the prothorax and barely $\frac{1}{2}$ wider, evenly oval, the sides broadly arcuate; humeral plica and adjacent impression small and moderately strong; inner fovea evident, the outer subobsolete; subsutural impressions nearly obsolete, the suture very finely beaded basally. Legs moderate, the femora rather strongly

clavate, the anterior rather more distinctly than the other four. Length 1.15 mm.; width 0.3 mm.

Georgia (Liberty Co.) and Florida. A distinct type in the present genus, which can be identified very readily by its narrow form, relatively large head and strong impression of the pronotum. I cannot observe any definite sexual characters.

56. **C. decipiens** n. sp.– Narrowly suboval, polished, subimpunctate, rufo-testaceous throughout, the legs and antennæ paler and more diaphanous; pubescence rather abundant, pale, coarse, short, recurved and mingled with sparse erect setæ on the elytra. *Head* moderate in size, but slightly wider than long, subparabolic behind the eyes, which are not very large or prominent; antennal prominences very feeble, separated by scarcely more than ⅓ the total width; clypeus slightly asperate, the apical margin very evenly and just visibly sinuate throughout the width. *Antennæ* scarcely as long as the head and prothorax, stout, the club long and rather strong but subparallel and scarcely abrupt; second joint stout, cylindric, scarcely ⅖ longer than wide, fully as long as the next two and a little thicker; three to six perfectly similar in form and strongly transverse, apparently very slightly increasing in size, ⅔ to ¾ wider than long; seventh scarcely ¼ wider than the sixth, ⅓ wider than long; eighth ⅖ wider than the seventh, nearly as long as wide; ninth and tenth subequal, only very slightly wider than the eighth and very nearly as long as wide; eleventh barely thicker, not quite as long as the two preceding, obliquely pointed at tip. *Prothorax* conic with the sides distinctly arcuate or very obtusely subangulate at the middle, scarcely as long as wide; apex ½ as wide as the base, the latter nearly ¼ wider than the head; surface strongly and transversely biimpressed near the basal margin. *Elytra* evenly oval and acutely ogival at apex, widest before the middle, ½ longer than wide, distinctly more than twice as long as the prothorax and about ½ wider; sides evenly arcuate; humeral plica and attendant impression small but strongly marked; inner fovea strong and deep, the outer obsolete; subsutural impressions narrow, short and feeble, the suture finely but strongly beaded basally, the bead gradually wider but not abruptly expanded at base. *Legs* well developed, the femora all strongly clavate. Length 1.0 mm.; width 0.28 mm.

Texas (Colorado River).

A small and slender species, somewhat allied to *clavatum*, but distinguishable by the smaller head, more conical prothorax with coarser transverse impression, and by the stouter antennæ, the club of the latter being less abrupt. The antennal club in *decipiens* is very long, the joints of the funicle being shorter and more transverse. No sexual marks are observable in the two specimens before me.

57. **C. biceps** n. sp.—Moderately stout and feebly ventricose, polished and impunctate, pale flavo-testaceous throughout, the legs and antennæ con-

colorous; pubescence rather abundant, short, recurved and mingled with longer erect and widely dispersed tactile setæ on the elytra. *Head* much wider than long, dilated, angulate and widest behind the eyes, broadly rounded at base behind the lateral projections, deeply excavated transversely just behind the eyes, which are anterior, well developed and rather convex; vertex behind the excavation broadly swollen, finely and feebly scabrous and more densely pubescent, the pubescence projecting anteriorly over the middle of the excavation; tranverse elevated front before the excavation and between the antennæ longitudinally impressed at the middle, finely scabrous laterally; clypeus simple, not at all dentate; maxillary palpi nearly normal, the third joint dilated, oval and compressed. *Antennæ* rather stout, as long as the head and prothorax, the club strong and somewhat gradual; second joint stout, as thick as the first, suboval and about $\frac{1}{3}$ longer than wide, distinctly thicker and somewhat longer than the next two; three to six equal in width; three and four equal and fully $\frac{4}{5}$ wider than long; fifth and sixth equal, longer, $\frac{2}{5}$ wider than long; seventh $\frac{1}{4}$ wider, $\frac{2}{5}$ wider than long; eighth nearly $\frac{1}{2}$ wider than the seventh, $\frac{1}{2}$ wider than long; ninth and tenth nearly similar, the latter scarcely visibly wider, $\frac{2}{3}$ and $\frac{3}{4}$ wider than long respectively; eleventh not distinctly thicker, short, but little longer than wide, obtusely ogival and but slightly oblique at apex and as long as the two preceding. *Prothorax* feebly conic with straight sides, about as long as wide; apex fully $\frac{3}{4}$ as wide as the base, the latter scarcely $\frac{1}{5}$ wider than the head; surface even, convex, without a distinct transverse impression near the basal margin. *Elytra* oval, $\frac{1}{3}$ longer than wide, not quite twice as long as the prothorax and fully $\frac{3}{4}$ wider, widest before the middle, the sides broadly rounded; humeral plica and adjacent impression extremely small and feeble; inner fovea very small, the outer obsolete; subsutural impressions obsolete, the suture very finely beaded near the base. *Abdomen* normal. *Legs* rather short, the femora moderately clavate; hind tarsi rather thick, with the first four joints about equal among themselves. Length 0.7 mm.; width 0.26 mm.

Pennsylvania (Westmoreland Co.). Mr. Schmitt.

The description is drawn from the male. In the female the body is nearly similar in form and size, but the prothorax is more conical and the head much smaller and of the ordinary form, being subcircularly rounded behind the anterior and slightly prominent eyes, with the antennal prominences small; the antennal club is less dilated and more gradually incrassate.

58. **C. caviceps** n. sp.—Feebly subrhomboid-oval, polished, subimpunctate, pale brownish-testaceous throughout, the legs and antennæ concolorous; pubescence rather abundant, short and recurved on the elytra and with a few longer erect setæ. *Head* transversely oval, slightly and subangularly prominent at the sides behind and above the eyes, the latter rather small, not convex and not visible from above; base broadly arcuate; surface broadly concave at the middle, smooth and polished but becoming densely and finely asperato-punctate at the anterior margin of the front, these punctules bearing each an

extremely minute and short but stiff and erect seta; clypeus smooth and almost vertical, its anterior margin simple; maxillary palpi normal. *Antennæ* slender, rather longer than the head and prothorax, the club moderately stout and very gradually formed; second joint obconic, fully ½ longer than wide, stouter and distinctly longer than the next two and a little thinner than the first; three to six subequal in size throughout and about as long as wide; seventh scarcely ¼ wider, as long as wide and subglobular; eighth subglobular, scarcely ⅖ wider than the seventh and almost as long as wide; ninth ⅓ thicker, globular, as long as wide; tenth a little thicker and very slightly wider than long; eleventh still thicker, obtusely and obliquely ogival, not quite as long as the two preceding; joints eight to eleven together as long as two to seven. *Prothorax* conic, with feebly arcuate sides, not quite as long as wide; apex ⅗ as wide as the base, the latter barely ¼ wider than the head; surface even and convex, not impressed near the base. *Elytra* oval, ⅖ longer than wide, fully twice as long as the prothorax and about ⅔ wider, widest before the middle, the sides broadly arcuate; humeral plica and attendant impression extremely small and feeble; inner fovea feeble and alone visible; subsutural impressions obsolete, the suture unmodified. *Abdomen* normal in structure. *Legs* rather short but slender; femora moderately clavate; hind tarsi slender, with the first four joints subequal among themselves. Length 0.65–0.75 mm.; width 0.26 mm.

Pennsylvania (Westmoreland Co.). Mr. Schmitt.

The form described above is the male, and the female differs in having the elytra rather shorter and relatively more dilated, the head slightly smaller, circularly rounded behind the eyes which are moderate in size, anterior and visible from above, and in having the penultimate joints of the antennæ shorter and more transverse; the middle of the vertex is however broadly impressed, nearly as in the male, and the antennal prominences are relatively more marked, but there is no frontal punctulation.

This and the preceding are by far the most minute of the entire genus, and differ besides in presenting strongly marked cephalic modifications in the male, but they are perfectly normal members of the genus in general structure.

59. **C. trinifer** n. sp —Somewhat narrowly suboval, polished and subimpunctate, piceous-black, the head and antennæ paler and dark rufo-testaceous; legs pale luteo-testaceous; pubescence rather abundant, pale, coarse, rather short recurved and almost even on the elytra. *Head* moderate, distinctly wider than long, almost evenly elliptical, the eyes small and but slightly convex; antennal prominences large and distinct, separated by a depression; clypeus even, the median tooth distinct, narrow and rather acute. *Antennæ* moderately stout, slightly longer than the head and prothorax, the club very abrupt, strong, short, 3-jointed and paler in color; second joint stout,

obconic, ⅓ longer than wide, as long as the next two and much thicker; three to six equal, cylindric, ⅓ wider than long; seventh and eighth similar in form, symmetric and trapezoidal from the base, ⅓ and ⅖ wider than the sixth respectively and a little more roughly sculptured; ninth ¾ wider and ½ longer than the eighth, nearly ½ wider than long; tenth similar, though scarcely visibly wider, fully ½ wider than long, both with a whorl of short stout and porrect setæ beyond the middle; eleventh not quite as long as the two preceding, scarcely oblique at apex. *Prothorax* moderately conic with very slightly arcuate sides, about as long as wide; apex ⅔ as wide as the base, the latter but slightly more than ¼ wider than the head; surface perfectly even, without trace of impression. *Elytra* relatively long, oval, widest at basal ⅖, narrowly obtuse at apex, ⅖ longer than wide, distinctly more than twice as long as the prothorax and nearly ⅕ wider; sides broadly arcuate; humeral plica minute, the adjacent impression small, basal and inconspicuous; inner fovea deep and distinct, the outer indistinct; subsutural impressions obsolescent, the suture not elevated. *Legs* well developed; femora rather strongly clavate, the anterior only a little more so. Length 1.1–1.2 mm.; width 0.45 mm.

Rhode Island (Boston Neck); New York; District of Columbia; Pennsylvania (Westmoreland Co.).

This is a distinct species and is apparently common and widely diffused in the northern Atlantic States. It resembles *fulvum*, but differs in its piceous-black color and much larger size; from *trifidum* it may be known by its less ventricose form and much smaller subhumeral impression, and, from *debilitans*, which it resembles most of all, by its larger size, darker color, much longer elytra, narrower prothorax and shorter but stouter antennal club. The description is drawn from the male, the female however not differing in any external aspect. It is represented by a large series and some individuals are pale, probably from immaturity.

60. **C. debilitans** n. sp.—Rather narrowly subrhomboid-oval, polished, impunctate, dark rufo-testaceous, the antennæ same; elytra rather paler and brighter red but dusky toward tip; legs very pale luteo-testaceous; pubescence rather abundant, coarse, pale, short recurved and mingled with some longer and more erect setæ on the elytra. *Head* moderately developed, slightly wider than long, subcircular behind the eyes, which are rather small and scarcely at all prominent; antennal prominences somewhat large and distinct, separated by a feeble depression; clypeus not carinate, having a few subasperate punctures, the apex finely but distinctly toothed at the middle, the tooth narrow and acute. *Antennæ* stout, fully as long as the head and prothorax, the club abrupt, stout and 3-jointed; second joint stout, obconic, ⅓ longer than wide, as long as the next two and thicker; three to six subequal, nearly ½ wider than long, the inner side of the fourth distinctly shorter than the outer; seventh perceptibly wider, transverse; eighth still a little wider, more pointed within; five to eight gradually more roughly sculptured; ninth abruptly

⅔ wider than the eighth and nearly twice as long, ⅓ wider than long; tenth just visibly wider, similar in form; eleventh rather stouter, not as long as the two preceding; the ninth and tenth have a whorl of peculiar short, very stiff and porrect bristles at apical ⅔, which are distinct from the ordinary erect setæ or shorter hairs, and there is also a feebler whorl of similar setæ at about the middle of the eleventh. *Prothorax* conic with nearly straight sides, as long as wide; apex fully ⅗ as wide as the base, the latter ¼ wider than the head; surface perfectly even. *Elytra* ⅔ longer than wide, twice as long as the prothorax and ¾ wider, narrowly rounded behind, widest near basal third; sides broadly rounded; humeral plica short, narrow and not very pronounced, the adjacent impression rather small and feeble; inner fovea small but deep and distinct, the outer obsolete; subsutural impressions small but rather distinct, rounded, at basal fifth, the suture extremely finely and feebly elevated toward base. *Legs* moderate, the four posterior femora rather feebly, the anterior more strongly, clavate. Length 1.0 mm.; width 0.38 mm.

Pennsylvania (near Philadelphia).

The single specimen, which is probably a male, represents a species allied to *fulvum* and *trifidum*, but differing in its much stouter antennæ, especially in the funicular portion. The subhumeral plica and impression are much more pronounced than in the former, but rather less so than in the latter, and the subsutural impressions and clypeal tooth are more developed than in either of those species. In form it more nearly resembles *fulvum*, being less stout than *trifidum*. The last two segments combined occupy nearly half of the entire abdomen.

61. **C. trifidum** n. sp.—Somewhat stout, suboval, polished, subimpunctate, pale brownish-testaceous throughout, the legs and antennæ concolorous; pubescence rather abundant, pale, coarse, rather short and recurved on the elytra, where it is mingled with a few widely dispersed and erect tactile setæ of moderate length. *Head* moderate, but very slightly wider than long, rounded behind, the eyes small and slightly convex; antennal prominences very feeble, the front scarcely impressed; clypeus simple, sparsely asperate, the apical margin with an exceedingly minute and obtuse median tooth. *Antennæ* barely as long as the head and prothorax, slender, the club abrupt, stout and 3-jointed; second joint very feebly obconic, ½ longer than wide, longer and much wider than the next two; three to six equal, cylindric, about ½ wider than long; seventh nearly ¼ wider than sixth, fully ½ wider than long; eighth nearly ¼ wider than the seventh and almost similar in form; ninth abruptly ½ wider than the eighth, fully ⅖ wider than long; tenth similar to the ninth but just visibly wider; eleventh not quite as long as the two preceding. *Prothorax* conic with very feebly arcuate sides, about as long as wide; apex truncate, ⅗ as wide as the base, which is nearly ⅓ wider than the head; surface perfectly even and unimpressed. *Elytra* about ⅓ longer than wide, scarcely twice as long as the prothorax and nearly ⅘ wider;

apex narrowly rounded; sides broadly rounded; disk widest before the middle; humeral plica moderate in length, strongly elevated and distinct; subhumeral impression pronounced though not very large; inner fovea small but deep and distinct, the outer subobsolete; subsutural impressions very nearly obsolete, the suture not at all elevated. *Legs* well developed, the anterior femora moderately strongly, the four posterior feebly, clavate. Length 0.95 mm.; width 0.43 mm.

Wisconsin (Bayfield). Mr. Wickham.

A small species, closely allied to *fulvum*, but differing in the more dilated seventh and eighth antennal joints, larger size, more ventriculate form and much stronger humeral plica and adjacent impression. It is represented before me by a single specimen of indeterminate sex but in all probability female. The elytra are sparsely and feebly punctulate, particularly toward base.

62. **C. fulvum** Lec.—Proc. Acad. Nat. Sci., Phila., 1852, p. 155 (Scydmænus).

Narrowly suboval, polished, impunctate, pale brownish-testaceous throughout, the elytra, legs and antennæ still somewhat paler; pubescence rather abundant, coarse, pale and conspicuous, rather short and recurved on the elytra. Head somewhat small, slightly wider than long, subcircularly rounded behind the eyes, which are rather small and but slightly prominent; antennal prominences strong, separated by a distinct depression; clypeus sparsely asperulate, not at all carinate, evenly rectilinear and transverse at apex, with a very minute and obtusely rounded marginal tooth. Antennæ barely as long as the head and prothorax, the funicle slender, the club very abrupt and purely 3-jointed; second feebly obconic, $\frac{2}{5}$ longer than wide, a little longer than the next two and much wider; three to six equal, very slightly wider than long, cylindric; seventh scarcely visibly wider; eighth very slightly wider than the seventh, $\frac{2}{5}$ wider than long, its surface smooth like that of the preceding joints; ninth $\frac{4}{5}$ wider, $\frac{1}{4}$ wider than long; tenth just visibly wider than the ninth, $\frac{2}{5}$ wider than long; eleventh not thicker, not quite as long as the two preceding. Prothorax conic with feebly arcuate sides, as long as wide; apex $\frac{3}{5}$ as wide as the base, the latter $\frac{1}{3}$ wider than the head; surface perfectly even, without trace of impression. Elytra oval, widest slightly before the middle, narrowly parabolic at tip, $\frac{2}{5}$ longer than wide, barely twice as long as the prothorax and scarcely $\frac{3}{5}$ wider; sides broadly arcuate; humeral

plica and subhumeral impression very small and inconspicuous; foveæ obsolete, the inner existing only as a trace; subsutural impressions wholly obsolete, the suture not elevated. Abdomen rather convex, the first segment rather shorter, the last two longer, than usual; fifth equal to the two preceding. Legs moderate, the tarsi rather thick, the first four joints of the posterior equal; anterior femora somewhat strongly, the four posterior feebly, clavate. Length 0.8–0.9 mm.; width 0.3–0.35 mm.

Appalachian mountain system, from New York to northern Georgia. This species may be known at once by its minute size, 3-jointed club, feeble modification at the base of the elytra, abdominal structure and pale coloration. It is said by LeConte to occur under pine bark, but its very convex form would suggest the accidental nature of such a habitat. The type is a male, the copulatory spicule being very slender and without a terminal button.

63. **C. repugnans** n. sp.—Moderately stout, not very ventricose, polished, impunctate, dark rufo-testaceous throughout, the legs and antennæ concolorous; pubescence abundant, long, erect, coarse, pale and conspicuous on the elytra. *Head* nearly as long as wide, parabolic behind, the eyes moderately large, rather convex and prominent; front feebly concave; clypeus long and well developed, coarsely and sparsely setose, the apical margin transversely rectilinear, with a small but distinct and equilaterally triangular median tooth. *Antennæ* distinctly less than ½ as long as the body, only moderately slender, the club somewhat abrupt but elongate and paler in color; second joint stout and but feebly obconic, scarcely ⅔ longer than wide, distinctly shorter than the next two but much thicker; three to six equal in width; third and sixth equal and quadrate; fourth and fifth slightly longer than wide and about equal; seventh ⅕ wider and ¼ longer than the sixth, parallel, with arcuate sides, slightly longer than wide; eighth fully ⅔ wider than the seventh, oval, truncate at base, fully as long as wide; ninth and tenth very nearly equal and scarcely visibly wider than the eighth, both fully as long as wide; eleventh not thicker, gradually acutely and obliquely conic from the middle, scarcely as long as the two preceding. *Prothorax* conic with slightly arcuate sides, nearly as long as wide; apex rather more than ½ as wide as the base, which is fully ¼ wider than the head; surface strongly impressed transversely near the base, the impression not interrupted at the middle. *Elytra* long, ⅔ longer than wide, much more than twice as long as the prothorax and about ⅕ wider, with the sides very broadly and evenly arcuate, widest before the middle; humeral plica long and very strong, the subhumeral impression rather large and conspicuous; foveæ small but distinct; subsutural impressions very strong, the suture strongly beaded basally, the bead scarcely at all expanded at base. *Abdomen* with the first segment widely overlapping the next, arcuate at apex and with a very deep pale coriaceous border, which is

apparently composed of evenly contiguous flat parallel scales; intercoxal process acutely triangular. *Legs* well developed, the femora all strongly clavate; tarsi slender, the basal joint of the posterior as long as the next two. Length 1.65 mm.; width 0.7 mm.

Texas (Austin).

A rather large and distinct species, which may be distinguished from any other of the present section by the small but pronounced median tooth of the clypeus; this tooth is not elongate, however, as in the first section of the genus, but is equilateral and triangular. It may be known from any of the larger species of the first group of the genus by the strongly impressed pronotum. A single female specimen.

64. **C. calcaratum** n. sp.—Stout and ventricose, polished and impunctate, black throughout, the legs and antennæ rufo-testaceous; pubescence abundant, long, erect, rather coarse, pale and conspicuous on the elytra. *Head* well developed, nearly as long as wide, circularly rounded behind, the eyes rather small but convex and somewhat prominent; antennal prominences distinct, the front concave between them; clypeus somewhat setose, perfectly even and rectilinear at apex, without trace of median tooth or other modification. *Antennæ* barely ½ as long as the body, slender, the club somewhat gradually formed; second joint feebly obconic, fully ½ longer than wide, as long as the next two and distinctly thicker; three to six equal in width and feebly obconic in form; third but little longer than wide; fourth and sixth fully ¼, the fifth ⅓, longer than wide; seventh cylindric, as long as the sixth and ⅕ wider, a little longer than wide; eighth longer and nearly ½ wider than the seventh; distinctly longer than wide, rounded at apex; ninth fully ¼ wider than the preceding, conic in apical half, about as long as wide; tenth slightly wider, similar in form, not quite ⅓ wider than long; eleventh much stouter, obliquely pointed, rather shorter than the two preceding. *Prothorax* strongly conic with feebly arcuate sides, not quite as long as wide, rather small; apex more than ½ as wide as the base, the latter scarcely ¼ wider than the head; surface perfectly even, convex and without trace of transverse impression. *Elytra* short, oval, obtusely ogival behind, barely ⅓ longer than wide, much more than twice as long as the prothorax and very nearly twice as wide, widest but slightly before the middle, the sides broadly and evenly arcuate; humeral plica small and moderately elevated, the impression small, basal and inconspicuous; foveæ feeble; subsutural impressions barely traceable and near the base; suture perfectly even, not elevated and without the slightest trace of basal bead. *Abdomen* with the first segment broadly arcuate and narrowly pale and coriaceous at apex, overlapping the next. *Legs* long; femora rather strongly clavate, more particularly the anterior; tarsi long and filiform. Length 1.3 mm.; width 0.65 mm.

Virginia (southwestern).

This is one of the most isolated species of the genus, and may

be known at once by its black color with pale legs, unimpressed pronotum, rather small eyes, inflated elytra with feeble basal modifications, slender and elongate antennal funicle, and by the greatly developed tibial spur of the male, this being oblique and perfectly straight, gradually tapering throughout the length, and fully ¾ as long as the tarsus. The basal joint of the hind tarsi is almost as long as the next three combined. A single example.

65. **C. bifidum** n. sp.—Rather stout, suboval, polished and impunctate, piceous, the legs and antennæ scarcely paler ; elytra slightly paler and more rufous ; pubescence abundant, moderately long, rather inclined and recurved, coarse and somewhat pale on the elytra. *Head* about as long as wide, well developed, subcircular behind, the eyes rather small but convex ; front not distinctly impressed; clypeus somewhat rugose, the apex transverse, with a very faint and broadly rounded projection at the middle; maxillary palpi long, flavate. *Antennæ* slender, ½ as long as the body, the club slender and quite gradual, incrassate; second joint feebly obconic, ½ longer than wide, as long as the next two and much thicker; three to six equal in width, smooth and subcylindric ; third fully as long as wide; four to six nearly equal and ⅕ longer than wide; seventh sculptured, ¼ wider, cylindric, as long as wide; eighth nearly ½ thicker, as long as wide, rounded at apex; ninth and tenth slightly wider than the eighth and very nearly as long as wide; eleventh long, decidedly thicker, fully as long as the two preceding, very obliquely and gradually conic and acutely pointed from behind the middle. *Prothorax* strongly conic with very feebly arcuate sides, not quite as long as wide; apex slightly more than ½ as wide as the base, the latter scarcely more than ¼ wider than the head; surface distinctly biimpressed transversely near the base. *Elytra* nearly ⅖ longer than wide, 2½ times as long as the prothorax and about ⅘ wider, narrow at apex, widest at basal ⅖, the sides evenly and strongly arcuate; humeral plica only moderate in length, strong at base but rapidly evanescent, the subhumeral impression rather narrow and somewhat feeble but moderately large ; foveæ rather strong ; subsutural impressions narrow and very feeble, the suture not definitely beaded. *Abdomen* with the basal segment fringed at apex with long and contiguous porrect and membranous scales; intercoxal process acute, with the angle slightly blunt. *Legs* well developed, the femora strongly clavate, the posterior distinctly less so than the anterior. Length 1.55 mm.; width 0.65 mm.

Pennsylvania (Westmoreland Co.) Mr. Schmitt.

The male described above serves as the type of a species allied in general to *capillosulum*, but with very much feebler subhumeral modifications of the elytra. It is rendered very distinct by the conformation of the terminal hind tibial spur of the male, which is slender and oblique as usual, scarcely half as long as the tarsus and bifurcated from about the middle, the diverging angle being

small and the inner ramus more slender than the outer; there is also a long and slender seta attached to the spur near its base and equalling it in length.

66. **C. mutilans** n. sp.—Moderately stout, suboval, polished and impunctate, piceous-black, the elytra, legs and antennæ dark rufous; pubescence moderately abundant, rather long and suberect but stiff, pale, and to some extent recurved on the elytra. *Head*, clypeus and antennæ nearly as in *bifidum*, the last joint of the latter, however, less developed. *Prothorax* conic with the sides feebly arcuate, about as long as wide; apex rather more than ½ as wide as the base, the latter fully ¼ wider than the head; surface rather feebly biimpressed near the base, the impression confined to the median parts of the disk as in *bifidum*. *Elytra* ⅔ longer than wide, distinctly more than twice as long as the prothorax and scarcely ¾ wider, widest before the middle, the sides very broadly and evenly arcuate; humeral plica large, long and conspicuous, the subhumeral impression long and very pronounced; foveæ distinct; subsutural impressions narrow and moderate, the suture elevated and strongly beaded basally, the bead expanded at base. *Abdomen* with the first segment fringed at apex with membranous scales. *Legs* well developed, the femora moderately clavate, the anterior more strongly. Length 1.35 mm.; width 0.6 mm.

Pennsylvania (Westmoreland Co.). Mr. Schmitt.

This species is closely allied to *bifidum*, but is smaller, with relatively larger prothorax and narrower elytra, much larger and stronger humeral plica and impression and strongly beaded suture. It further differs in the conformation of the posterior tibial spur of the male, this being likewise abnormal in structure. This spur is much longer than in *bifidum*, being fully ¾ as long as the tarsus, and is split from near the base into three long slender filaments, which become more or less contorted at their tips. The constancy of this singular modification cannot be stated, as I only have a single male and two females before me, but it is probably variable in degree to an appreciable extent; the splitting of the spur into filaments is, however, in all probability not the result of accident.

67. **C. capillosulum** Lec.—Proc. Acad. Nat. Sci., Phila., 1852, p. 152 (Scydmænus).

Stout and rather ventricose, polished and impunctate, dark red-brown, the elytra pale and bright red throughout; antennæ dark testaceous, the legs slightly paler; pubescence abundant, long even, erect and somewhat pale on the elytra. Head about as long as wide, semicircular behind the eyes, which are only moderate in size but somewhat convex and prominent; antennal prominences

obsolete; clypeus long, even, with sparse setæ, the apex not toothed. Antennæ long and slender, rather more than $\frac{1}{2}$ as long as the body, the club slender and rather abruptly formed; second joint stout, feebly obconic, $\frac{2}{5}$ longer than wide, thicker but scarcely as long as the next two; three to six equal in width, the first three smooth, the sixth asperate like the following; third scarcely as long as wide; fourth just visibly longer than wide; fifth fully $\frac{1}{4}$ longer than wide; sixth similar to the fourth but cylindric and not feebly obconic in form; seventh scarcely $\frac{1}{5}$ wider than the sixth, distinctly longer than wide; eighth $\frac{2}{5}$ wider, as long as wide, rounded in apical half; ninth and tenth almost similar, just visibly wider than the eighth, nearly as long as wide; eleventh large, stouter, obliquely pointed, very nearly as long as the two preceding. Prothorax strongly conic, with very feebly arcuate sides, not quite as long as wide; apex $\frac{1}{2}$ as wide as the base, the latter fully $\frac{1}{3}$ wider than the head; surface distinctly biimpressed transversely near the base. Elytra $\frac{2}{5}$ longer than wide, oval, widest only slightly before the middle, much more than twice as long as the prothorax and $\frac{4}{5}$ wider; sides strongly arcuate; apex narrowly obtuse; humeral plica long and very strong; impression large and very conspicuous; inner fovea distinct; subsutural impressions very strong, the suture conspicuously and broadly beaded basally, the bead expanded at base. Abdomen with the basal segment fringed at tip with long hairs and short porrect membranous scales, black, the tip rufous. Legs long, the femora subequally and rather strongly clavate. Length 1.6 mm.; width 0.8 mm.

Massachusetts, Rhode Island (Boston Neck) and District of Columbia, probably of wide distribution in the coastal plains of the Atlantic region.

The description is drawn from the male, and, in that sex, the hind tibiæ have at tip a straight slender and simple spur, scarcely half as long as the tarsus, bent obliquely outward near the base. The female does not differ from the male except in some slight details of antennal structure, the sixth joint, for example, being smooth like the preceding and the club rather narrower and more elongate.

68. **C. proximum** n. sp.—Stout, highly polished and impunctate, piceous-black, the elytra bright red; antennæ piceous-brown, the legs dusky-testaceous with the tarsi pale flavate; pubescence abundant, rather pale, long

fine erect and conspicuous on the elytra. *Head* as long as wide, semicircular behind, the eyes rather small but convex and prominent, situated just before the middle; antennal prominences moderate, the front distinctly impressed between them; clypeus long and well developed, the apex transversely rectilinear, with the feeblest trace of a broadly rounded inequality at the middle but not toothed; maxillary palpi long and slender. *Antennæ* slender, fully ½ as long as the body, the club slender and very gradual in formation; second joint obconic, scarcely ½ longer than wide, not quite as long as the next two and but slightly thicker; three to six equal in width, feebly obconic, the sixth cylindric; third not quite as long as wide; fourth scarcely longer; fifth nearly ¼ longer than wide; sixth rather longer than wide; seventh ¼ wider, parallel with the sides broadly arcuate, at least ¼ longer than wide; eighth scarcely ⅓ thicker, oval, a little longer than wide; ninth just visibly thicker than the eighth, rather longer than wide; tenth still very slightly wider, as long as wide; eleventh rather thicker, obliquely pointed, not quite as long as the two preceding. *Prothorax* conic as usual, not quite as long as wide, with the apex rather more than ½ as wide as the base, which is about ¼ wider than the head; surface transversely impressed near the base, the impression not distinctly interrupted at the middle. *Elytra* large and ample, fully ⅓ longer than wide, nearly 2½ times as long as the prothorax and fully ⅘ wider, widest before the middle, narrow and subacute at apex, the sides evenly rounded; humeral plica rather long and strong, the impression large; foveæ deep; subsutural impressions narrow, very deep and conspicuous, the suture strongly beaded basally, the bead gradually increasing in width. *Abdomen* with the basal segment overlapping the next, unevenly fringed at apex. *Legs* rather long; femora moderately clavate, the anterior strongly so. Length 1.75 mm.; width 0.8 mm.

Texas (Colorado River).

Very closely allied to *capillosulum*, but slightly larger and with a still more slender and gradual antennal club, less interrupted transverse impression of the pronotum, larger head, stronger subsutural impressions, shorter tibial spur of the male and longer hind tarsi. The tibial spur of the male is straight, oblique, simple and very slender, and is distinctly less than half as long as the tarsus. A single specimen.

69. **C. illustre** n. sp.—Rather stout, suboval, highly polished and impunctate, piceous-black, the elytra bright red, rather dusky at base and on the flanks; legs and antennæ pale reddish-brown; pubescence abundant, long erect pale and conspicuous on the elytra. *Head* very nearly as long as wide, semicircular behind, the eyes only moderately large but very convex and prominent, near the middle; antennal prominences feeble, the front slightly impressed; clypeus long and well developed, highly polished and impunctate, the apical edge perfectly even and without trace of median modification. *Antennæ* more than ½ as long as the body, the club gradual and elongate but quite heavy; second joint feebly obconic, ½ longer than wide, not quite as

long as the next two but thicker ; next four subequal, ¼ longer than wide, the fifth ⅓ longer than wide ; seventh ¼ wider, longer than wide ; eighth ⅓ wider, rather longer than wide ; ninth and tenth only slightly wider than the eighth, about as long as wide ; eleventh long, obliquely and gradually pointed, nearly as long as the two preceding. *Prothorax* strongly conic with feebly arcuate sides, about as long as wide ; apex not more than ½ as wide as the base, the latter barely ¼ wider than the head across the eyes ; surface transversely and feebly impressed near the base, the impression very narrowly interrupted. *Elytra* long, ⅔ longer than wide, very narrowly parabolic at tip, distinctly more than twice as long as the prothorax and about ¾ wider, widest at basal ⅔, the sides evenly rounded ; humeral plica strong but unusually short, the subhumeral impression relatively small ; foveæ deep ; subsutural impressions narrow, very deep and conspicuous, the suture strongly beaded basally, the bead gradually expanded. *Abdomen* with the basal segment overlapping the next and with its hind edge fringed with a deep and almost solid membranous border, the latter apparently composed of contiguous scale-like pieces. *Legs* long, the femora strongly clavate, especially the anterior. Length 1.8 mm.; width 0.75 mm.

Iowa (Iowa City). Mr. Wickham.

This species is closely allied to *capillosulum* and *proximum*, but differs from the former in its larger size, more elongate elytra, more elongate head, which is much less broadly rounded behind and with the eyes not larger but rather more abruptly prominent, and, from *proximum*, in its larger eyes; from both it differs in the very much smaller and less conspicuous subhumeral impression, which character will distinguish it at once. A single female example.

The eyes, quite unexpectedly, are perceptibly larger and more conspicuous in the female than in the male of *capillosulum*, and the head is a little shorter and broader in that sex, so that in making comparisons between these species the sex should be carefully noted.

70. **C. lynceum** n. sp.—Moderately stout, suboval, polished, impunctate, rather pale testaceous-brown, the antennæ and legs nearly concolorous; elytra pale, bright rufous; tarsi flavate; pubescence abundant, long, coarse, erect, pale and conspicuous on the elytra. *Head* much wider than long, subcircularly rounded behind, the eyes very large, convex and prominent; antennal prominences and frontal concavity very slight; clypeus very sparsely setulose and with a very feeble tubercle on the surface at the middle of the apical margin, which however does not project in the form of a tooth, the edge broady and very feebly incurvate throughout the width. *Antennæ* barely ½ as long as the body, slender, the club narrow and subparallel but rather abruptly formed; second joint feebly obconic, barely ½ longer than wide, scarcely as long as the next two but decidedly thicker; three to six

equal in width, cylindric; third quadrate; four and six just visibly longer than wide, the fifth obviously so; seventh barely ¼ wider, parallel with the sides feebly arcuate; fully as long as wide; eighth much longer and fully ½ wider than the seventh, as long as wide, rounded in apical third; ninth and tenth equal, just visibly wider than the eighth and very slightly, though obviously, wider than long; eleventh rather thicker, very obliquely and gradually pointed, nearly as long as the two preceding. *Prothorax* well developed, about as long as wide, conic with feebly arcuate sides; apex rather more than ½ as wide as the base, the latter not quite ⅓ wider than the head; surface strongly impressed transversely near the base, the impression extremely finely interrupted at the middle. *Elytra* barely ⅔ longer than wide, distinctly more than twice as long as the prothorax and scarcely more than ¾ wider, widest slightly before the middle, the sides very broadly and evenly arcuate; apex subacute; humeral plica long and rather strong, the subhumeral impression somewhat large but shallow, the foveæ deep; subsutural impressions long and only moderately strong, the suture strongly beaded basally, the bead strongly expanded at base. *Abdomen* with the basal segment broadly arcuate and having a deep pale coriaceous border at apex. *Legs* well developed; femora rather strongly clavate, especially the anterior; tarsi long and filiform. Length 1.4 mm.; width 0.58 mm.

New York (Hudson Valley). Mr. H. H. Smith.

A somewhat small species, which is quite distinct by reason of its large and prominent eyes; it can be distinguished from small specimens of *nigrum* and *atrum* by the coloration and somewhat transverse penultimate joints of the antennæ, and from *paganum* by the color and by its shorter and broader head with larger eyes. It is represented before me by the female only.

71. **C. basale** Lec.—Proc. Acad. Nat. Sci., Phila., 1852, p. 152 (Scydmænus).

Not very stout, suboval, polished and impunctate, pale rufotestaceous throughout the body and legs, the antennæ rather darker red-brown; pubescence abundant, long, coarse, pale and conspicuous on the elytra. Head but little wider than long, semicircular behind, the eyes rather small, anterior and but slightly convex; clypeus well developed, rectilinear and unmodified at the apical margin. Antennæ but little longer than the head and prothorax, the club narrow and but slightly differentiated; second joint feebly obconic, ⅗ longer than wide, fully as long as the next two and thicker; three to six equal in width; third and fourth quadrate; fifth distinctly longer than wide; sixth barely longer than wide; seventh cylindric, as long as the sixth and scarcely ⅕ wider, quadrate; eighth nearly ½ wider than the sev-

enth, as long as wide; ninth and tenth subequal, but little wider than the preceding, nearly as long as wide; eleventh as long as the two preceding and a little thicker, obliquely pointed. Prothorax well developed, conic, nearly as long as wide, with two rather widely separated, short and transverse impressions near the base. Elytra $\frac{2}{5}$ longer than wide, only slightly more than twice as long as the prothorax and scarcely more than $\frac{2}{3}$ wider, broadly arcuate at the sides, widest near basal $\frac{2}{5}$; humeral plica long and strong, the subhumeral impression large and conspicuous; foveæ deep; subsutural impressions deep, the suture strongly beaded basally, the bead expanded at base. Abdomen with the basal segment broadly arcuate at apex, with a pale coriaceous margin moderate in depth. Legs well developed; femora strongly and conspicuously clavate. Length 1.4 mm.; width 0.55 mm.

Georgia and Louisiana. A rather small species, described above from the male, in which sex the hind tibiæ are provided at tip with a short slender spur, scarcely $\frac{2}{5}$ as long as the tarsus, the latter slender and filiform.

This species may be distinguished by its rather small size, not strongly inflated hind body, having the subhumeral modifications strong, by its strongly clavate femora and other characters. It is related most closely perhaps to *longipilosum*, but differs in its larger prothorax, less inflated hind body and very much shorter spur of the male hind tibiæ.

72. **C. politum** Say—Journ. Acad. Nat. Sci., Phila., V, p. 245 (Anthicus).

Rather stout and ventricose, polished and impunctate, blackish-piceous in color, the elytra more or less rufous, darker toward tip; legs and antennæ pale rufo-testaceous; pubescence abundant, moderately long, suberect, ashy and conspicuous on the elytra. Head but slightly wider than long, subparabolic behind, the eyes somewhat large, convex and prominent; antennal prominences very feeble, the frontal impression only just visible; clypeus sparsely setulose, the apical margin perfectly even and rectilinear throughout. Antennæ $\frac{1}{2}$ as long as the body, moderately slender, the club rather strong and incrassate but gradually formed; second joint strongly obconic, rather more than $\frac{1}{2}$ longer than wide, as long as the next two and much thicker; three to six equal in width and cylindric; third not quite as long as wide; fourth and sixth subequal and just visibly longer than wide, the

fifth still longer; seventh fully $\frac{1}{4}$ thicker and more asperate, cylindric, fully as long as wide; eighth $\frac{2}{5}$ wider, as long as wide; ninth and tenth equal, but slightly thicker than the eighth and as long as wide; eleventh notably thicker, very obliquely and gradually pointed and as long as the two preceding. Prothorax moderate in size, conic with distinctly arcuate sides; apex fully $\frac{1}{2}$ as wide as the base, which is scarcely more than $\frac{1}{4}$ wider than the head; surface strongly and uninterruptedly impressed transversely near the base. Elytra scarcely $\frac{2}{5}$ longer than wide, distinctly more than twice as long as the prothorax and fully $\frac{4}{5}$ wider, narrowly rounded behind, widest at basal $\frac{2}{5}$, the sides broadly and evenly arcuate; humeral plica long and very strong; subhumeral impression large, deep and conspicuous; foveæ deep; subsutural impressions deep and distinct; suture strongly beaded basally, the bead expanded rather gradually at base. Abdomen with the basal segment very feebly arcuate, overlapping the next and fringed at apex with distinct porrect membranous scales. Legs long, the femora all rather strongly clavate. Length 1.3 mm.; width 0.6 mm.

Illinois (northern). The terminal spur of the hind tibiæ in the male is straight, oblique, bent at base, simple and slender and is not quite half as long as the tarsus. The description is taken from the male, but the female does not differ observably. Two specimens.

This species differs from *paganum* in the longer antennal club, with the penultimate joint not transverse, and from *nigrum* in its smaller size and relatively much larger subhumeral impression. It agrees throughout with the original description of *Anthicus politus* of Say, the position of which has been so long in doubt.

73. **C. longipilosum** n. sp.—Moderately stout, highly polished and impunctate, red-brown, the antennæ concolorous; elytra and legs throughout pale testaceous; pubescence abundant, rather fine, pale, very long, erect and conspicuous on the elytra. *Head* only slightly wider than long, broadly parabolic behind the eyes, which are rather small and only moderately prominent; antennal prominences large and very feeble; clypeus long and well developed, flat toward tip, with a few fine setigerous punctures, the apical edge perfectly even and without trace of median protuberance. *Antennæ* rather slender, $\frac{1}{2}$ as long as the body, the club narrow and gradual in formation; second joint very feebly obconic, fully $\frac{1}{2}$ longer than wide, rather longer than the next two and distinctly wider; three to six equal in width, smooth and cylindric; third distinctly wider than long; fourth nearly as long as wide; fifth and

sixth equal and fully as long as wide; seventh ⅕ wider, cylindric and rougher, slightly longer than wide; eighth not more than ⅖ wider than the seventh, fully as long as wide or a little longer; ninth and tenth equal in width and about ¼ wider than the eighth, very nearly as long as wide and almost ⅓ wider than long respectively; eleventh somewhat thicker, long, very obliquely and gradually pointed and rather longer than the two preceding. *Prothorax* conic with very feebly arcuate sides, as long as wide; apex rather more than ½ as wide as the base, the latter fully ¼ wider than the head; surface with two approximate and distinct transverse impressions near the base. *Elytra* ⅖ longer than wide, distinctly more than twice as long as the prothorax and ⅘ wider, gradually narrowly parabolic at apex, widest before the middle, the sides very evenly arcuate throughout; humeral plica long, strong and conspicuous, the impression large and deep; foveæ distinct; subsutural impressions rather well marked, the suture narrowly beaded basally, the bead expanded at base. *Abdomen* with the first segment overlapping the next and having a short fringe of hairs and scattered membranous scales. *Legs* well developed, the anterior femora rather strongly, the four posterior much less strongly, clavate. Length 1.3 mm.; width 0.6 mm.

Pennsylvania (Westmoreland Co.). Mr. Schmitt.

The male described above has the spur of the hind tibiae slender, perfectly straight and simple, oblique in direction, being bent abruptly at base and is notably long, being rather more than ⅗ as long as the tarsus. The species may be readily known not only by this character, but by its rather elongate elytra, strongly modified at the humeri, long pubescence, pale coloration and other characters. The last two segments of the abdomen are still paler as usual. Several specimens.

74. **C. lacunosum** n. sp.—Rather stout, polished, impunctate, very dark piceo-rufous, the entire elytra slightly paler and dark rufous; antennæ dark red-brown, the legs rather paler, rufous; pubescence moderately abundant, long coarse erect and pale on the elytra. *Head* well developed, slightly wider than long, subcircular behind, the eyes rather large, convex and prominent; antennal prominences almost obsolete, the front not definitely impressed; clypeus even, the apex rectilinearly transverse, without trace of median projection. *Antennæ* only slightly longer than the head and prothorax, rather slender but with the club pronounced and rather abrupt; second joint feebly obconic, nearly ½ longer than wide, as long as the next two and thicker; three to six equal in width, not quite as long as wide, the fifth as long as wide; seventh ¼ wider than the sixth, not as long as wide; eighth ⅖ wider than the seventh, ⅕ wider than long; ninth ¼ wider than the preceding, broadly spherical in apical half, ⅖ wider than long, the tenth almost similar but just visibly wider and nearly ½ wider than long; eleventh paler, slightly thicker, as long as the two preceding, very obliquely pointed at apex. *Prothorax* rather small, distinctly shorter than wide, strongly conic with the sides feebly arcuate; apex about ½ as wide as the base, which is nearly ⅓

wider than the head; surface very feebly impressed transversely near the base. *Elytra* ⅓ longer than wide, distinctly more than twice as long as the prothorax and ⅘ wider, widest only slightly before the middle, narrowly parabolic at apex, the sides strongly and almost evenly arcuate; humeral plica long and very strong, the subhumeral impression large, deep and conspicuous; foveæ deep; subsutural impressions feeble and indistinct, the suture finely but distinctly beaded basally, the bead rapidly and strongly expanded at base. *Abdomen* with the basal segment nearly transverse at apex, having the margin fringed densely with a short porrect and subdivided membranous border. *Legs* well developed, the femora strongly and subequally clavate. Length 1.35 mm.; width 0.65 mm.

Pennsylvania (Westmoreland Co.). Mr. Schmitt.

The two specimens before me are both females, but the species can readily be distinguished from *capillosulum*, and other allied forms, by its smaller size, shorter, coarser and less abundant elytral vestiture, much shorter antennæ with transverse penultimate joints, and by the very faint transverse impression of the pronotum.

75. **C. filitarse** n. sp.—Somewhat narrowly oval, polished and impunctate, dark testaceous, the entire elytra, legs and antennæ uniform and paler testaceous; pubescence rather sparse, long, coarse, pale, erect, and conspicuous, though decidedly sparse, on the elytra. *Head* as long as wide, broadly parabolic behind, the eyes only moderately large but very convex and prominent; front distinctly and narrowly concave between the feeble antennal prominences; clypeus smooth and polished, rectilinear at apex, with the feeblest possible rounded inequality for a short distance at the middle. *Antennæ* slender, about ½ as long as the body, the club narrow and very gradual in formation; second joint much shorter than the first, about ⅔ longer than wide, as long as the next two and much thicker; three to six equal in width, cylindric; third not quite as long as wide; fourth quadrate; fifth and sixth subequal and just visibly longer than wide; seventh cylindric, ⅕ thicker and ¼ longer than the sixth, rather longer than wide; eighth scarcely ⅔ thicker than the seventh, subglobular, fully as long as wide; ninth and tenth slightly but distinctly wider, the latter slightly the shorter and very little wider than long; eleventh slightly thicker than the two preceding and nearly as long, obtusely pointed and scarcely at all oblique at tip. *Prothorax* well developed, nearly as long as wide, conic with slightly arcuate sides; apex ⅗ as wide as the base, which is rather more than ¼ wider than the head; surface transversely and rather strongly impressed near the base, the impression feebly interrupted at the middle. *Elytra* long, ⅔ longer than wide, much more than twice as long as the prothorax and ¾ wider, widest near basal third, the sides broadly arcuate; apex narrow; humeral plica moderate in length but strongly elevated, the subhumeral impression deep and rather large; foveæ deep; subsutural impressions rather deep and distinct, the suture however scarcely at all modified. *Abdomen* with the basal segment simple and scarcely at all modified at apex,

the process triangular. *Legs* moderate, the femora moderately clevate; hind tarsi long and slender, the basal joint as long as the next three. Length 1.25 mm.; width 0.5 mm.

North Carolina.

This species is somewhat aberrant in its nearly simple basal segment of the abdomen. It may be recognized by the narrowly oval form, rather sparse and coarse elytral vestiture and other characters. The single male in my cabinet has the terminal spur of the hind tibiæ rather stout, straight and somewhat more than half as long as the tarsus.

76. **C. atrum** n. sp.—Stout and ventricose, polished and impunctate, black throughout, the antennæ dark red-brown ; legs piceous-black, the tarsi pale; pubescence abundant, long, fine, erect and rather dark in color on the elytra. *Head* distinctly wider than long, circularly rounded behind, the eyes only moderate in size though convex ; antennal prominences large and rather strong, the front concave between them ; clypeus long, even, feebly asperate, the apex rectilinear, with an exceedingly minute and broadly rounded median projection. *Antennæ* slender but rather short, not ½ as long as the body, the club pronounced though not very abrupt and distinctly incrassate ; second joint very feebly obconic, ⅔ longer than wide, barely as long as the next two and distinctly thicker ; three to six subequal, smooth, the third as long as wide ; four to six somewhat longer ; seventh but slightly wider, cylindric, as long as wide ; eighth nearly ½ wider than the seventh, as long as wide, rounded in nearly apical half ; ninth almost ⅓ wider than the eighth and distinctly wider than long ; tenth similar to the ninth in form but somewhat larger ; eleventh large, thicker, as long as the preceding two, roughly sculptured, gradually and very obliquely pointed ; eight to ten each with a whorl of short, stout porrect setæ beyond the middle. *Prothorax* small, strongly conic with nearly straight sides, not quite as long as wide ; apex a little more than ½ as wide as the base, the latter scarcely more than ¼ wider than the head ; surface strongly biimpressed transversely near the base. *Elytra* large, ⅓ longer than wide, nearly 2½ times as long as the prothorax and very nearly twice as wide, strongly arcuate at the sides and rapidly pointed behind, widest only slightly before the middle ; humeral plica long and strong, the subhumeral impression large, very deep and conspicuous ; foveæ deep ; subsutural impressions long and rather vague, the basal bead of the elytra ill-defined and thick. *Abdomen* with the basal segment large, overlapping the next, with its hind margin broadly arcuate and fringed densely with long and close-set submembranous scales. *Legs* well developed, the femora rather strongly clavate, the anterior distinctly more so than the others. Length 1.6 mm.; width 0.8 mm.

Pennsylvania.

The single type is a male, having the terminal spur of the hind tibiæ rather more than half as long as the tarsus, straight and

oblique, bent at base and simple. The abdomen is rufous at tip.

This species is allied closely to *capillosulum*, but differs in its shorter antennæ, minutely subdentate clypeus, deep black color, smaller prothorax and relatively larger elytra.

77. **C. pertinax** n. sp.—Rather stout and ventricose, polished and impunctate, black, the elytra feebly picescent in a strong light; legs rufo-testaceous, the femora blackish; antennæ red-brown; pubescence rather abundant, coarse, pale, rather short and recurved, but even and without intermixed setæ on the elytra. *Head* much wider than long, broadly rounded behind, the eyes quite large, very convex and prominent; front scarcely impressed; clypeus with a few setigerous punctures, perfectly even and rectilinear at apex. *Antennæ* slender, about ½ as long as the body, the club narrow, feebly incrassate and gradual in formation; second joint obconic, slender, a little shorter than the first, as long as the next two and thicker, nearly ⅔ longer than wide; three to six equal in width; third, fourth and sixth subequal and about as long as wide, the fifth a little longer, the sixth asperulate; seventh ⅕ wider, quadrate; eighth scarcely ⅖ wider than the seventh, subglobular, nearly as long as wide; eighth to tenth increasing very slightly and gradually in width; ninth about as long as wide, the tenth a little shorter; eleventh decidedly thicker, obliquely pointed, as long as the two preceding. *Prothorax* small, conic, not as long as wide; apex ⅗ as wide as the base, the latter scarcely more than ⅕ wider than the head; surface strongly, transversely impressed near the base, the impression not thoroughly interrupted at the middle. *Elytra* relatively large, oval, widest before the middle with very evenly arcuate sides, ⅛ longer than wide, 2½ times as long as the prothorax and about twice as wide; humeral plica rather large and strong, the corresponding impression somewhat narrow but deep and conspicuous; foveæ deep; subsutural impressions rather strong, the suture finely but strongly beaded basally, the bead expanded at base. *Abdomen* with the basal segment large, overlapping the next, arcuate and fringed with coarse porrect separated hairs at apex. *Legs* well developed, the femora moderately clavate; tarsi slender, the basal joint of the posterior about as long as the next two. Length 1.2 mm.; width 0.48 mm.

Canada (Ottawa). Mr. W. H. Harrington.

One of the smallest species of this section of the genus and readily identifiable by the small prothorax, rather large and prominent eyes, blackish coloration and by the form of the spur terminating the hind tibiæ in the male, this being unusually short, not quite a third as long as the tarsus and contorted toward tip; it is however simple in structure and very finely acuminate. The description is drawn from the male, but the female does not differ, except in being a trifle less stout and with a still narrower antennal club. Two specimens.

78. **C. pallidipes** n. sp.—Rather stout and ventricose, polished and impunctate, black, the antennæ dark rufous and the legs still paler; pu-

bescence abundant, rather coarse and pale, suberect and moderately long on the elytra. *Head* slightly wider than long, almost semicircular behind the eyes, which are moderately large and somewhat prominent; antennal prominences feeble, the front only very slightly impressed; clypeus somewhat asperate, the apical edge even and without trace of median tooth. *Antennæ* rather stout, slightly longer than the head and prothorax, the club strong and abruptly formed; second joint feebly obconic, not quite ½ longer than wide, barely as long as the next two but much thicker; three to five subequal, cylindric and not quite as long as wide; sixth rather wider, with the inner side a little shorter than the outer, almost as long as wide; seventh scarcely ¼ wider than the sixth, cylindric and almost symmetrical, ⅖ wider than long; eighth ½ wider than the seventh, not quite as long as wide; ninth and tenth darker in color, nearly similar in form, about ⅓ wider than long, ¼ and nearly ⅓ wider than the eighth respectively; eleventh much stouter, oval, gradually very obliquely pointed, fully as long as the two preceding. *Prothorax* conic with feebly arcuate sides, not as long as wide; apex nearly ⅗ as wide as the base, the latter scarcely more than ¼ wider than the head; surface distinctly biimpressed transversely near the base. *Elytra* ⅓ longer than wide, distinctly more than twice as long as the prothorax and more than ⅘ wider, pointed at tip, widest well before the middle, the sides rather strongly arcuate; humeral plica moderate in length, narrow and strong, the adjacent impression long, deep and conspicuous; foveæ and subsutural impressions extremely feeble, the suture beaded only at the extreme base. *Abdomen* with the first segment broadly arcuate at apex and overlapping the next, the edge fringed with long but simple porrect hairs. *Legs* moderate; anterior femora strongly, the four posterior rather feebly, clavate. Length 1.2 mm.; width 0.55.

Pennsylvania (Westmoreland Co.). Mr. Schmitt.

A small but distinct species, to be recognized at once by its black color, rather strongly inflated elytra with strong subhumeral modifications, and by the distinctly clavate antennæ. The maxillary palpi are rather short. Several specimens.

The male, which serves as the type of the description, has the usual slender terminal tibial spur of the present group. It is simple and rather short, not quite half as long as the tarsus. The tip of the abdomen is paler as usual.

79. **C. nigrum** n. sp.—Rather stout, suboval, highly polished and impunctate, black throughout, the legs and antennæ pale rufo-testaceous; pubescence abundant, long, erect, rather coarse and somewhat pale on the elytra. *Head* well developed, as long as wide, rather narrowly parabolic behind the moderately large and prominent eyes; antennal prominences feeble; clypeus long, polished, smooth, very sparsely setose, the apical edge rectilinear and even. *Antennæ* long and slender, more than ½ as long as the body, the club narrow, elongate and gradually formed; second joint very stout, narrowed at

base, scarcely more than ⅓ longer than wide, not as long as the next two and very decidedly thicker; three to six equal in width, cylindric; third quadrate; fourth and sixth ⅕, the fifth nearly ¼, longer than wide; seventh almost ¼ wider than the sixth, fully as long as wide, finely beaded at base; eighth ⅖ wider than the seventh, fully as long as wide; ninth and tenth subequal and but little wider, fully as long as wide; eleventh long, obliquely and gradually pointed, rather thicker but not quite as long as the two preceding. *Prothorax* rather small, nearly as long as wide, strongly conic with distinctly arcuate sides; apex narrow, not more than ½ as wide as the base, the latter nearly ⅓ wider than the head; surface distinctly biimpressed transversely near the base. *Elytra* ⅖ longer than wide, 2½ times as long as the prothorax and nearly ⅘ wider, widest near basal ⅖, acutely rounded behind, the sides broadly arcuate; humeral plica rather long and strong, the impression distinct; foveæ deep; subsutural impressions narrow and feeble, the suture finely and not very strongly beaded basally, the bead feebly expanding at base. *Abdomen* with the first segment widely overlapping the next, and with a very minutely fringed coriaceous hind margin. *Legs* long, the femora all strongly clavate, the posterior only slightly less so. Length 1.6 mm.; width 0.68 mm.

Michigan.

The description is drawn from the female, which is the only sex which I have been able to examine; the species is rather closely allied to *atrum*, but is notably narrower in the body, with much less developed humeral plica and subhumeral impression, longer antennæ with less abruptly formed club, much paler legs and other characters of minor weight. The type was communicated by Mr. J. Croissandeau.

80. **C. paganum** n. sp.—Moderately stout and ventricose, polished, impunctate, black throughout, the elytra with a feeble rufo-piceous tinge, the legs and antennæ pale rufo-testaceous; pubescence rather abundant, erect, coarse, pale and conspicuous on the elytra. *Head* quite distinctly wider than long, subcircular behind, the eyes rather large, convex and prominent; antennal prominences small but distinct, the front concave; clypeus with strongly setigerous punctures, the apical margin rectilinear but interrupted at the middle by a minute and very broady rounded feeble projection. *Antennæ* moderate, not quite ½ as long as the body, slender, the club distinct but gradual; second joint long, very feebly obconic, ⅗ longer than wide, fully as long as the next two and but slightly thicker; three to five subequal, cylindric, rather longer than wide; sixth only just visibly wider and not quite as long as wide; seventh ⅕ wider, ¼ wider than long and more asperate; eighth scarcely ⅓ thicker, not quite as long as wide; ninth and tenth equal in width and ⅕ wider than the eighth, ¼ and about ⅖ wider than long respectively; eleventh a little thicker, obliquely and gradually pointed, somewhat longer than the two preceding. *Prothorax* moderately large, nearly as long as wide; apex nearly ⅗ as wide as the base, the latter scarcely ¼ wider than the

head ; surface strongly, transversely impressed near the base, the impression not definitely interrupted at the middle. *Elytra* 2/5 longer than wide, evenly oval, narrowly rounded at apex, much more than twice as long as the prothorax and very nearly twice as wide, widest at basal 2/5; sides broadly arcuate ; humeral plica distinct and moderatly long, the attendant impression moderate in size but deep at base ; foveæ distinct ; subsutural impressions very conspicuous, the suture strongly beaded basally, the bead strongly expanded at base. *Abdomen* with the first segment widely overlapping the next and having a deep pale coriaceous hind margin. *Legs* well developed, the femora moderately clavate. Length 1.4 mm.; width 0.6 mm.

Pennsylvania (locality unknown).

This species, which is represented by the female only, is somewhat similar in appearance to *nigrum* and *atrum*, but differs from both in its smaller size and distinctly transverse penultimate joint of the antennæ; the subhumeral impression is nearly as in *nigrum*, and is decidedly less developed than in *atrum*; the head is relatively wider, more broadly rounded at base and with somewhat larger eyes than in *nigrum*.

81. **C. limatum** n. sp.—Not very stout, highly polished and impunctate, dark rufo-testaceous, the antennæ concolorous; elytra blackish-piceous throughout, paler at apex from diaphaneity ; legs dark red-brown, the tarsi flavate; pubescence abundant, long, erect and pale on the elytra. *Head* slightly wider than long, parabolic behind, the eyes quite large, prominent and conspicuous ; antennal prominences feeble, the front feebly impressed ; clypeus slighty rugose, rectilinear at apex, with a very minute, broadly triangular and inconspicuous median projection. *Antennæ* barely 1/2 as long as the body, the club rather narrow and somewhat gradual in formation but distinct ; second joint stout, feebly obconic, 2/5 longer than wide, as long as the next two and much thicker; three to six equal in width ; third distinctly shorter than wide ; fourth and sixth as long as wide ; fifth slightly longer ; seventh fully 1/4 wider, with a fine basal bead, 1/4 wider than long ; eighth fully 2/5 wider than the seventh, as long as wide ; ninth and tenth very nearly equal, a little wider than the eighth, scarcely 1/4 wider than long ; eleventh somewhat thicker, long, very gradually, obliquely and finely pointed, fully as long as the two preceding. *Prothorax* well developed, scarcely as long as wide, conic ; apex about 3/5 as wide as the base, the latter nearly 1/3 wider than the head ; surface strongly impressed transversely near the base, the impression scarcely interrupted. *Elytra* rather long, oval, widest only slightly before the middle, narrow at apex, 2/5 longer than wide, distinctly more than twice as long as the prothorax and about 3/4 wider ; sides broadly, evenly arcuate ; humeral plica long and strong, the impression large and deep ; foveæ deep ; subsutural impressions very long and rather vague, the suture strongly beaded basally, the bead expanded at base. *Abdomen* with the first segment overlapping the next and fringed with a deep porrect submembranous border at apex. *Legs* long ; femora rather strongly clavate, especially the anterior. Length 1.5 mm.; width 0.65 mm.

Rhode Island (Boston Neck).

Allied to *capillosulum*, but much narrower and less ventricose and differing in coloration. The blackish elytra with pale anterior parts is a form of coloration which is very rare in the genus, and known to me otherwise only in *nigripenne*, which does not belong to this division. *Limatum* is represented before me by a single female example.

82. **C. pumilum** n. sp.—Moderately stout and but slightly ventricose, polished and impunctate, piceous-black, the elytra rufo-testaceous, legs and antennæ pale rufous; pubescence abundant, coarse, pale, rather short and recurved but without longer setæ on the elytra. *Head* slightly wider than long, broadly subcircular behind, the eyes only moderate in size and not very prominent; front feebly concave; clypeus perfectly even and transversely rectilinear at apex. *Antennæ* nearly ½ as long as the body, slender, the club narrow but incrassate and somewhat abruptly formed; second joint obconic, ½ longer than wide, as long as the next two and much thicker; three to six equal in width and smooth, the seventh and following rougher; eighth to eleventh paler in color; third and sixth subequal and about as long as wide; fourth and fifth nearly equal and just visibly longer; seventh just visibly thicker, nearly as long as wide; eighth fully ⅖ wider than the seventh, only slightly narrowed at base, fully as long as wide; ninth ¼ and tenth nearly ⅓ wider than the eighth, ⅓ and ⅖ wider than long respectively; eleventh distinctly stouter, obliquely pointed in ogive, about as long as the two preceding. *Prothorax* rather well developed but not as long as wide, conic with the sides broadly arcuate; apex a little more than ½ as wide as the base, which is scarcely more than ¼ wider than the head; surface strongly biimpressed transversely near the base. *Elytra* but slightly more than ⅓ longer than wide, much more than twice as long as the prothorax and about ⅘ wider, widest but slightly before the middle, the sides broadly arcuate; apex acutely rounded; humeral plica moderate in length, strong and distinct, the adjacent impression deep and rather conspicuous; foveæ deep; subsutural impressions strong, the suture with a distinct bead which is expanded at base. *Abdomen* with the basal segment broadly arcuate at apex, overlapping the next and fringed with coarse porrect and separated hairs. *Legs* moderate, the anterior femora very strongly, the four posterior much less strongly, clavate; tarsi rather short and somewhat compressed, the basal joint of the posterior distinctly shorter than the next two combined. Length 0.9 mm.; width 0.4 mm.

New York (Hudson Valley); Canada (Ottawa); Iowa (Iowa City).

This species may be recognized at once in the present group by its very small size, and unusually short basal joint of the hind tarsi. The terminal spur of the hind tibiæ in the male is very slender but nearly straight, and is scarcely a third as long as the tarsus. Several specimens.

SMICROPHUS n. gen.

In general organization the two minute species constituting this genus are intimately allied to Euconnus; but they have two characters which cannot be harmonized with any variation of that complex, and I have therefore been obliged to separate them. The head is far exserted as in Euconnus, but the eyes are large, very prominent and situated at the middle of the sides. The other character is quite extraordinary in the present group, though common in the Eumicrini, and resides in the fact that the metepisternum is broadly visible at the sides of the body. In Euconnus it frequently happens that this piece is exposed by accident, if the elytra be not placed closely against the body, but here it appears to be a true exposure and cannot be entirely accounted for in that way.

The head is usually small, and, while both the head and elytra are glabrous, the prothorax bristles with unusually developed stiff spicules and hairs. The elytra, legs and palpi are as in Euconnus, and the pronotum has two feeble subbasal foveæ near the middle but is otherwise unmodified. The hind coxæ are moderately separated and the mesosternum rather feebly carinate. The antennæ are moderate in length and have a 4-jointed club.

The two species may be separated by the following characters :—

Black throughout, larger, the elytra more inflated; head less minute, the eyes relatively smaller, separated on the vertex by twice their own length. 1 **leviceps**

Black, the elytra dull rufous; head very small, the eyes relatively larger, separated on the vertex by about ½ more than their own length; antennal prominences more evident.....2 **evanescens**

In distribution this genus is confined as far as known to the regions east of the Rocky Mountains, but there is a bare possibility that it may be very nearly identical with the form separated by Mr. Croissandeau (Ann. Fr., 1893, p. 225) under the name Microscydmus.

1. **S. leviceps** n. sp.—Rather stout and pyriform, polished, impunctate, black throughout; legs and antennæ rufo-testaceous, the club of the latter dusky; head and elytra glabrous, the former with a long seta immediately behind each eye and another above the point of antennal insertion, and the latter with a series of three or four erect setæ near inner third and one or two exterior to this; prothorax bristling on the flanks with numerous stiff erect hairs and spicules, which are fine on the disk anteriorly and nearly wanting posteriorly.

Head small, fully as long as wide, the eyes large, prominent, at the middle of the sides, the occiput rounded at base, becoming less broadly rounded behind the eyes; antennal prominences very feeble or subobsolete, the cavities rather widely separated on the declivous front; clypeus normal, rectilinearly truncate; labrum large; maxillary palpi normal. *Antennæ* as long as the head and prothorax, rather slender, the club narrow but very abrupt and parallel; second joint nearly as long as the first but much narrower, feebly obconic, as long as the next two and much thicker, scarcely ½ longer than wide; three to six cylindric and subequal in width, the fifth rather more swollen; third fully, the fourth and sixth not quite, as long as wide; fifth very little longer than wide; seventh only very slightly wider than the sixth, parallel, fully as long as wide or rather longer; eighth fully ½ wider, as long as wide, feebly obconic; ninth and tenth just visibly wider, ¼ and nearly ⅓ wider than long; eleventh not thicker, obliquely pointed, not more than ½ longer than the tenth. *Prothorax* about as long as wide, ⅗ wider than the head, the sides feebly arcuate and convergent nearly throughout anteriorly, but parallel near the base; surface smooth, with two feeble median foveæ near the base which are connected by a feeble impression; disk without lateral foveæ or basal modification. *Elytra* short, oval, ¼ longer than wide, scarcely twice as long as the prothorax and ¾ wider, oval, widest only slightly before the middle, the sides strongly, evenly arcuate throughout the length; apex acutely ogival; humeral plica and impression obsolete; basal foveæ small and feeble; subsutural impressions obsolescent, the suture not beaded or modified toward base. *Legs* slender, the femora subequally and only moderately clavate. Length 0.8 mm.; width 0.36 mm.

Iowa (Iowa City). Mr Wickham.

The abdomen is generally retired considerably within the elytra at the sides, the flanks of the elytra being very deep. The posterior tarsi are of normal structure, filiform, with the first three joints equal, the fourth a little shorter. No sexual marks are discoverable in the two specimens before me.

2. **S. evanescens** n. sp.—Rather stout, only feebly ventricose, polished and impunctate, black, the elytra dark brownish-rufous, with the suture narrowly blackish; legs and antennæ testaceous, the club of the latter dusky; head and elytra glabrous, with a few isolated setæ as in the preceding species; prothorax densely bristling with unusually coarse hairs and slender spicules on the flanks and apical parts of the disk, the disk broadly and completely glabrous toward base. *Head* very small, barely as long as wide, the eyes very large, convex, prominent, coarsely faceted and situated at the middle of the length; occiput broadly rounded behind them, the tempora short and oblique; vertex flattened; antennal prominences small and feeble; clypeus simple. *Antennæ* slender, as long as the head and prothorax, the club rather narrow and parallel but very abrupt; second joint slightly shorter and thinner than the first, oval, barely ⅖ longer than wide, as long as the next two and distinctly thicker; three to seven equal in width, cylindric; third and fourth

equal, quadrate; sixth but little longer; fifth and seventh about ⅓ longer than wide; eight to ten and basal ⅔ of the eleventh regularly obtrapezoidal; eighth ½ wider than the seventh and as long as wide; ninth and tenth just visibly wider, ¼ and ⅖ wider than long; eleventh with the basal trapezoid exactly equal to the tenth, the apex very abruptly narrowed and briefly acute. *Prothorax* subparallel, abruptly narrowed at apex, scarcely as long as wide, about ⅗ wider than the head; surface with two small and rather feeble foveæ near the base, the transverse impression between them almost obsolete. *Elytra* widest at about the middle, narrowed only very slightly thence to the base, ⅓ longer than wide, not twice as long as the prothorax and scarcely ½ wider, oblique at the sides behind, the apex subacute; humeral plica and impression obsolete; foveæ nearly obsolete, represented only by the basal depression; subsutural impressions very feebly traceable, the suture feebly and broadly elevated near the extreme base. *Legs* slender, the femora feebly clavate. Length 0.7 mm.; width 0.3 mm.

Florida.

Allied evidently to the preceding but differing in its smaller size, much smaller, less inflated and paler elytra, more bristling pronotum, especially the median parts anteriorly, and in numerous other characters. The single specimen before me gives no external indication of sex.

Scydmænini.

The substitution by Reitter of Cyrtoscydmus Mots., for Scydmænus Lat. (auct.), does not appear to be warranted, although it should be stated that the original literature of the subject is not fully accessible to me at present. In looking over the article on Scydmænidæ in the "Analecta Entomologica" of Schaum, I can discover only two species which had been previously referred to by Latreille. One of these is *godarti*, which was originally described and named by that author, and therefore, in all probability, intended by him to be the type of his genus Scydmænus, and the other an identification of the Fabrician *hellwigi*, which, according to Schaum, was not *hellwigi* at all but the species afterwards named *tarsatus* by Müller. If the literature quoted by Schaum is complete, the case is therefore clearly determinable in favor of the present identification of Scydmænus.

The Scydmænini comprise two genera within our limits as follows:—

Body ventricose; prothorax cordiform, the pronotum impressed, foveate or rugose at the base.....**Scydmænus**

Body linear; prothorax obovoidal, the pronotum wholly devoid of foveæ or sculpture of any kind.....**Catalinus**

Catalinus is represented by a single species peculiar to the Pacific coast fauna. Scydmænus is abundant in species and distributed about equally over both slopes of the continent.

The European Neuraphes is closely allied to Scydmænus, but differs in having the foveæ at the base of the elytra spongiose and not nude, and therefore forms a transition to the Cephenniini. The long carinæ at the sides of the prothorax toward base also form a character which leads onward to the acute thoracic margins of Cephennium. Although Neuraphes therefore, is the most obvious bond between Cephennium and the Scydmænidæ subulipalpi, there are many profound differences, especially in the head and in the hind coxæ, as well as in the entire facies of the body.

SCYDMÆNUS Latr.

Among the genera common to Europe and North America, Scydmænus is the only one, except Cephennium, which so far as known, is distributed throughout the United States; it is well represented in the Atlantic regions, and, on the Pacific coast, forms one of the most prominent types of the family. It can be distinguished at once from any of the Euconnini by certain general habital features, such as the smaller prothorax more dilated anteriorly and more elliptical and convex elytra.

The head is always narrower than the prothorax, with the clypeus large, simple and truncate at apex, more or less dilated and subangulate at the sides and separated from the front by a short transverse sulcus, the neck wide and the nuchal constriction moderate in depth, the occiput not having the deep vertical base so general in the Euconnini. The eyes are at most median in position, generally subbasal, and vary much in size, becoming large and extremely prominent in Brachycepsis. The maxillary palpi are well developed, with the second joint slender, bent and clavate at apex, the third elongate, obconic, with rounded sides and the fourth distinct though slender and very finely aciculate, being occasionally more than half as long as the third. The antennæ are incrassate but never have a pronounced club, although the three outer joints sometimes constitute a feeble club, and, in one species of Brachycepsis, the five outer joints may be imagined to have same status.

The prothorax is always dilated anteriorly, narrowed toward

base and sinuate at the sides behind the middle, but the nature of the sculpture near the basal margin differs very much in the several subgenera. The scutellum is always distinct, except in Parascydmus, where it becomes minute. The elytra are oval or elliptical, generally very convex and frequently punctured in a conspicuous manner, the basal impressions exceedingly small and feeble in Scydmænus proper, but well developed in Brachycepsis and Taphroscydmus; they narrowly overlap along the suture posteriorly, the apex generally subtruncate with nearly right sutural angles, but becoming broadly rounded with a feeble entering angle in some species of Brachycepsis, the dorsal pygidium in these cases being usually visible but always nearly horizontal; humeri more or less visible in all except three of the species of Parascydmus, where they are wholly obliterated, but almost obsolete also in *Scydmænus perforatus* and *Taphroscydmus californicus*.

The mesosternum is more or less carinate, with the episternum tumid and setose; met-episterna entirely covered by the elytra. Abdomen normal, with the first four segments short, the last two much developed in some forms of Brachycepsis. The hind coxæ are very narrowly separated, with the small prolongation of the metasternum between them deeply and narrowly cleft. The legs are generally long and well developed, with the femora moderately or feebly clavate, the anterior very strongly so in the subgenus Scydmænus. Tarsi varying in structure in the several subgenera.

The secondary sexual characters generally affect the anterior femora in the subgenus Scydmænus, but in *turbatus* the hind trochanters are alone modified. In Brachycepsis they affect the tibiæ, hind trochanters and abdominal apex in various ways, according to the species, while in Parascydmus they appear to be altogether wanting.

The species are somewhat numerous and may be assigned to four strongly differentiated subgenera as follows :—

Head not impressed ; pronotum with four subbasal foveæ but frequently with confused sculpture near the base, the prothorax dilated anteriorly, narrowed and more or less feebly sinuate at the sides to the base ; hind tarsi elongate, with the four basal joints decreasing in length ; scutellum distinct.....I

Head impressed or biimpressed at the middle of the vertex.

Scutellum distinct ; prothorax constricted near basal third, with a short and feeble transverse impression in the middle near the base and two large foveæ at each side within the constriction ; hind tarsi long and very slen-

der, with the four basal joints decreasing rapidly in length ; species generally rather large.....**II**

Scutellum very minute ; prothorax narrowed gradually toward base but not constricted, the pronotum with six subbasal foveæ ; hind tarsi shorter, with the four basal joints subequal ; species minute.....**III**

Head with a large and deep excavation at the base of the occiput and a large and profoundly excavated pit above and contiguous to each eye ; prothorax feebly narrowed and subsinuate toward base, feebly biimpressed before the scutellum and foveate at the sides ; hind tarsi long and slender, with the joints decreasing in length ; scutellum distinct ; prosternum slightly developed before the coxæ.....**IV**

The first two of these subgenera occur on both sides of the continent, but the third appears to be confined to the more northern regions of the Atlantic district, and the fourth to the true Pacific coast fauna. The species may be separated as follows :—

Subgenus I.

Scydmænus Latr.

Species of the Atlantic and Gulf regions.

Head smooth, not distinctly punctate in either sex.

Elytra very coarsely and conspicuously punctured, the pubescence long, erect or suberect and very distinct.

Elytra rather feebly inflated and strongly but gradually narrowed posteriorly ; body black or paler ; anterior femora moderately angulate above in the male.....1 **perforatus**

Elytra strongly inflated and less narrowed posteriorly, the humeri more evident ; punctures sparser ; body piceous, the elytra pale ; male with the anterior femora very strongly angulate above.....2 **badius**

Elytra less coarsely and sometimes quite finely punctate ; humeri evident.

The punctures very sparse ; pubescence long, suberect and bristling. 3 **conjux**

The punctures close-set ; pubescence shorter, more inclined and recurved.

Body pale rufo-testaceous throughout, the elytral vestiture coarser and more fulvous.....4 **cribrarius**

Body piceous-black ; elytral punctures still finer and closer, the vestiture finer and cinereous ; posterior trochanters dentate posteriorly in the male .....5 **turbatus**

Head strongly and closely punctate, at least in the male ; elytral humeri very evident, the vestiture coarse and fulvous.

Elytral punctures rather small but distinct, rather close-set, the pubescence somewhat short, abundant and recurved.....6 **puncticeps**

Elytral punctures sparse and finer, much less distinct, the pubescence longer, sparser and more erect.....7 **sculpticeps**

Species of the Pacific coast faunal region.

Larger, rufo-testaceous throughout; elytral punctures strong and distinct, the vestiture coarse, shorter, fulvous and recurved.....8 **ovipennis**

Smaller and less stout, the elytral punctures fine, sparse and inconspicuous, the pubescence longer, sparse and less recurved..... 9 **sparsus**

Subgenus II.

Brachycepsis Bndl.

Elytral pubescence rather inconspicuous, finer or shorter and always strongly recurved.

Head with a single large and very deep excavation, the binary nature of which can only be discerned at its bottom; species larger, the elytra very feebly and sparsely punctulate.

Body stouter; antennæ more robust, with the penultimate joint strongly transverse. California.....10 **pacificus**

Body less stout, the antennæ more slender, with the penultimate joints feebly transverse. Lake Superior.....11 **subpunctatus**

Head with the two impressions rounded and distinct, not or only feebly coalescent.

Larger, black, the elytra with a feeble piceous tinge.....12 **tristis**

Small, pale rufo-testaceous throughout.....13 **fuchsi**

Elytral pubescence very long, erect, bristling and conspicuous; excavation of the vertex transverse and not at all binary.....14 **pubipennis**

Subgenus III.

Parascydmus n. sg.

Elytra oval and very convex, without trace of humeri, the sides very convergent to the base of the prothorax; subhumeral impression very small; body black.

Prothorax finely carinate at each side toward base.

Larger species, more than 1 mm. in length; head larger, with the tempora less convergent and almost as prominent as the eyes.

15 **ventriculus**

Smaller, less than 1 mm. in length, the head smaller, with the tempora rapidly convergent behind the eyes.....16 **corpusculum**

Prothorax not carinate at the sides; body much more elongate; head small, with the tempora rounded and very convergent behind the eyes.

17 **caducus**

Elytra less oval, less narrowed at base and not so convex, the humeri somewhat evident; subhumeral impression longer and more conspicuous; body dark brown in color; prothorax not carinate at the sides.....18 **exiguus**

Subgenus IV.

Taphroscydmus n. sg.

Elongate-oval, blackish, the elytra, legs and antennæ testaceous; pubescence rather short, coarse and sparse.....19 **californicus**

1. **S. perforatus** Schaum—Analecta Entomologica, 1841, p. 9; Lec., Proc. Acad. Nat. Sci., Phila., 1852, p. 151.

Not very stout and only moderately ventricose, polished, impunctate anteriorly, the elytra very coarsely and deeply but somewhat sparsely punctate, the punctures much feebler toward apex; body black, or piceous with the elytra paler brownish; prothorax paler at base and apex; legs and antennæ pale rufo-testaceous; pubescence cinereous, fine and rather sparse anteriorly, long, erect but somewhat sparse on the elytra. Head much wider than long, $\frac{1}{3}$ wider than the neck, the tempora short, broadly rounded; eyes moderate in size but convex and prominent. Antennæ about $\frac{1}{2}$ as long as the body, quite strongly incrassate toward apex, the club not distinct; second joint obconic, nearly twice as long as wide, slightly thicker but much shorter than the next two; three to six equal in width; three to five distinctly elongate; sixth shorter and but very slightly longer than wide; seventh more than $\frac{1}{4}$ wider, subquadrate, as long as wide; eighth $\frac{1}{5}$ wider than the preceding, conic at apex, transversely truncate at base, slightly wider than long; ninth nearly $\frac{1}{3}$ wider than the eighth; eight to ten increasing rapidly and evenly in width, similar but successively more transverse; ninth $\frac{1}{3}$, tenth nearly $\frac{1}{2}$ wider than long; eleventh rather narrower than the tenth, gradually pointed and narrowly ogival almost from the base, a little shorter than the two preceding. Prothorax not quite as long as wide, nearly $\frac{1}{3}$ wider than the head, swollen and arcuate at the sides anteriorly, broadly constricted toward base, with two small and approximate foveæ at the middle near the base and a larger one at each side less basal, also with a few punctures laterally toward base. Scutellum angulate behind. Elytra elongate, gradually, rather acutely pointed behind from basal $\frac{2}{5}$, nearly $\frac{1}{2}$ longer than wide, $2\frac{1}{2}$ times as long as the prothorax and $\frac{3}{5}$ wider, broadly rounded and convergent at the sides toward base, the basal margin broadly, feebly sinuate; basal foveæ obsolete, the impressions very small, feeble and basal; suture not modified. Legs slender; anterior femora moderately, the other four feebly, clavate; tarsi slender and filiform; first four joints of the posterior rapidly decreasing in length, the first much longer than the second. Length 1.15–1.2 mm.; width 0.45–0.52 mm.

Massachusetts, New York, Pennsylvania and Iowa (Cedar Rapids). A well known species but closely allied to three or four

others found in the same geographical regions, so that a detailed description is necessary. *Perforatus* may be known by its rather narrow form, long and narrowly oval, gradually pointed and very coarsely punctate elytra and somewhat strongly incrassate antennæ, with the penultimate joints moderately transverse. In the male from Iowa the penultimate joints of the antennæ are a little less transverse, and the eleventh more elongate than in the male described above, being equal to the two preceding together.

The anterior femora of the male in this species, as well as in *badius*, are swollen much more than in the female and are angulate above.

2. **S. badius** n. sp.—Rather strongly ventricose, polished, impunctate anteriorly, the elytra coarsely but sparsely punctate; body piceous in color, the elytra generally much paler; legs and antennæ pale testaceous; pubescence moderately abundant, shorter and inconspicuous anteriorly, rather long stiff fulvous and suberect but strongly recurved on the elytra. *Head* much wider than long, the eyes prominent and rather large, much longer than the tempora; edges of the front above the antennæ slightly elevated. *Antennæ* a little less than ½ as long as the body, gradually and moderately incrassate toward tip; second joint almost as long as the first but thinner, feebly obconic, ⅗ longer than wide, ½ longer than the third and much thicker; three to six equal in width, cylindric; third ⅖, fourth ⅓, fifth nearly ½, sixth ⅓, longer than wide; seventh nearly ⅓ thicker, more rounded, not quite as long as wide, almost similar to the eighth, the latter just perceptibly thicker; ninth ⅖, tenth ½, thicker than the eighth, ⅓ and ⅖ wider than long respectively; eleventh fully as thick as the tenth, about as long as the two preceding, very obliquely and acutely pointed. *Prothorax* about as long as wide, fully ¼ wider than the head, dilated and narrowly rounded laterally at apical third, the sides thence moderately convergent and broadly sinuate to the base; four subbasal foveæ not connected but very irregular in form, the less basal and larger depression at each side enclosing a small setigerous tubercle as is frequently the case also in other allied species. Scutellum distinct, parabolic. *Elytra* ⅖ longer than wide, not quite three times as long as the prothorax and about ⅘ wider, widest as basal ⅖, gradually narrowed in ogive toward tip; sides strongly rounded at base to the prothorax, the humeri somewhat evident; subhumeral impression very small; inner fovea large; subsutural impressions just traceable, the suture not modified. *Legs* slender, the femora feebly clavate, the anterior more strongly, particularly in the male; tarsi slender and filiform, the four basal joints of the posterior decreasing rapidly in length as usual. Length 1.1–1.25 mm.; width 0.5–0.62 mm.

Pennsylvania (Westmoreland Co.); Virginia (Fredericksburg); Canada (Ottawa).

The anterior femora of the Pennsylvania male described above

are strongly swollen and angulate above beyond the middle, the apical slope of the angle nearly straight in profile and minutely irregular or subserrulate. In the female these femora are more clavate than the other four but are simple, and in that sex the antennæ are a little shorter but nearly similar, except that the fifth and sixth joints are distinctly thicker than the two preceding. In general form of the body and outline of the elytra the two sexes are almost exactly similar. The head seems to be relatively smaller in some females than in others.

This species, while allied to *perforatus*, differs conspicuously in its more dilated hind body and perceptibly less coarse and somewhat sparser punctures, also in its shorter, more fulvous and more recurved pubescence of the elytra, much more irregular subbasal foveæ of the pronotum, color and other characters. In the series of eight specimens before me the largest and smallest individuals are both females. The single example from Ottawa, communicated by Mr. W. H. Harrington, has the elytra more elongate, but does not appear to differ much otherwise; it is pale testaceous throughout, as however are several of the Pennsylvania specimens. The Virginia representatives have the prothorax rather more inflated anteriorly.

3. **S. conjux** n. sp.—Moderately stout, polished, impunctate anteriorly, the elytra strongly but sparsely and not very coarsely punctate ; body piceous-black, the elytra slightly paler and rufescent, the abdomen slightly paler at apex ; legs and antennæ rufo-testaceous ; pubescence moderately abundant, rather long coarse pale semi-erect and recurved on the elytra, shorter and less conspicuous anteriorly. *Head* much wider than long, the eyes rather well developed, convex, longer than the tempora. *Antennæ* a little less than ½ as long as the body, gradually incrassate toward tip ; second joint as long as the first but thinner, feebly obconic, ½ longer than wide, only slightly longer than the third but obviously thicker ; third and fourth narrowest, cylindric, equal in width, ⅖ and ¼ longer than wide ; fifth and sixth just visibly thicker, ¼ and ⅕ longer than wide ; seventh nearly ⅓ thicker, suboval, as wide as long, very nearly as wide as the eighth, which is more than ¼ wider than long and conic at apex ; ninth and tenth almost exactly equal, fully ⅖ wider than the eighth, strongly obtrapezoidal and transverse, nearly ½ wider than long ; eleventh about as long as the two preceding and not wider, obliquely and acutely pointed. *Prothorax* not quite as long as wide, ¼ wider than the head, only moderately inflated and rounded laterally toward apex, the sides feebly convergent but distinctly sinuate toward base ; four subbasal foveæ isolated and not jointed by impressions but irregular in form, the irregular cluster at the sides deep. *Elytra* suboblong-oval, ⅖ longer than wide, obviously less than three times as long as the prothorax and about ¾

wider, parabolic at tip, widest at basal $\frac{2}{5}$, the sides more rounded at base, the humeri rather evident; impressions at the base almost obsolete; inner fovea distinct; subsutural impressions rather distinct, the suture feebly elevated toward base but not beaded. *Legs* slender, the femora feebly clavate, the anterior only just visibly more strongly. Length 1.25 mm.; width 0.6 mm.

Iowa (Iowa City). Mr. Wickham.

The single type before me is probably a female, but the species can be readily distinguished from *perforatus* by its more oblong elytra, with more basally exposed humeri, obvious subsutural impressions with elevated suture, and smaller and still sparser elytral punctures; the head is larger than in *perforatus*, and the prothorax is less swollen anteriorly and less narrowed at base.

4. **S. cribrarius** Lec.—Proc. Acad. Nat. Sci., 1852, p. 151.

Moderately stout, rather feebly ventricose, polished, impunctate anteriorly, the elytra distinctly and rather closely punctate; body pale rufo-testaceous throughout, the legs and antennæ concolorous; pubescence abundant, short and inconspicuous anteriorly, pale fulvous, coarse, moderate in length, suberect, strongly recurved and very conspicuous on the elytra. Head transverse, the eyes rather large and prominent, nearly twice as long as the tempora; fourth joint of the maxillary palpi $\frac{1}{2}$ as long as the third but slender and finely aciculate. Antennæ rather less than $\frac{1}{2}$ as long as the body, gradually incrassate; second joint much shorter and narrower than the first, feebly obconic, $\frac{1}{2}$ longer than wide, $\frac{1}{2}$ longer than the third and distinctly thicker; third and fourth equal in width, $\frac{1}{3}$ and $\frac{1}{4}$ longer than wide, the next two just visibly thicker, $\frac{1}{3}$ longer than wide and quadrate; seventh and eighth nearly $\frac{1}{3}$ thicker than the sixth, almost equal and subglobular; ninth $\frac{1}{3}$, the tenth $\frac{1}{2}$, thicker than the eighth, $\frac{1}{4}$ and $\frac{1}{2}$ wider than long respectively; eleventh barely as long as the two preceding, ogival. Prothorax not as long as wide, nearly $\frac{1}{3}$ wider than the head, strongly dilated and laterally rounded in apical half, the sides strongly convergent and distinctly sinuate thence to the base; surface slightly uneven and indefinitely rugulose transversely near the base, and with one or two minute tubercular setigerous punctures at the sides and less basal. Scutellum distinct, rounded at tip. Elytra elongate-oval, $\frac{1}{2}$ longer than wide, between two and three times as long as the prothorax and fully $\frac{3}{4}$ wider, widest at basal $\frac{2}{5}$ but with the sides broadly and evenly arcuate throughout; humeri somewhat visible at base; subhu-

meral impression small and faint but extending somewhat from the base; inner fovea large; suture not modified, the impressions obsolete. Legs slender, the anterior femora somewhat strongly, the middle moderately and the posterior feebly, clavate. Length 1.25 mm.; width 0.6 mm.

Austral regions of the Appalachian mountain system. This species is very distinct from *perforatus* in its larger size, smaller punctures and much shorter, coarser, more abundant and recurved fulvous pubescence of the elytra. It differs from *badius* in it denser punctures and pubescence, more elongate and less dilated elytra and longer prothorax. It is described above from the female.

5. **S. turbatus** n. sp.—Rather stout and ventricose, polished, sparsely, unevenly and very feebly punctulate anteriorly, finely and closely but obviously punctured on the elytra, blackish-piceous throughout, the legs and antennæ pale; pubescence abundant, sparse and shorter anteriorly, dull cinereous, moderate in length, recurved and conspicuous but rather fine on the elytra, the hairs becoming short toward the suture behind the middle. *Head* transverse, the eyes rather large, moderately convex, nearly twice as long as the tempora; vertex broadly flattened. *Antennæ* about ½ as long as the body, gradually and moderately incrassate; second joint distinctly shorter and very slightly narrower than the first, oval, narrowed at base, ½ longer than wide, ⅔ longer than the third and much thicker; three to eight evenly and just visibly increasing in width; third ¼, fourth and fifth scarcely ⅕, longer than wide; sixth subglobular, as long as wide; seventh very slightly, the eighth more obviously, wider than long; eight to eleven increasing regularly but more rapidly in width, without trace of club, distinctly and almost equally wider than long; eleventh about as long as the two preceding, ogival and slightly oblique at tip. *Prothorax* not quite as long as wide, about ⅓ wider than the head, swollen and strongly rounded laterally in apical half, the sides rather strongly convergent and broadly sinuate thence to the base; surface confusedly rugose for some distance from the basal margin throughout the width. Scutellum distinct, triangular, rather longer than wide. *Elytra* evenly elliptical, nearly ½ longer than wide, not quite three times as long as the prothorax and almost twice as wide; sides evenly arcuate; humeri rather distinct at base; subhumeral impression nearly obsolete; inner fovea distinct, the outer obsolete. *Legs* slender, the femora feebly clavate, the anterior more strongly. Length 1.25 mm.; width 0.62 mm.

Pennsylvania (Westmoreland Co.). Mr. Schmitt.

A distinct species, readily identifiable among the eastern species of this genus by the male modification of the posterior trochanters, these being acutely angulate and prominent at apex though not much produced. The description is taken from

the male, but the female differs in no respect, except its slightly smaller head and just visibly shorter antennæ; the anterior femora are similar and normal in both sexes.

6. **S. puncticeps** n. sp.—Rather stout and somewhat strongly ventricose, polished, rufo-testaceous throughout, the head strongly and closely, the elytra equally strongly, but less closely, punctate, the punctures small and not much impressed; pubescence almost wanting on the head, excepting a few short hairs laterally, sparse short and indistinct on the pronotum, longer coarse fulvous suberect recurved and conspicuous on the elytra. *Head* transverse, slightly flattened above in the punctured area, the latter divided longitudinally by an impunctate line, the punctures evanescent toward the base and eyes, the latter large, convex, more than twice as long as the tempora; front slightly produced and rounded between the antennæ, the usual transverse groove separating it from the clypeus more pronounced. *Antennæ* slender, $\frac{2}{5}$ as long as the body, gradually and moderately incrassate; second joint slender, slightly shorter and much narrower than the first, feebly obconic, $\frac{3}{4}$ longer than wide, much shorter than the next two but only slightly thicker; three to five increasing just visibly in thickness, the sixth as wide as the fifth; third nearly $\frac{1}{2}$, fourth $\frac{1}{3}$, fifth $\frac{2}{5}$ and sixth $\frac{1}{4}$, longer than wide; seventh and eighth equal in width, obtrapezoidal, broadly conic at apex, $\frac{2}{5}$ wider than the sixth, equal and barely as long as wide; ninth and tenth subsimilar in outline to the eighth, $\frac{2}{5}$ and $\frac{1}{2}$ wider, $\frac{2}{5}$ and $\frac{1}{2}$ wider than long; eleventh oval, acutely and obliquely pointed, fully as thick as the tenth and as long as the two preceding. *Prothorax* nearly as long as wide, fully $\frac{1}{4}$ wider than the head, dilated and broadly rounded laterally in apical $\frac{2}{3}$, somewhat constricted at basal third, the base slightly expanded; disk impunctate, except along the basal margin, where the punctures are confused and subrugose. Scutellum distinct, parabolic, as wide as long. *Elytra* large, $\frac{1}{2}$ longer than wide, three times as long as the prothorax and twice as wide, elliptical, the sides parallel and evenly arcuate; humeri pronounced at base; subhumeral impression very feeble, the plica somewhat distinct; inner fovea large. *Legs* slender; femora feebly clavate, the anterior rather strongly. Length 1.4 mm.; width 0.65 mm.

North Carolina (Asheville).

The sculpture and modified front of the head may be secondary sexual characters to some extent, but there are no other exposed features which may enable us to determine the sex of the unique type. The anterior femora and posterior trochanters are simple. The four basal joints of the hind tarsi decrease gradually in length. This species and the next depart from all other American representatives of the genus in the cephalic characters alluded to.

7. **S. sculpticeps** n. sp.—Moderately stout and ventricose, polished and rufo-testaceous throughout; head closely and strongly punctured except to-

ward the base and eyes, nearly as in *puncticeps ;* elytra finely and rather sparsely punctate ; pubescence moderately abundant, short on the head and pronotum, long, erect, pale and conspicuous on the elytra. *Head* slightly transverse, the eyes large and moderately prominent, more than twice as long as the tempora; vertex feebly convex; front impunctate, produced, narrowly rounded and only feebly declivous between the antennæ; maxillary palpi moderately developed. *Antennæ* slender, moderately and gradually incrassate, $\frac{2}{5}$ as long as the body; second joint shorter and very much thinner than the first, subcylindric, $\frac{2}{5}$ longer than wide, much shorter and thicker than the next two; three to seven increasing almost uniformly and just visibly in width; third $\frac{1}{4}$ longer than wide; fourth and fifth subquadrate; sixth and seventh obtrapezoidal, slightly wider than long; eighth scarcely $\frac{1}{4}$ wider than the seventh; eight to ten increasing uniformly and more rapidly in width, $\frac{1}{3}$, $\frac{2}{5}$ and $\frac{3}{5}$ wider than long; eleventh shorter than the two preceding, obtusely and obliquely ogival at tip. *Prothorax* very nearly as long as wide, the sides rounded anteriorly, convergent and subconstricted toward base, rather more than $\frac{1}{3}$ wider than the head, impunctate but feebly, sparsely and altogether indefinitely sculptured near the basal margin, with the usual deeper and less basal impression at each side. Scutellum distinct, parabolic, as wide as long. *Elytra* moderate, subelliptical, the sides evenly rounded, $\frac{2}{5}$ longer than wide, $2\frac{1}{2}$ times as long as the prothorax and scarcely $\frac{1}{5}$ wider, the humeri rounded to the prothorax and quite distinct; subhumeral impression small and feeble; inner fovea moderate. *Legs* slender, the anterior femora moderately, the other four feebly, clavate. Length 1.25 mm.; width 0.55 mm.

Texas (near Austin).

The single specimen represents a species closely allied to *puncticeps*, but differing in its smaller size, smaller elytra, relatively larger prothorax and smaller head, much longer pubescence, shorter antennæ and several other characters. The punctures of the head in this species bear each a short stiff and erect hair, while in *puncticeps* they are nude, although the type specimen is in a perfect state of preservation. The type above described is probably the male.

8. **S. ovipennis** n. sp.—Stout, strongly ventricose, polished, subimpunctate anteriorly, the elytra rather coarsely and deeply but not very closely punctate; body pale rufo-testaceous throughout; pubescence pale, very short, sparse and indistinct anteriorly, moderately long, suberect, recurved and conspicuous on the elytra. *Head* distinctly wider than long, the eyes rather large and convex, much longer than the tempora; fourth palpal joint fully $\frac{3}{5}$ as long as the third, acutely conic and finely aciculate. *Antennæ* about $\frac{1}{2}$ as long as the body, slender, gradually and moderately incrassate, the 3-jointed club somewhat distinct; second joint only slightly shorter but much thinner than the first, arcuately narrowed toward base, $\frac{2}{3}$ longer than wide, $\frac{1}{2}$ longer than the third and distinctly thicker; three to five just visibly increasing in width,

$\frac{2}{5}$, $\frac{1}{3}$ and $\frac{1}{3}$ longer than wide; sixth not wider but shorter, $\frac{1}{4}$ longer than wide; seventh and eighth equal in width, nearly $\frac{1}{3}$ thicker, obtrapezoidal in basal $\frac{3}{5}$, as long as wide and a little shorter respectively; ninth and tenth subsimilar, obtrapezoidal, more than $\frac{1}{3}$ and nearly $\frac{1}{2}$ thicker than the eighth, $\frac{1}{5}$ and $\frac{1}{3}$ wider than long; eleventh unusually short, only $\frac{1}{2}$ longer than the tenth and fully as wide, obliquely ogival in apical half. *Prothorax* relatively small, scarcely as long as wide, barely $\frac{1}{4}$ wider than the head, prominent and narrowly rounded laterally at apical third, the sides thence rather feebly convergent and very broadly sinuate to the base; surface with a continuous chain of irregular sculpture transversely near the base, flexed slightly forward at the sides. Scutellum distinct, nearly as wide as long, ogival. *Elytra* nearly $\frac{1}{2}$ longer than wide, almost three times as long as the prothorax and twice as wide, almost evenly elliptical, only just visibly wider at basal $\frac{2}{5}$; subhumeral impression rather distinct but small, transverse and deep along the basal margin; inner fovea large and deep; suture not modified, the impressions obsolete. *Legs* slender, the anterior femora rather strongly, the four posterior feebly, clavate. Length 1.2–1.4 mm.; width 0.6–0.68 mm.

California (Siskiyou, Humboldt, Sonoma and Nevada Cos.).

This is a very abundant species in the northern and hilly parts of California, probably extending in its range much further to the northward. The description is drawn from the male, in which sex the anterior femora are a little more strongly clavate, the thickened portion rather strongly rounded but not angulate and at a point much nearer the apex than in the eastern species, with the apical slope very rapid and feebly granulato-serrulate. The female differs scarcely at all in antennal structure, but has the elytra a little more inflated. There is but little similarity between this species and *sparsus*, it being much larger, more ventricose and much more strongly sculptured.

9. **S. sparsus** Lec.—Proc. Acad. Nat. Sci., Phila., 1852, p. 151; *cautus* Lec.: i. litt.

Moderately stout and rather feebly ventricose, polished, impunctate anteriorly, the elytra sparsely and quite finely punctate; body piceous-black, the elytra paler, dark testaceous; legs and antennæ pale; pubescence rather sparse and short anteriorly, long, suberect, pale and conspicuous on the elytra. Head slightly transverse, the eyes moderate in size and prominence, only slightly longer than the tempora. Antennæ about $\frac{1}{2}$ as long as the body, gradually and moderately incrassate toward tip; joints three to five distinctly longer than wide and subequal, the sixth shorter and only slightly elongate; seventh and eighth distinctly thicker, subequal and fully as long as wide; ninth and tenth ob-

trapezoidal, more than $\frac{1}{3}$ and $\frac{1}{2}$ wider than the eighth, and $\frac{1}{3}$ and $\frac{2}{5}$ wider than long respectively; eleventh fully as thick as the tenth and as long as the two preceding, obliquely pointed toward apex. Prothorax not quite as long as wide, nearly $\frac{1}{3}$ wider than the head, dilated and broadly rounded laterally in apical half, the sides thence strongly convergent and feebly sinuate to the base; four subbasal foveæ very irregular and feebly connected in twos, the sides more anteriorly also having two or three deep approximate foveæ. Scutellum very narrow and elongate, narrowly parabolic. Elytra scarcely more than $\frac{2}{5}$ longer than wide, slightly less than three times as long as the prothorax and nearly $\frac{4}{5}$ wider, oval, widest at basal $\frac{2}{5}$ but with the sides broadly arcuate, narrowly parabolic toward tip; subhumeral impression quite distinct and elongate; inner fovea large; suture not modified, the impressions obsolete. Legs slender, the anterior femora rather strongly, the four posterior very feebly, clavate; tarsi long, the posterior very slender, with the four basal joints decreasing gradually and not very rapidly in length. Length 1.15 mm.; width 0.5 mm.

California. This species is one of the smallest of Scydmænus proper and may be known by its coloration, sparse and rather small elytral punctures and other characters.

The name *cautus* was applied in manuscript by LeConte to the entirely testaceous specimens of this species, and the name is published, as far I am aware, only in the LeConte list of Coleoptera.

10. **S. pacificus** n. sp.—Elongate, suboval, moderately ventricose, pale and uniform rufo-testaceous throughout, polished, subimpunctate, the elytra sparsely and very feebly though rather coarsely punctulate, rather sparsely and inconspicuously pubescent, the hairs of the elytra moderate in length, suberect and recurved. *Head* wider than long, the eyes large, prominent and subbasal, the tempora very short and convergent; impression of the vertex deep and distinctly double at the bottom, subquadrate. *Antennæ* fully ½ as long as the body, very evenly, gradually and moderately incrassate from near the base to the apex; second joint much shorter and narrower than the first, ⅓ longer and only slightly thicker than the third, cylindric and ½ longer than wide; third to tenth increasing in width and gradually more transverse; fifth longer than wide, spherical at base and apex; sixth as long as wide; seventh distinctly wider; seven to ten transverse, the club, if any, being 5-jointed. *Prothorax* almost as long as wide, more than ¼ wider than the head, dilated and strongly, circularly rounded at the sides in apical half, constricted at basal third; surface with a short transverse impression near the base at the middle,

also coarsely biimpressed laterally within the constriction. Scutellum distinct. *Elytra* elongate-oval, widest and somewhat angulate broadly at the sides at basal $\frac{2}{5}$; humeri broadly rounded to the prothorax; humeral plica and impression rather long and distinct; inner fovea large; subsutural impressions rather distinct; suture narrowly elevated toward base. Dorsal pygidium well exposed behind, parabolic. *Legs* long; femora distinctly and equally clavate; hind tarsi very long and filiform, the four basal joints decreasing rapidly in length, the first almost as long as the next two. Length 1.5–1.65 mm.; width 0.6–0.7 mm.

California (Humboldt and Marin Cos.).

In the male of this species the last two ventral segments are much more convex than the remainder of the abdomen, and almost equal the first four in length, the sixth long, parabolic and evenly convex throughout, the posterior trochanters prolonged posteriorly in a slender corneous process, and the hind tibiæ thickened and internally flattened near the apex.

11. **S. subpunctatus** Lec.—Proc. Acad. Nat. Sci., Phila., 1852, p. 150.

Elongate-oval, moderately stout, polished, subimpunctate, the elytra not finely but very feebly and remotely punctulate, dark rufo-piceous throughout, the legs and antennæ slightly paler and more ferruginous; pubescence rather sparse and inconspicuous. Head transverse, the eyes very large, prominent and subbasal, with the tempora very short and convergent to the neck, the impression of the vertex large, transverse, deep and single, its posterior margin rounded, the anterior transversely rectilinear; front strongly declivous anteriorly to the rather large and horizontal clypeus. Antennæ slender, fully $\frac{1}{2}$ as long as the body, gradually and moderately incrassate from the third joint to the apex; second joint as long as the first and only slightly narrower, cylindric, $\frac{3}{5}$ longer than wide, nearly $\frac{1}{3}$ longer than the third but scarcely visibly thicker; third to fifth subequal in length, about $\frac{1}{2}$ longer than wide; sixth shorter, scarcely $\frac{1}{3}$ longer than wide; seventh nearly globular; eighth slightly wider than long; tenth moderately transverse; eleventh almost as long as the two preceding. Prothorax not quite as long as wide, rather more than $\frac{1}{4}$ wider than the head, inflated and rounded laterally in apical half, constricted at a considerable distance from the base; surface with a short and feeble transverse impression near the base, and two larger impressions at each side in the lateral constriction. Scutellum moderate. Elytra oval, widest and more prominently rounded at basal $\frac{2}{5}$, $\frac{1}{2}$ longer than wide, $2\frac{1}{2}$ times as long as the

prothorax and $\frac{4}{5}$ wider; humeri quite evident, the plica strong; subhumeral impression rather small, the inner fovea distinct; subsutural impressions narrow, short and feeble, the suture extremely finely and feebly elevated near the base. Legs long, the femora rather strongly and equally clavate. Length 1.6 mm.; width 0.65 mm.

Lake Superior. This species is closely allied to *pacificus*, but has the antennæ still more slender with the outer joints less transverse. The above description is taken from a female specimen in rather poor condition, but the species may be known by its rather large size, short, sparse and not very conspicuous elytral vestiture and dark coloration.

12. **S. tristis** n. sp.—Moderately stout and ventricose, polished, subimpunctate, the minute punctulation of the elytra barely traceable; body black, the elytra with a faint piceous tinge, the abdomen piceous at tip; legs and antennæ dark rufo-testaceous, the tarsi paler; pubescence sparse and indistinct anteriorly, rather short coarse cinereous recurved and distinct on the elytra. *Head* wider than long, the eyes rather large, strongly convex and subbasal, the tempora very short and convergent; vertex with two large rounded foveiform impressions; clypeus convex. *Antennæ* slender, very gradually incrassate from near the base, nearly $\frac{1}{2}$ as long as the body; second joint distinctly shorter and thinner than the first, cylindric, nearly $\frac{1}{2}$ longer than wide, fully $\frac{1}{2}$ longer and distinctly thicker than the third; three to ten gradually and slowly increasing in width; third much shorter than the fourth, $\frac{1}{4}$ longer than wide; fourth $\frac{2}{5}$, fifth larger and fully $\frac{2}{5}$, longer than wide; sixth subglobular; seventh $\frac{1}{3}$, eighth shorter, $\frac{2}{5}$, wider than long; ninth and tenth longer and larger, nearly equal, $\frac{1}{3}$ wider than long; eleventh not wider, not as long as the two preceding, gradually and narrowly ogival and scarcely oblique toward tip. *Prothorax* about as long as wide, fully $\frac{1}{4}$ wider than the head, dilated and strongly rounded laterally before the middle, constricted at basal third; disk with a short and feeble transverse impression near the base terminating at each end in a foveiform impression, the two large foveæ at each side within the constriction well developed. Scutellum moderate, parabolic, wider than long. *Elytra* $\frac{1}{2}$ longer than wide, nearly three times as long as the prothorax and almost twice as wide, elongate-oval, widest and more prominent at the sides at basal $\frac{2}{5}$; humeri evident at base, the humeral plica narrow and distinct; subhumeral impression narrow, moderate in length, deep and conspicuous; inner fovea large; subsutural impressions feeble, the suture finely and feebly elevated toward base. Dorsal pygidium only exposed at the extreme tip. *Legs* long and slender, the four anterior femora moderately, the posterior feebly, clavate; tarsi long and very slender. Length 1.3 mm.; width 0.6 mm.

Colorado.

The unique male type has the posterior trochanters simple,

but the hind tibiæ are broadly subprominent within at apical third, the prominence rendered more conspicuous by a brush of stiff hairs; last two segments of the abdomen together not longer than the preceding three, the sixth moderate in size, circular at tip, with the surface only feebly convex and not distinctly modified.

This species may be readily distinguished from *subpunctatus* by the two separated foveiform impressions of the head, smaller size and more conspicuous elytral pubescence.

13. **S. fuchsi** Bndl.—Entomologica Americana, V, p. 193 (Brachycepsis).

Moderately stout and ventricose, highly polished, subimpunctate, pale rufo-testaceous throughout; pubescence rather sparse, scarcely distinct anteriorly, longer suberect and recurved on the elytra. Head slightly wider than long, the eyes large and very prominent, nearly at the base, the tempora very short and convergent behind them; impression of the vertex large and deep, consisting of two large foveæ feebly coalescent; clypeus large. Antennæ almost half as long as the body, slender, gradually and rather strongly incrassate toward tip; second joint cylindric, a little shorter and much narrower than the first, $\frac{3}{5}$ longer than wide, $\frac{1}{3}$ longer than the third but much thicker; three to six just visibly increasing in thickness and becoming gradually more oval, with prominent basal bead; third rather more, the fourth a little less, than $\frac{1}{2}$, fifth $\frac{2}{5}$, sixth $\frac{1}{4}$, longer than wide; seventh $\frac{1}{3}$, eighth $\frac{2}{5}$, thicker than the sixth, as long as wide and very slightly transverse respectively, both strongly conic at apex; ninth and tenth much larger, $\frac{2}{5}$ and $\frac{3}{5}$ wider than the eighth, feebly obtrapezoidal, $\frac{1}{3}$ and nearly $\frac{1}{2}$ wider than long; eleventh scarcely as wide as the tenth, ogival, not as long as the two preceding. Prothorax nearly as long as wide, $\frac{1}{4}$ wider than the head, almost angularly prominent laterally in apical half, constricted at basal third; surface just visibly impressed transversely for a short distance in the middle near the base but not foveate, the lateral fovea feeble and indefinite. Scutellum distinct, triangular, rather wider than long. Elytra elongate-oval, widest near basal $\frac{2}{5}$, $\frac{1}{2}$ longer than wide, almost three times as long as the prothorax and about twice as wide, broadly rounded at the sides, the humeri strongly rounded and somewhat visible at base; subhumeral impression long, deep and distinct, the humeral plica strong and elongate; inner fovea moderate; subsutural impressions obvious, the suture feebly

elevated toward base. Legs long and slender, the femora moderately clavate, the anterior not distinctly more strongly. Length 1.1 mm.; width 0.5 mm.

California (Marin and San Francisco Cos.). The male secondary characters of this species differ conspicuously from those of the allied but much larger *pacificus*, the hind trochanters being perfectly simple and the posterior tibiæ less flattened internally toward tip. In the male of *fuchsi* the sixth ventral is narrowly rounded at tip, flat at base, becoming upwardly declivous at basal ⅔ along a broadly angulate transverse line, the basal parts of the ascending portion finely punctulate, the last two segments equalling the preceding four in length; the anterior tibiæ become slender and slightly sigmoid distally, and are finely prominent and with a cluster of bristles within at apex; the middle tibiæ are slender, broadly bent inward distally, and have a long slender internal process at tip. The dorsal pygidium is slightly exposed behind the elytra and is circularly rounded. The female has the elytra a little less elongate, the prothorax relatively somewhat larger and the head smaller, the antennæ differing very little.

14. **S. pubipennis** n. sp.—Rather stout and ventricose, polished, the elytra subimpunctate; body black throughout, the elytra scarcely visibly picescent in strong light; legs and antennæ pale, rufo-testaceous; pubescence abundant, shorter and less distinct anteriorly, very long erect pale and extremely conspicuous on the elytra. *Head* but slightly wider than long, greatly narrowed before the eyes, which are large, subbasal and extremely convex and prominent; tempora very short and transversely rounded to the neck; vertex transversely impressed from side to side; labrum blackish. *Antennæ* long and very slender, gradually and feebly incrassate from near the base, almost ⅗ as long as the body; second joint only slightly shorter but much narrower than the first, obconic, ¾ longer than wide, ½ longer than the third and distinctly thicker; third and fourth subequal, nearly ½ longer than wide; fifth longer, ⅗ longer than wide; three to five subequal in width and cylindric; sixth shorter and nearly ¼ thicker, more oval, about ⅖ longer than wide; six to ten increasing slowly and with perfect regularity in width; seventh slightly elongate; eighth as wide as long; ninth and tenth feebly obtrapezoidal, only slightly wider than long; eleventh fully as wide as the tenth, much shorter than the two preceding, obtusely parabolic and slightly oblique at apex. *Prothorax* nearly as long as wide, almost ⅓ wider than the head, strongly dilated and narrowly rounded at the sides at apical third, constricted near basal third; apex truncate and only slightly more than ½ as wide as the base; surface transversely impressed near the base, the flanks bifoveate within the constriction. Scutellum rather large, very distinct, equilatero-triangular. *Elytra* moderate in size, ⅖ longer than wide, 2½ times as long as the prothorax and fully ⅘

wider, oval, widest though only a little more rounded at the sides behind basal third ; humeri evident at base ; humeral plica narrow and strong, the impression deep and oblique ; inner fovea large and very deep ; subsutural impressions very feeble, the suture very slightly elevated toward base. Dorsal pygidium with the mere tip exposed and broadly rounded. *Legs* long ; femora moderately clavate, the posterior feebly; tarsi long and slender. Length 1.3 mm.; width 0.6–0.65 mm.

Pennsylvania (Westmoreland Co.). Mr. Schmitt.

The type described above appears to be a male, but I can find no obvious secondary sexual structures and the abdominal apex is but little modified. In the female the elytra are somewhat more briefly oval and more inflated, and the antennæ are slightly shorter.

The long, erect and very conspicuous pubescence of the elytra, black color and transversely impressed head, will readily identify *pubipennis* among the species of Brachycepsis.

15. **S. ventriculus** n. sp.—Strongly ventricose, polished, impunctate, except the elytra, which are minutely, very feebly and sparsely punctate ; body deep black throughout, the abdomen slightly paler at tip ; legs and antennæ pale ; pubescence rather sparse, even, less distinct anteriorly, pale and recurved on the elytra. *Head* transverse, the eyes rather small and but slightly convex, a little longer than the tempora, which are nearly as prominent and strongly rounded to the neck ; vertex with a deep transverse median impression, which is bisetose at the bottom ; fourth palpal joint only slightly more than $\frac{1}{3}$ as long as the preceding, finely aciculate ; clypeus large. *Antennæ* as long as the head and prothorax, gradually and strongly incrassate toward tip ; second joint nearly as large as the first, $\frac{2}{5}$ longer than wide, about as long as the next two and very much stouter ; three to ten increasing gradually in width, at first very slowly then more rapidly ; three and six scarcely as long as wide ; fifth quadrate ; fourth $\frac{1}{4}$ longer than wide ; seventh globular ; eighth $\frac{1}{3}$, ninth $\frac{2}{5}$, and tenth $\frac{2}{3}$ wider than long ; eleventh small, scarcely as wide as the tenth and $\frac{1}{2}$ longer, gradually ogival and oblique from the base. *Prothorax* well developed, about as long as wide, almost $\frac{2}{5}$ wider than the head, subglobular, narrowed, rectilinear and finely carinate at the sides toward base ; six basal foveæ large and distinct, not united, the two lateral near the carina ; flanks beneath the carina obliquely impressed. Scutellum very small, equilatero-triangular. *Elytra* oval, very convex, $\frac{1}{3}$ longer than wide, scarcely $2\frac{1}{2}$ times longer than the prothorax and $\frac{3}{4}$ wider ; sides parallel and very evenly arcuate throughout ; humeri altogether obsolete ; subhumeral impression small but elongate and deep, the plica narrow ; outer fovea obsolete, the inner deep and within a conspicuous subelongate excavation ; suture not modified. *Legs* slender, the femora feebly clavate, the anterior more strongly; tarsi rather short. Length 1.1 mm; width 0.52 mm.

Massachusetts.

No secondary sexual marks can be discovered in the four specimens before me. This species is readily distinguishable from any other of the present subgenus by its decidedly larger size.

16. **S. corpusculum** n. sp.—Oval, very convex and ventricose, highly polished, deep black, the abdomen slightly pale at tip and the head rufescent; legs and antennæ rufo-testaceous, the tarsi flavate; integuments impunctate, the elytra minutely, remotely and not at all distinctly punctulate; pubescence short and sparse anteriorly, slightly pale, moderate in length, rather sparse and recurved on the elytra. *Head* only slightly wider than long, the eyes small and moderately convex, much longer than the tempora and more prominent, the latter rapidly convergent and feebly, evenly arcuate behind them to the nuchal constriction; vertex with the transverse double depression not bisetose; clypeus large and broadly angulate at each side. *Antennæ* barely as long as the head and prothorax, gradually and strongly incrassate toward tip; second joint almost as long as the first but distinctly narrower, oval, $\frac{3}{5}$ longer than wide, fully as long as the next two and distinctly thicker; third smallest, parallel, $\frac{1}{4}$ wider than long; fourth to sixth increasing scarcely visibly in width, the fourth quadrate, the next two slightly shorter than wide and more oval; seventh nearly $\frac{1}{3}$ wider; seven to ten increasing gradually and rapidly in width, $\frac{1}{3}$, $\frac{2}{3}$, $\frac{3}{4}$ wider than, and nearly twice as wide as, long; eleventh small, obliquely and acutely conoidal, rather narrower than the tenth and a little shorter than the two preceding. *Prothorax* well developed, as long as wide, nearly $\frac{1}{2}$ wider than the head, strongly rounded laterally in apical half, the sides thence moderately convergent and straight to the base; lateral carinæ at base and six subbasal foveæ distinct; flanks also foveate below the carina. Scutellum very minute. *Elytra* oval and very convex, $\frac{1}{3}$ longer than wide, slightly more than twice as long as the prothorax and nearly $\frac{1}{5}$ wider; sides evenly and strongly arcuate throughout; humeri obsolete; subhumeral impression small and narrow but rather deep; inner fovea and impression distinct; suture not modified. *Legs* slender; femora rather feebly clavate, the anterior a little more strongly; hind tarsi very slender but moderate in length, the four basal joints but slightly elongate and subequal. Length 0.9 mm.; width 0.45 mm.

Canada (Ottawa)—Mr. W. H. Harrington; Pennsylvania (Westmoreland Co.)—Mr. Schmitt.

The large series before me exhibits scarcely any variation, even in size or color, and no secondary sexual characters of the male are discoverable. This species resembles *ventriculus* very closely in general form, but is much smaller; the head, also, is much smaller and with less prominent tempora, and the elytral vestiture rather longer and sparser.

17. **S. caducus** n. sp.—Elongate-oval, very convex and somewhat ventricose, polished, almost completely impunctate; body black, the head rufescent, the pronotum at apex and elytral suture sometimes paler and rufo-piceous;

legs and antennæ very pale testaceous throughout; pubescence rather sparse, short and indistinct anteriorly, coarse and recurved, cinereous and distinct on the elytra. *Head* small, as long as wide, the eyes small, somewhat prominent, the tempora a little shorter, not at all prominent, strongly convergent and evenly arcuate behind them to the neck; double impression of the vertex deep and bisetulose; clypeus large, greatly extended and angulate at the sides; maxillary palpi well developed. *Antennæ* short and stout, much shorter than the head and prothorax, gradually and strongly incrassate toward tip; second joint almost as large as the first, longer and much thicker than the next two, cylindric-oval, ½ longer than wide; three to seven increasing very slowly but gradually in width; seven to ten equally gradually but much more rapidly; three to five nearly similar, ⅕ wider than long; sixth oval, ⅖, seventh more developed externally than internally, ⅖, wider than long, the eighth shorter and more transverse, about twice as wide as long; eight to ten increasing rapidly in length as well as width; ninth ¾, the tenth ⅗, wider than long; eleventh small, scarcely as wide as the tenth and ½ longer, rapidly obliquely conoidal in form. *Prothorax* rather longer than wide, ⅗ wider than the head, parallel and strongly rounded laterally, the sides convergent and distinctly sinuate posteriorly; surface with six subbasal foveæ which are rather feeble and imperfectly connected transversely, except in the middle, also with a fovea on the flanks less basal; lateral carina wholly obsolete. Scutellum extremely minute, visible with difficulty and only under strong amplification. *Elytra* evenly oval, very convex, widest at the middle, with the sides strongly and evenly arcuate, ⅖ longer than wide, not more than twice as long as the prothorax and ⅔ wider; humeri altogether obsolete; subhumeral impression minute; inner fovea large and conspicuous; suture not modified. *Legs* slender; femora rather feebly clavate, the anterior only a little more strongly. Length 0.9 mm.; width 0.38 mm.

Pennsylvania (Westmoreland Co.). Mr. Schmitt.

A very small species of rather elongated form, but otherwise closely resembling *corpusculum*. It may be separated at once, however, by its non-carinate prothorax with the sides not straight and convergent toward base, but sinuate, by its somewhat smaller head with shorter autennæ and still more laterally prominent clypeus, and many other characters. No conspicuous sexual characters are observable in the series which Mr. Schmitt has kindly sent me.

18. **S. exiguus** n. sp.—Narrowly suboval, moderately ventricose, polished, subimpunctate, dark piceous-brown throughout, the legs and antennæ paler, rufo-testaceous; pubescence sparse anteriorly, short recurved pale and rather sparse on the elytra. *Head* small, somewhat longer than wide, the eyes well developed, convex, more than twice as long as the tempora, which are strongly convergent, feebly arcuate and not in the least prominent; vertex transversely impressed, the impression faintly bifoveate at the bottom near

the middle and also bisetose; front very gradually declivous anteriorly, the transverse sulcus separating it from the clypeus almost obsolete; clypeus large, broadly prominent at each side. *Antennæ* not quite as long as the head and prothorax, gradually and moderately incrassate toward apex; second joint cylindric-oval, nearly as large as the first, $\frac{2}{5}$ longer than wide, barely as long as the next two but very much thicker; three to six just perceptibly increasing in size, subquadrate or nearly globular and as long as wide throughout; six to ten more rapidly but uniformly increasing in size; sixth globular; seventh and eighth oval, slightly transverse and $\frac{2}{5}$ wider than long; eight to ten increasing only slightly in length; ninth $\frac{3}{5}$, tenth $\frac{1}{2}$, wider than long; eleventh nearly as long as the two preceding but scarcely as wide as the tenth, ogival. *Prothorax* rather longer than wide, fully $\frac{1}{2}$ wider than the head, parallel, broadly rounded at the sides anteriorly, moderately narrowed and feebly sinuate toward base; disk with six strong deep foveæ near the basal margin extending throughout the width but without trace of lateral carina. Scutellum extremely minute. *Elytra* $\frac{2}{5}$ longer than wide, a little more than twice as long as the prothorax and rather more than $\frac{3}{4}$ wider, parallel and broadly rounded at the sides, strongly rounded at base, the humeri somewhat evident; humeral plica narrow but strong, the subhumeral impression correspondingly deep and distinct; inner fovea large; suture not modified. *Legs* slender, moderate in length, the femora feebly clavate, the anterior only slightly more so; four basal joints of the hind tarsi subequal. Length 0.85 mm.; width 0.3 mm.

Pennsylvania (locality unknown).

This species differs from any other of the subgenus in its narrower and more depressed form, the elytra being less convex, less narrowed toward base, and with the humeri somewhat evident. It is represented in my cabinet by a single specimen.

19. **S. californicus** Mots.—Bull. Mosc., 1845, No. 1, p. 48; Mann.: l. c., 1852, p. 329.

Elongate-oval, strongly convex, polished, black, the elytra and legs dark testaceous, the antennæ and palpi still paler; apical margin of the pronotum narrowly pale; head and pronotum impunctate, the former coarsely pubescent with the hairs erect, the latter more sparsely and inconspicuously; elytra rather sparsely but coarsely pubescent, the hairs moderately short and strongly recurved. Head subtriangular, as wide as long, the eyes moderate in size, convex and near the base; front tumid in the middle between the scarcely marked antennal prominences; clypeus gradually declivous, not prominent at the sides; labrum transverse, rather large and convex, broadly arcuate at apex; maxillary palpi long, the third joint rather slender, fusiform, the fourth acicular, scarcely more than $\frac{1}{3}$ as long as the third. Antennæ

scarcely longer than the head and prothorax, moderately incrassate toward tip; basal joint cylindric, perceptibly longer and thicker than the second, the latter ovo-cylindric, $\frac{3}{4}$ longer than wide, thicker and much shorter than the next two; third $\frac{2}{3}$ longer than wide; third to eighth gradually increasing in thickness and decreasing in length, the eighth subglobular; ninth to eleventh a little more rapidly but gradually and almost continuously incrassate; ninth and tenth moderately transverse; eleventh gradually pointed, as long as the preceding two. Prothorax subquadrate, scarcely as long as wide, fully $\frac{2}{5}$ wider than the head, moderately dilated, parallel and rounded laterally toward apex, the sides perceptibly convergent and broadly, feebly sinuate thence to the base; surface evenly convex, feebly and confluently biimpressed near the base at the middle, the lateral fovea large and distinct, the lateral edge acute near the fovea, becoming more obtuse again at the base. Scutellum moderate in size. Elytra minutely and sparsely punctulate, elongate-oval, strongly convex, $\frac{1}{2}$ longer than wide, $2\frac{1}{2}$ times as long as the prothorax and fully $\frac{2}{5}$ wider, the sides broadly, evenly arcuate, gradually and continuously rounding and convergent to the base of the prothorax, the humeral plica short and only moderately prominent; subhumeral impression short, the inner long and strong; subsutural impressions obsolete, the suture minutely elevated toward base. Abdomen convex, sparsely but strongly pubescent, the last two segments longer but together shorter than the first four, the sixth parabolic, with a small excavation at the apex. Legs long and slender, the femora very feebly dilated toward tip, the anterior more distinctly; hind tarsi long and slender, with the basal joint as long as the next two, the anterior stouter toward base and clothed beneath with long pale hairs. Length 1.9 mm.; width 0.62 mm.

Queen Charlotte Islands (Massett—Mr. J. H. Keen), Sitka—Mannerheim and California—Motschulsky (possibly in error). This distinct species may be identified immediately by the very deep and conspicuous excavations of the head; the rather large and very profound excavation above each eye was not observed by either Mannerheim or Motschulsky.

The two specimens sent to me by Mr. Keen are evidently males, but there are no visible crural modifications. The excavation at the base of the head will prove to be perfectly asexual, though the pits above the eyes, and particularly the tumidity of

the front between the antennæ, may possibly prove to be influenced somewhat by sex in extent of development.

CATALINUS n. gen.

This genus has for its type, and only representative thus far known to the writer, a small, very slender and linear species, described by LeConte under the name *Scydmænus angustus.* It is unmistakably allied to Scydmænus in general organization, but differs especially in the form and structure of the prothorax. The eyes are subbasal, the palpi normal, with the fourth joint slender and aciculate, and the scutellum very small and in great part hidden by the arcuate base of the pronotum. The elytra are evenly and broadly rounded or subtruncate at tip, with the sutural angle right and only minutely blunt, entirely covering the dorsal pygidium and mutually overlapping on the suture toward apex, though only to an extremely slight degree. The characters of the under surface are those of Scydmænus, except that the last ventral segment is not unusually developed; the hind coxæ are very approximate, and the posterior tarsi moderate in length, with the four basal joints subequal.

The prothorax is evenly obovoidal, with rounded base and more broadly rounded apex, and is wholly devoid of any trace of subbasal impressions or lateral foveæ.

1. **C. angustus** Lec.—Proc. Acad. Nat. Sci., Phila., 1852, p. 151 (Scydmænus).

Linear and only slightly convex, polished, subimpunctate, black or blackish with dark rufo-testaceous legs and antennæ, the last two abdominal segments also slightly pale; pubescence moderately abundant, indistinct anteriorly, very short, cinereous and closely recurved on the elytra. Head well developed, transverse, evenly convex and unimpressed, the eyes moderate in size, convex but not very prominent, the tempora short and moderately rounded to the neck, almost continuous with them in curvature; neck wide; clypeus moderately developed, paler in color, broadly and continuously arcuate at tip, porrect with regard to the strongly declivous front; labrum small, transverse; mandibles moderate. Antennæ rather longer than the head and prothorax, with a distinct 3-jointed club; second joint much shorter and slightly narrower than the first, $\frac{3}{5}$ longer than wide, narrowed toward base, not quite as long as the next two and but slightly thicker; three

to eight increasing gradually and slowly in width, about as long as wide and subglobular, the eighth distinctly wider than long, oval; ninth about $\frac{2}{5}$ wider than the eighth and but little narrower than the tenth, both moderately transverse; eleventh nearly as long as the two preceding. Prothorax quite distinctly longer than wide and about $\frac{1}{4}$ wider than the head, widest at about apical third, the sides evenly and broadly rounded and gradually convergent to the base, the basal angles obliterated; surface evenly convex throughout. Elytra elongate-oval, $\frac{4}{5}$ longer than wide, more than twice as long as the prothorax and not more than $\frac{1}{3}$ wider, widest and just visibly more arcuate at the sides at basal $\frac{2}{5}$; sides parallel and broadly arcuate, the base but little wider than the thoracic base; subhumeral impression narrow, long, linear and distinct, the humeral plica fine and strong; outer fovea wholly obsolete, the inner distinct; subsutural impressions very feeble, the suture quite strongly elevated toward base, the ridge expanded slightly at the basal margin. Legs rather short, the anterior femora quite strongly, the intermediate moderately and the posterior feebly, clavate. Length 0.85 mm.; width 0.28 mm.

California. The sex of the individual described is not determinable.

Opresini.

The remarkable succession of minute species which constitute this tribe are only beginning to be known, and almost all the types here referred to are due to the patient and skillful collecting of Mr. Schmitt, within a single limited section of country among the mountains of Pennsylvania, to which I have already alluded. Among the other tribes with the fourth palpal joint subulate and oblique, they may be known at once by the rather long prosternum before the coxæ. They are assignable to three quite distinct genera, which may be briefly defined as follows:—

Eyes median; neck strongly constricted; antennal cavities narrowly separated; pronotum impressed at base.
  Scutellum completely invisible and covered by the pronotum, the elytral suture not modified.....**Opresus**
  Scutellum distinct; elytral suture elevated and enveloping the scutellum. **Delius**
Eyes anterior and less developed; antennal cavities more widely separated; neck moderately constricted; pronotum not impressed at base; scutellum distinct.....**Neladius**

It is almost certain that the *Scydmænus ovithorax* of Brendel, forms another genus in this tribe; if this be not the case, however, there is no known representative west of the Missouri River.

OPRESUS n. gen.

The species of this genus are the most minute of the Scydmænidæ, and could only be compared with Ptilium of the Trichopterygidæ in point of size. They are probably numerous, but only three or four are known at present. The body is narrowly suboval, feebly ventriculate, rather strongly convex, and clothed with very short and rather sparse pubescence. The head is well developed, borne on a stout but deeply constricted and exposed neck, and is but feebly inclined downward, the eyes median and generally rather well developed, the antennæ of the usual type in neighboring tribes of the Scydmænidæ subulipalpi, the three outer joints forming a distinct club. Front between the antennal cavities narrow, nearly vertical and somewhat prominent; labrum transverse, truncate, the mandibles rather small, circularly rounded externally. Prothorax obovulate, the subbasal markings fine, consisting of two minute united median foveæ and another near each basal angle. Prosternum before the coxæ rather long and finely puberulent as in the other genera of the tribe. Scutellum completely wanting and covered by the pronotum. Elytra oval, somewhat individually rounded at apex, the dorsal pygidium exposed at tip and broadly rounded.

The middle coxæ are contiguous, the posterior very narrowly separated, the narrow process of the metasternum between them deeply and finely cleft as in Scydmænini, extending virtually to the sides of the body. First ventral segment longer than the next, the last two moderately elongate. Legs very short and rather stout, the hind tarsi short, with the four basal joints equal; claws short and strongly arcuate. Secondary sexual characters appear to be wanting.

The three species known to me may be separated as follows :—

Elytra each with two minute basal impressions, the vestiture finer and closely decumbent, generally intermingled on the elytra with remote erect setæ which are short and inconspicuous; body narrower, more punctulate anteriorly.

Elytra less inflated, parallel and not more than ⅓ wider than the prothorax; eyes rather smaller.....1 **misellus**

Elytra more inflated and rounded at the sides, ⅔ wider than the prothorax.....2 **luteus**

Elytra each with a single much larger basal excavation ; pubescence less decumbent, stiffer and not intermingled with erect setæ on the elytra ; body stouter, the head relatively smaller.....3 **atomus**

No representative of this genus has been taken very far west of the Mississippi, as far as known to me, and it extends thence to the Atlantic Ocean both north and south.

1. **O. misellus** Lec.—Proc. Acad. Nat. Sci., Phila., 1852, p. 155 (Scydmænus).

Narrow, subparallel, moderately convex, polished, the head and pronotum sparsely, finely and feebly punctulate, the elytra impunctate; body pale ferruginous throughout, the legs and antennæ flavescent ; pubescence very short, even and decumbent, fine, pale in color and inconspicuous. Head wider than long, the base truncate with the hairs somewhat longer and more bristling ; temporal angles right but rounded ; eyes rather small, at fully their own length from the base ; antennal prominences small, rounded, quite conspicuous. Antennæ slender, the club distinct and 3-jointed ; two basal joints larger as usual. Prothorax obovoidal, as long as wide, widest and more strongly rounded at apical third, the sides thence moderately convergent and broadly arcuate to the base, ¼ wider than the head ; basal angles obtuse ; disk evenly and moderately convex, with two minute foveæ at the middle separated by more than ⅓ the width and connected by an anteriorly arcuate channel, also with a small fovea at each side near the basal angles in the same transverse line. Elytra oblong-oval, only moderately convex, not connate, evenly and obtusely rounded behind, ½ longer than wide, only just visibly more than twice as long as the prothorax and scarcely ⅓ wider ; sides broadly arcuate, just perceptibly more prominent near the middle, the humeri slightly evident ; suture not modified. Legs very short, stout, the femora rather strongly clavate but short. Length 0.6 mm. ; width 0.21 mm.

Georgia and Louisiana The species described by Brendel under the name *Scydmænus minimus*, is perhaps not different from this ; it is the smallest species of the family known to me.

2. **O. luteus** n. sp.—Elongate, narrowly suboval, rather convex, polished, sparingly clothed with very short, fine and decumbent whitish hairs, uniformly distributed throughout, with a few short and stiff erect setæ on the

elytra ; body pale luteo-testaceous, the legs and antennal club slightly paler ; head and pronotum finely, feebly and sparsely punctulate, the elytra impunctate. *Head* ⅓ wider than long, evenly convex above, the eyes somewhat far down on the sides, convex, somewhat prominent, rather longer than the tempora, which are feebly convergent and only slightly arcuate behind them to the basal angles, the latter narrowly rounded ; antennal prominences small, distinct, separated by ⅓ the maximum width. *Antennæ* somewhat shorter than the head and prothorax ; funicle slender, the club strong ; basal joint cylindric, ¾ longer than wide, as long as the next two ; second oval, about as thick as the first, ⅖ longer than wide, longer than the next two and much thicker ; three to six very small, subequal, slightly transverse ; seventh fully as long as the sixth and ⅖ wider, transverse, slightly larger than the eighth, which is still more transverse ; ninth ¾, tenth 1¼, wider than the eighth, ½ and ¾ wider than long ; eleventh very short, not as long as wide, triangular, obtusely rounded at tip, much shorter than the two preceding and scarcely as wide as the tenth. *Prothorax* not quite as long as wide, ¼ wider than the head, widest and rounded at the sides at apical third, the sides convergent and feebly arcuate to the base, which is slightly arcuate ; angles obtusely rounded; disk evenly and moderately convex, with a fine but strong, transversely arcuate line near the base, ending in slight foveæ separated by more than ⅓ the width, and with the usual fovea at each side in addition. *Elytra* oval, ½ longer than wide, 2⅖ times as long as the prothorax and ⅖ wider, with the sides broadly and obtusely angulate just before the middle ; apex obtusely rounded; humeri scarcely at all evident ; disk convex, the suture not at all modified. *Legs* short, the femora moderately clavate. Length 0.65 mm.; width 0.24 mm.

Pennsylvania (Westmoreland Co.).

The description applies to the male, the copulatory spicule being finely acuminate at tip, but there is very little if any sexual difference, and no secondary male characters. This species is closely allied to *misellus*, but is larger, more ventricose and more convex.

3. **O. atomus** n. sp.—Oval, stouter, strongly convex, feebly ventricose, polished, impunctate and pale rufo-testaceous anteriorly, the elytra feebly, sparsely and very finely punctulate and blackish, but pale toward base and apex ; legs and antennæ very pale, ferruginous ; pubescence rather abundant, but very short, pale, stiff and strongly recurved on the elytra, mingled with a few inclined stiff spicules at the extreme sides of the prothorax. *Head* rather small, transverse, feebly convex above ; eyes quite large and convex, slightly prominent, much longer than the tempora, which are strongly convergent and circularly arcuate behind them to the neck ; antennal prominences very feeble, separated by less than ⅓ the total width ; neck scarcely more than ½ as wide as the head. *Antennæ* fully as long as the head and prothorax, the club distinct but with the ninth joint much smaller than the tenth as in the preceding species ; basal joint cylindric, ½ longer than wide ; second slightly shorter and narrower, cylindric but gradually narrowed at base, ⅔ longer

than wide, longer than the next two and distinctly thicker ; three to six subequal, the latter, perhaps, just visibly larger, moniliform, wider than long ; seventh $\frac{2}{5}$ wider, $\frac{2}{5}$ wider than long, larger than the eighth, the latter not wider than the sixth but a little more transverse ; ninth $\frac{3}{4}$, tenth $1\frac{1}{5}$, wider than the eighth, obtrapezoidal, subsimilar, moderately transverse ; eleventh short, conoidal, ogival at apex and not oblique, barely as long as wide, much shorter than the two preceding and not quite as wide as the tenth. *Prothorax* distinctly wider than long, the sides strongly rounded throughout, widest scarcely before the middle, nearly $\frac{1}{3}$ wider than the head, strongly convex, with two foveæ near the base separated by scarcely $\frac{1}{3}$ the width and united by a transverse and somewhat anteriorly arcuate channel, also with a small fovea near each angle in the same line. *Elytra* evenly oval, not quite $\frac{1}{2}$ longer than wide, $2\frac{1}{2}$ times as long as the prothorax and $\frac{2}{5}$ wider ; sides rounded rather strongly and very evenly ; apex narrowly parabolic ; humeri not evident ; disk rather convex, widest near the middle, the suture not modified. *Legs* short but rather slender, the femora feebly clavate. Length 0.65 mm. ; width 0.28 mm.

Pennsylvania (Westmoreland Co.).

The general habitus of this species is very different from that of the two preceding and, in connection with the single coarse, deep and subpubescent fovea at the base of each elytron, would almost seem to demand for it a separate subgenus. Sexual characters have not been observed.

DELIUS n. gen.

This genus is closely allied to Opresus, but has the scutellum exposed between the elytra, the legs longer, the hind tarsi moderately elongate with the first four joints equal, short and oblique at apex, the fifth normal and longer than the two preceding, and the prothorax bristling on the flanks with stiff but short setæ. The hind coxæ extend virtually to the sides of the body and are extremely approximate, though apparently not quite contiguous. The single species may be described as follows :—

1. **D. robustulus** n. sp.—Rather stout, slightly ventricose, very strongly convex throughout, polished, impunctate, pale rufo-testaceous, the legs and antennæ paler, more flavate and translucent; pubescence short, pale, suberect but strongly recurved, sparse, inconspicuous anteriorly but becoming extremely dense and intermingled with stiff inclined spicules on the sides of the prothorax, moderately coarse, even and distinct on the elytra. *Head* rather small, slightly wider than long, the eyes well developed, median, convex and prominent, the tempora strongly convergent and very feebly arcuate behind them to the neck and nearly as long as the eyes; neck almost $\frac{2}{3}$ as wide as the head; antennal prominences small and feeble, separated by less than $\frac{1}{2}$ the

total width; third palpal joint stout and oval, the subulate fourth joint oblique and slender. *Antennæ* as long as the head and prothorax, the club abrupt and strong; second joint as long as the first but much thinner, nearly twice as long as wide, a little longer than the next two; three to six subequal, not appreciably narrower than the second and distinctly wider than long; seventh and eighth equal in width and ⅖ wider, strongly conic in apical half, ⅓ and ⅘ wider than long; ninth and tenth very feebly obtrapezoidal, the sides nearly parallel, fringed about the apex with short whitish hairs, ⅘ and once wider than the eighth, similar in form but increasing slightly in size, ¾ wider than long; eleventh scarcely as wide as the tenth, not quite as long as the two preceding, longer than wide, ogival but not oblique at apex. *Prothorax* broadly subovoidal, scarcely as long as wide, ¾ wider than the head, widest before apical third; sides broadly rounded, convergent and less arcuate toward base, the latter arcuate, wider than the apex; basal angles obtuse and blunt; disk evenly convex, with two small approximate and confluent foveæ in the middle near the base. Scutellum triangular, flat. *Elytra* entire, slightly overlapping toward tip as usual, rhomboid-oval, narrowly parabolic at apex, widest and subprominent at the sides just before the middle, scarcely ⅖ longer than wide, 2⅓ times as long as the prothorax and barely ½ wider; humeri slightly evident; humeral plica and impression both very small, the inner fovea more distinct, subsutural impressions obsolete, the suture finely beaded basally, the bead expanding and strongly enveloping the scutellum at base. *Legs* slender, the femora very feebly clavate, the anterior more distinctly. Length 0.68 mm.; width 0.28 mm.

Pennsylvania (Westmoreland Co.).

No secondary sexual characters are visible in the two specimens before me. The first four ventral segments are equal and rather short, the last two moderately long.

NELADIUS n. gen.

The single species composing this genus has an elongate and very convex form of body, the elytra narrowed very gradually to the extreme base of the prothorax and without trace of humeri, somewhat as in the subgenus Parascydmus of the Scydmænini; they are probably perfectly connate. The head is but feebly inclined, the neck wide, with the constriction simple and well exposed, the antennæ rather widely separated by the subvertical front, the clypeus very short and broadly subtruncate at tip, the labrum short but broad and truncate, and the mandibles moderate in size, evenly arcuate and with the apices finely aciculate. The maxillary palpi are of the usual form in the Scydmænini.

The middle and hind coxæ are contiguous, the latter transversely suboval, not extending quite to the sides of the body, but

the metasternal side-pieces are nevertheless not visible; the metasternum is more pubescent anteriorly and the male sexual characters at the ventral apex moderately developed.

1. **N. tenuis** n. sp.—Narrow, very convex, slightly ventricose, highly polished and impunctate, very pale luteo-testaceous throughout, the antennæ and legs still paler; integuments translucent; pubescence sparse, short, pale, evenly distributed throughout, even, coarser and recurved on the elytra. *Head* as long as wide, evenly convex, the eyes small, situated before the middle and down on the sides, feebly convex and not at all prominent, the tempora very long, only feebly convergent and slightly arcuate behind them to the neck. *Antennæ* as long as the head and prothorax, slender, the club rather abrupt, distinct but not strong; second joint only slightly shorter and narrower than the first, a little thicker than the following, feebly obconic, ⅔ longer than wide; third to sixth equal in width; third distinctly, fourth and sixth very slightly, shorter than wide; fifth distinctly longer than wide; seventh wider and much longer than the eighth, slightly distorted, rather longer than wide, ⅖ wider than the sixth; eighth small and transverse; ninth and tenth feebly fusiform, ⅕ and once wider than the eighth, ¼ and ⅖ wider than long; eleventh short, conoidal, not oblique, as wide as the tenth, only slightly longer than wide and much shorter than the two preceding. *Prothorax* as long as wide, scarcely ¼ wider than the head, widest slightly before the middle, the sides evenly arcuate; base arcuate, without distinct angles; disk evenly convex, wholly unmodified. Scutellum small, parallel, longer than wide, obtusely rounded at apex. *Elytra* fusiform, gradually and acutely pointed behind, widest just before the middle, with the sides evenly and strongly arcuate, nearly ⅗ longer than wide, 2½ times as long as the prothorax and ⅗ wider, each with two extremely small and feeble impressions at the basal margin; surface strongly, evenly convex, without trace of sutural impressions, the suture finely beaded in basal sixth or seventh, the bead enveloping the scutellum. Extreme tip of the dorsal pygidium exposed and broadly rounded. *Legs* moderate in length, rather thick, the femora feebly swollen, the anterior more strongly; hind tarsi nearly ⅕ as long as the tibiæ, the four basal joints almost exactly equal, the fifth slightly thicker, rather longer than the two preceding. Length 0.75 mm.; width 0.26 mm.

Pennsylvania (Westmoreland Co.).

The specimen described above is presumably a male, the tip of the abdomen being narrowly rounded and the apparatus within the dorsal and ventral plates, which are widely opened, quite complicated; there are visible on inferior rounded ligula and a superior upturned spatulate member within the opening. The four basal segments are subequal in length. The female is similar to the male, but has the abdominal vertex broadly and obtusely rounded.

CEPHENNIINI.

This tribe includes within our territories but one genus, containing about five or six known species, of which three are here described. These species are assignable to two subgenera.

CEPHENNIUM Müller.

Europe appears to be the headquarters of this very peculiar and isolated genus, and the species occurring there outnumber the American about six to one, as far as known at present. There is no other type of the family approaching very near to Cephennium in structure, but Neuraphes may be considered a connecting bond with the Scydmænini, and Eutheia with the Chevrolatiini.

The body is oblong-oval, generally strongly convex, with the prothorax about as wide as the elytra, having its lateral edges acute, the hypomera slightly concave, and the prosternum very deeply emarginate through the width of the head and very short before the coxæ, differing very radically in this respect from Eutheia. The head is small, triangular and strongly deflexed, so that it is but slightly visible from above, the neck altogether unconstricted and deeply imbedded in the prothorax, and the eyes basal when present. Clypeus not separated from the front, the labrum small, variable in form according to the subgenus. The mandibles are generally stout, short and arcuate, and a comparison of them with those of Leptomastax, shows the most extreme divergence in form known in the family. Maxillary palpi with the first three joints nearly as in Euconnini and Scydmænini, but with the fourth small, much more obscure and not subulate, short, stout and obtuse in form and spongy in structure, projecting axially from the apex of the third. Antennæ very widely separated, situated at the sides of the head before the eyes and not so frontal as in most other types of the family; in our species the club is incrassate and 3-jointed, the joints increasing rapidly in thickness.

The pronotum is devoid of coarse sculpture, except a feeble and occasionally subfoveiform depression near each of the basal angles. Scutellum relatively large, transverse and rounded. Elytra generally a little wider near basal third or $\frac{2}{5}$ than at base, the latter fitted closely to the thoracic base throughout the width, the sides usually more or less acute for a short distance

behind the thoracic angles, and the subhumeral impression strongly modified or absent, sometimes taking the form of a long impressed line, the inner fovea well developed and always spongy-pubescent, this being one of the most constant peculiarities of the tribe and the one which declares most emphatically its relationship with Neuraphes.

Mesosternum carinate, the mes-epimera dilated, prominent and ciliate as usual, the metasternum very large, with the episterna entirely covered by the elytra. Hind coxæ rather widely separated and extending fully to the sides of the body. Legs rather slender but short, the femora usually feebly or moderately clavate, the hind tarsi moderate in length, with the first four joints subequal, the fifth unusually short and subequal to the two preceding in length, the ungues moderate.

The consistency of general form and habitus throughout this genus is very remarkable, and species within the various subgenera are determined more by the summation of a large number of gradial differences, than by abrupt and radical divergencies of structure. It is for this reason that marked departures in structure are of much greater weight than they would seem to possess when the tribe is compared, for example, with the Euconnini, and, when a general revision of the Cephenniini is written, it will probably prove necessary to subdivide it generically, but in view of the paucity of material known from this country, it will suffice for the purposes of this revision to merely indicate the two subgenera as follows :—

Eyes well developed ; labrum small, semicircular ; elytra without a long acute lateral edge behind the thoracic angles but with a longitudinal impressed discal line at base, rounded at tip conjointly, concealing the dorsal pygidium ; mesosternum with a rounded, impressed and scabrous area anteriorly at each side ; tibiæ normal.....**I**

Eyes wanting ; labrum short, transverse and truncate at apex ; mandibles less developed ; elytra with a long, acute and prominent side margin behind the thoracic angles, without a discal impressed line, the spongiose basal foveæ larger and very conspicuous, the surface subdepressed toward base, the apex subtruncate, exposing a dorsal pygidium which is more declivous than in allied European species ; mesosternum without trace of the depressed scabrous areas ; tibiæ strongly swollen toward tip.....**II**

The first subgenus has occurred thus far only near the Atlantic coast line, the second in the vicinity of San Francisco, California. The species known to me are as follows :—

Subgenus I.

Body stouter, dark brown, with rufo-testaceous elytra, the depressed metasternal areas small.....1 **corporosum**

Body less stout and more uniformly colored, blackish-piceous, the metasternal areas large.....2 **virginicum**

Subgenus II.

Narrowly oblong and subparallel, pale luteo-testaceous throughout; pubescence shorter and more unequal.....3 **anophthalmicum**

1. **C. corporosum** Lec.—Proc. Acad. Nat. Sci., Phila., 1852, p. 150.

Oblong-oval, stout, strongly convex, polished, impunctate anteriorly, the elytra finely, feebly and very sparsely punctulate; antennæ and anterior parts red-brown, the elytra and legs paler, bright rufo-testaceous; pubescence sparse, rather short anteriorly, longer and coarse, pale and more conspicuous on the elytra but strongly recurved. Head triangular, wider than long, the eyes moderate in size and convexity, coarsely faceted and adjacent to the prothorax; antennal prominences large and pronounced; produced front between the very widely separated antennæ transversely convex, evenly rounded at apex, fused with the clypeus and coarsely, densely punctate laterally; mandibles stout. Antennæ $\frac{1}{2}$ as long as the body, the club distinct, gradually formed; second joint shorter than the first but equally stout, cylindric, $\frac{2}{5}$ longer than wide, shorter than the next two but very much stouter; three to six subequal and slightly elongate; seventh much larger, fully $\frac{1}{4}$ thicker, obconic, nearly $\frac{1}{3}$ longer than wide; eighth small, barely as wide as the seventh, short, cylindric, distinctly wider than long; ninth and tenth obtrapezoidal, $\frac{3}{4}$ wider than, and twice as wide as, the eighth, distinctly wider than long; eleventh still thicker, large, obliquely pointed and conoidal, longer than the two preceding. Prothorax $\frac{4}{5}$ wider than long, rather more than twice as wide as the head, the apex feebly and transversely arcuate, the base subequal in width and feebly bisinuate; sides parallel, broadly arcuate and finely beaded; disk even, with a large but feeble, rounded and foveiform impression near each basal angle. Scutellum large, twice as wide as long, evenly rounded. Elytra not longer than wide, a little less than twice as long as the prothorax and not wider, the sides parallel and feebly arcuate; apex subparabolic; surface with a narrow, deep, straight and excavated line on each, longitudinal in direction and rather beyond outer third, extending from the basal margin not quite to

basal third; inner fovea small, pubescent and bearing a coarse erect seta, its impression large and ovulate; suture not modified. Legs moderate in length, the femora all very feebly clavate. Length 1.0 mm.; width 0.63 mm.

New York (near the city). The single specimen was kindly presented to me by the late Mr. Jülich; its sex is not apparent.

2. **C. virginicum** n. sp.—Oblong-oval, strongly convex, polished, impunctate, the elytra extremely minutely and sparsely punctulate; body blackish-piceous, slightly paler and rufescent anteriorly; legs and antennæ testaceous; pubescence sparse but pale, rather coarse and distinct, suberect and recurved on the elytra. *Head* triangular, nearly as long as wide, the eyes adjacent to the prothorax, moderately large, rather convex and coarsely faceted; antennal prominences large and rather distinct; front prolonged and gradually feebly declivous, transversely convex, strongly rounded at tip, the clypeus not separated; mandibles very stout, strongly arcuate, obliquely flattened externally and closely surrounding the small semicircular labrum when closed; front slightly punctate at the sides. *Antennæ* slender, gradually and strongly clavate in the three outer joints, about ½ as long as the body, in structure throughout almost exactly as in *corporosum*, except that the second joint is about as long as the first, as well as equally thick. *Prothorax* ¾ wider than long, not more than twice as wide as the head; apex broadly arcuate, as wide as the base, the latter transverse and feebly bisinuate; sides parallel and just visibly arcuate; basal angles right and having a very thick short and elevated bead, not at all rounded; disk even though broadly and feebly impressed toward the basal angles, without trace of fovea. Scutellum distinct but very transverse, more than twice as wide as long, parabolic. *Elytra* rather longer than wide, twice as long as the prothorax, and, at basal third, a little wider, the sides broadly arcuate; apex gradually and evenly parabolic from before the middle; flanks adjoining the thoracic angles slightly acute; disk with a long even and nearly straight excavated line at each side from the basal margin to basal third, slightly beyond outer third; inner fovea distinct, circular and spongiose but not setiferous, its impression rather elongate; suture not modified. *Legs* slender, moderate in length, the femora all very feebly clavate. Length 1.0 mm.; width 0.5 mm.

Virginia (Norfolk).

The metasternal plate, slightly prolonged between the hind coxæ, is deeply sinuate at the middle of its apex, the sinus almost exactly equal in size and curvature to the apices. The type and only specimen known to me is possibly a male, as the sixth ventral is finely punctulate and setulose abruptly in apical half, and the entire surface of the fifth is similarly but more coarsely asperato-punctate, the remainder of the abdominal surface being unmodified.

This species is allied closely to *corporosum*, but differs in its narrower form, darker color and still sparser vestiture, more elongate head, thickened hind angles and obliterated foveiform impressions of the pronotum, shorter and more angulate scutellum, longer sublateral excavated line of the elytra and other characters, among which may be noted the form of the sinus at the apex of the metasternal intercoxal prolongation, which is here shallower and more broadly rounded, the apices being narrower and more strongly rounded.

In *corporosum* the singular rugose and pubescent rounded depression near the sides of the metasternum, at its anterior margin, is quite small, extending through less than $\frac{2}{5}$ of the metasternal length, while in *virginicum* it is much larger, extending fully to the middle.

3. **C. anophthalmicum** Bndl.—Entomologica Americana, V, p. 194.

Narrowly oblong-oval, parallel, moderately convex, shining, impunctate, pale luteo-testaceous throughout, the legs and antennæ concolorous; vestiture moderately distinct, the hairs very short, closely recurved and mingled with others which are sparse and more erect, especially toward the tips of the elytra. Head parallel and nearly straight at the sides in basal half, the eyes wholly wanting, narrowed anteriorly, the antennæ inserted near the middle, the prominences very feeble; front moderately prolonged, declivous and evenly convex, the margin evenly rounded; mandibles small and only moderately stout. Antennæ about as long as the head and prothorax, slender, the 3-jointed club stout and very incrassate; second joint a little shorter than the first but nearly as stout, narrowed at base, $\frac{2}{5}$ longer than wide, shorter than the next two and much stouter; three to six equal, rounded, submoniliform and about as long as wide; seventh much larger, nearly $\frac{1}{3}$ wider, oval, more than $\frac{1}{4}$ wider than long; eighth a little smaller than the seventh but perfectly similar in form, rather darker in color than the joints preceding or following; ninth to eleventh very rapidly and evenly increasing in width, the ninth and tenth transversely oval, the eleventh ovoidal, gradually pointed, nearly $\frac{1}{2}$ wider than the tenth and longer than the two preceding. Prothorax $\frac{2}{5}$ wider than long, more than twice as wide as the head, slightly swollen anteriorly and widest near apical third, the sides broadly rounded, becoming slightly convergent and feebly sinuate toward base;

apex broadly rounded, the base transverse and feebly bisinuate; basal angles right, not rounded; marginal bead fine and serially punctulate; surface evenly and strongly convex, feebly subexplanate near the hind angles. Scutellum large, more than twice as wide as long, broadly rounded behind. Elytra nearly $\frac{2}{3}$ longer than wide, barely as wide as the prothorax, slightly narrowed behind the middle, the apex subtruncate; side margins toward base very acute, the humeral angles denticulate; subhumeral impression completely obsolete; each elytron with a single large circular fovea at the middle of its basal margin, the fovea densely spongy-pubescent; suture not modified. Legs short, the femora rather distinctly clavate. Length 0.9 mm.; width 0.4 mm.

California (Marin Co.). A very small species, apparently local in habitat and readily identifiable by the absence of eyes and peculiarities of elytral structure. It is represented before me by three specimens. Secondary sexual characters are not evident.

This species is somewhat related to the European *minimum*, but is larger and differs in its more depressed basal parts of the elytra, with much more extended acute side margins in continuation of the sides of the prothorax.

Ascydmini.

The single species, for which it appears to be necessary to propose a distinct tribal group, is not distinguished by any great singularity of habitus, but the palpal differences prevent it from joining either the Cephenniini or Eutheiini, to the latter of which it is probably most closely allied.

ASCYDMUS n. gen.

The maxillary palpi in this genus have a form which appears to be unique in the family, although somewhat remindful of the Chevrolatiini, the third joint being oval in outline with its apex obliquely truncate, the truncature being perfectly flat, spongiose in structure and beset with numerous very short stiff and erect setæ; the fourth joint is wholly obsolete, its function probably being performed by the terminal setose sensitive surface described. Aside from this, there seems to be nothing very peculiar about the type, although certain special structures, present also in Cephennium, Eutheia and Scydmænus, sufficiently prove its synthetic nature. There is, for example, a rounded and subimpressed, scab-

rous and densely setulose surface at each side of the metasternum anteriorly as in Cephennium. The general aspect of the body, distant hind coxæ and structure of the elytral apices, with the exposed dorsal pygidium, remind us of Eutheia; but the prosternum is short before the coxæ, and the prothorax is of a wholly different form. The antennæ remind us of Scydmænus, except the very slender pellucid connecting pedicels of the outer joints, but the nuchal constriction is anteriorly arcuate, the hind coxæ distant, and the prothorax of a different form. All these disparities, taken in connection with the remarkable structure of the palpi, force us to regard the single minute representative as the type of a distinct tribe. Other generic features will be alluded to in the description given below.

1. **A. tener** n. sp.—Narrowly suboblong, moderately convex, the elytra very feebly inflated, polished, impunctate anteriorly, the elytra sparsely punctulate, rather strongly toward base; body rufo-testaceous, the legs and antennæ very pale, flavo-testaceous; pubescence rather abundant, moderately long, coarse and pale, suberect but recurved on the elytra, less distinct anteriorly and with a few longer erect setæ. *Head* well developed, strongly transverse and triangular, the eyes large, convex, prominent, basal and coarsely faceted, the tempora extremely short and transverse to the neck, which is wide, the dorsal constriction feeble and anteriorly arcuate; vertex not at all impressed; antennal prominences rather marked; front evenly convex and moderately declivous between the antennæ to the apex of the clypeus, the latter very small, not at all developed laterally, subtruncate at apex and with broadly rounded angles; labrum small, transverse; mandibles well developed, very slender at apex. *Antennæ* a little longer than the head and prothorax, slender, gradually and moderately incrassate toward tip; second joint distinctly shorter but scarcely narrower than the first, scarcely as long as the next two but thicker, cylindric-oval, $\frac{1}{3}$ longer than wide; third smallest, somewhat distorted and a little darker in color, slightly wider than long, the inner side longer than the outer; fourth and fifth subequal, almost as thick as the second, slightly elongate; sixth a little shorter and narrower than the fifth; seventh $\frac{1}{4}$ longer than the sixth, subglobular; eighth a little larger, subglobular, scarcely as long as wide; ninth and tenth gradually slightly larger, rather wider than long; eleventh somewhat thicker, not as long as the two preceding, obliquely and obtusely pointed; last two or three joints mutually connected by extremely slender and translucent stipites. *Prothorax* almost exactly quadrate, very feebly rounded and narrowed at apex, the sides thence subparallel and nearly straight to the base, fully $\frac{1}{4}$ wider than the prothorax; surface very faintly impressed transversely in the middle near the base, also with a small deep and elongate fovea at each side near the side margin, the latter subacute toward base. Scutellum rather large and conspicuous, equilatero-triangular. *Elytra* scarcely $\frac{2}{5}$ longer than wide, obvi-

ously more than twice as long as the prothorax and about ½ wider, oblong-oval in form, slightly widest and with the sides just visibly more rounded behind basal ⅖; sides feebly arcuate; humeri somewhat traceable but not at all prominent; apices broadly and individually rounded, the dorsal pygidium well exposed in the entering angle, long and acutely rounded; basal, sutural and humeral impressions obsolete; each elytron with two small foveæ at the basal margin, the outer the larger. *Abdomen* with the basal segment longer than the second, the fifth moderate; sixth long, much developed, narrowly rounded, with its surface evenly convex and sloping slightly upward. Mesosternum carinate, the side-pieces protuberant and setose. Metasternum very long, densely hairy along its anterior margin throughout the width; posterior edge between the coxæ transverse and slightly prominent at each side; episterna entirely covered. *Legs* short; femora all feebly clavate; hind tarsi short, with the four basal joints subequal in length. Length 0.75–0.8 mm.; width 0.3–0.35 mm.

Pennsylvania (Westmoreland Co.); Massachusetts (Dracut).

The description is taken from the male, but there are no obvious secondary modifications; the female is a little more ventricose, with relatively smaller head and prothorax.

The specimens taken by Mr. Blanchard, under pine bark, in Massachusetts, do not seem to differ from those sent by Mr. Schmitt, showing that this remarkable type is not confined to mountainous districts.

Eutheiini.

The tribe Eutheiini is allied to the Cephenniini in many of its structural features, but differs very greatly in the head, which is here porrect and not deflexed, and borne on a distinct, though extremely wide, neck, with the constriction exposed. It differs equally strongly in the form of the prosternum before the coxæ, which, instead of being deeply emarginate and very short, is rather long and well developed. The genera appear to be three in number as follows:—

Hind coxæ widely separated; body larger in size.
Mesosternum broad and perfectly flat; sides of the prothorax acute throughout the length; nuchal constriction transverse and well marked above, the vertex not bifoveate; antennæ only moderately enlarged toward tip. **Eutheia**

Mesosternum strongly carinate; sides of the prothorax acute and margined only toward base; nuchal constriction more feeble above, anteriorly arcuate and involving two foveæ at the base of the vertex; last antennal joint much inflated and enclosing a large, conspicuous spongy-pubescent cavity. **Veraphis**

Hind coxæ very moderately separated; head without impressions; body minute in size [Brendel]..... **Euthiodes**

I have tried without much success to discover the true form of the fourth palpal joint in Eutheia and Veraphis; it is excessively minute or obscure, and, in some species, the third joint seems to be slightly oblique at apex, the fourth being a small and obtusely rounded anchylosed prolongation; in others it cannot be made out at all by reflected light, and it would be necessary to detach the palpus and mount it in Canada balsam in order to discover its true form. The palpi are much less developed than in Cephenniini, rather slender, the second joint shorter than the third, which is narrowly fusiform, pointed and coarsely pubescent.

EUTHEIA Steph.

The species described below agrees in every essential generic feature with *E. scydmænoides* of Europe, and is the only true Eutheia known to me at present from the American continent. Eutheia* is not at all closely related to Cephennium, although the two have been placed in the same tribal group by recent European writers. The well developed prosternum before the coxæ and form of the head, are the principal characters which necessitate a tribal separation.

1. **E. americana** n. sp.—Parallel, feebly convex, finely and closely punctured throughout, pale luteo-testaceous, the antennæ and legs concolorous, the head blackish; prothorax blackish-piceous, paler at the basal and apical margins; pubescence extremely short and evenly recurved, quite dense throughout, coarse, cinereous and distinct. *Head* much wider than long, very feebly convex, the eyes large and convex, occupying the entire sides behind the antennæ, finely faceted, the facets convex; antennal prominences small but distinct; front between the antennæ narrowly parabolic, abruptly vertical to the clypeus, which is very short and truncate; labrum minute, transverse, truncate; mandibles small, circularly arcuate. *Antennæ* slender, $\frac{2}{5}$ as long as the body, gradually and very moderately incrassate; basal joint about as long

*The particular combination of letters given by Stephens to designate this genus was Eutheia; for any subsequent author or set of authors to state that this was not a proper designation, but that "Euthia" must be substituted for it, is obviously a kind of impertinent meddling which would produce intolerable confusion if carried to its logical—or rather illogical, end. Another equally flagrant case is the change of Brentus Fabr. into Brenthus. Generic words are not a part of ordinary language and should not be subject to any of the usual rules of etymology, which are always inconstant and capricious; they are mere permutations and combinations of letters, used as symbols for genera simply because numbers, or other serial symbols, do not admit of interpolations.

as the next two, thicker than the second, which is oval, narrowed at base, $\frac{2}{5}$ longer than wide, nearly as long as the next two and somewhat thicker ; third smallest, parallel, $\frac{2}{5}$ wider than long, much narrower than the fourth, which is fully as long as wide ; fourth to eighth increasing evenly and slowly in width, eighth to tenth a little more rapidly ; fifth somewhat rounded, nearly as long as wide ; sixth to tenth obtrapezoidal ; sixth and seventh $\frac{2}{5}$, eighth $\frac{3}{4}$, ninth $\frac{3}{5}$, tenth $\frac{1}{2}$, wider than long ; eleventh barely as wide as the tenth, conoidal, not as long as the two preceding, indented slightly and spongiose internally near the apex. *Prothorax* $\frac{2}{5}$ wider than long, $\frac{3}{4}$ wider than the head, widest slightly before the middle, the sides broadly rounded, becoming straight toward base, the latter transverse, about as wide as the apex, which is broadly arcuate ; basal angles pronounced, not at all blunt ; disk evenly convex, broadly impressed toward the hind angles, with a deep and rounded fovea at the middle, and another at each side near the base, with a small feeble fovea intermediate at each side and still more basal. Scutellum small, semicircular. *Elytra* $\frac{2}{5}$ longer than wide, more than twice as long as the prothorax and just visibly wider ; sides parallel and feebly, evenly arcuate ; apex abbreviated and broadly truncate ; each elytron with two subfoveate basal impressions, the outer slightly the larger ; suture elevated at base about the scutellum. Exposed part of the dorsal pygidium wider than long, moderately declivous, parabolic. *Legs* rather short, slender, the femora extremely feebly swollen ; hind tarsi relatively very long, almost as long as the tibiæ, very slender, with the four basal joints decreasing very slowly in length. Basal segment of the abdomen almost as long as the next three and as long as the sixth, the latter parabolic. Length 1.0 mm. ; width 0.38 mm.

Pennsylvania (Westmoreland Co.). Mr. Schmitt.

The mesosternum is trapezoidal, flat, impunctate, extending to the middle of the intermediate acetabula and separated from the metasternum by a fine subelevated suture ; the metasternal process has two short, feebly diverging lines from the apex along the margins of the acetabula. The individual described is a male.

VERAPHIS n. gen.

The head and mesosternum in this genus differ very radically from the same parts in Eutheia, and, as the name Euthiodes was applied by Dr. Brendel to a type species described as *Euthiodes lata*, which seems to differ generically from his *Euthiodes* [*Veraphis*] *cristata*, it becomes necessary to give it a new name. The general form of the body, truncate elytra and exposed dorsal pygidium are nearly as in Eutheia, but the upper surface is more convex, the elytra more inflated, the antennæ much more incrassate at tip and the sculpture or punctuation of the integuments less pronounced.

The head is borne on a very short and broad neck, the dorsal constriction being much more feeble than in Eutheia and anteriorly arcuate, losing itself in a broad general depression at the base of the vertex, where there are two rather approximate and shallow foveæ. The last joint of the antennæ is very large and is deeply excavated, the excavation being suggested however, in a rudimentary manner, in certain species of Eutheia. The prothorax is generally transverse, with the lateral edges obtusely rounded, except toward base where they become acutely margined and finely beaded, the prosternum rather long before the coxæ exactly as in Eutheia. The scutellum is well developed, similar to that of Eutheia, but altogether different from the form assumed in Cephennium, where it is strongly transverse. Other characters of a generic nature may be noted in the detailed description of *cavicornis* and *capitata* given below.

The species supposed to be assignable to Veraphis may be indicated as follows :—

Elytra finely punctulate or subimpunctate; pronotum with a generally short transverse impressed line near the base.
Head not carinate.
Rufo-testaceous, the pronotum not canaliculate.
Prothorax at least as long as wide [LeConte.]
Basal foveæ of the pronotum three in number, the transverse impression strong.....1 **impressa**
Basal foveæ five in number, the impression fine.....2 **longula**
Prothorax distinctly wider than long.
Eyes larger, the tempora much shorter than the eyes and strongly convergent behind them ; mandibles circularly rounded externally. 3 **cavicornis**
Eyes small, the tempora behind them subparallel, almost straight and as long as the eyes ; mandibles falcate, larger, strongly rounded at base externally.....4 **capitata**
Black, the elytra testaceous; pronotum with a feeble longitudinal impression.....5 **scitula**
Head with a short longitudinal carina.....6 **cristata**
Elytra distinctly punctured, the pronotum without a transverse impressed line.....7 **colon**

These species are all unknown to me in nature except *cavicornis* and *capitata*, which are to be regarded as types of the genus; they are distributed over the entire country from the Atlantic to the Pacific, although apparently preferring northern latitudes or high altitudes and appear to be extremely rare, being represented for the most part by unique examples at present.

1. **V. impressa** Lec.—Bull. U. S. Geol. Surv., V, No. 3, p. 513 (Euthia).

Dark rufo-testaceous, shining, sparsely pubescent. Head convex, smooth; vertex with two small foveæ. Prothorax smooth, a little longer than wide, rounded on the sides, narrowed near the tip; disk convex, with a deep transverse line near the base upon which is a small medial puncture; near the hind angle at each side there is a small elongate fovea. Elytra convex, scarcely perceptibly punctulate. Length 1 mm.

California (Lake Tahoe). It may be strongly doubted that the prothorax is longer than wide, as stated above by LeConte; it would be a most remarkable form for the present tribe.

2. **V. longula** Lec.—Bull. U. S. Geol. Surv., V, No. 3, p. 513 (Euthia).

Elongate, rufo-testaceous; antennæ and legs yellow; elytra from the first third nearly to the tip darker; pubescence sparse and rather coarse. Head with two large shallow foveæ. Prothorax longer than wide, not narrowed in front, slightly rounded at the sides, marked with a transverse impressed line near the base; upon this line are situated two large punctures each side and a smaller one at the middle. Elytra sparsely punctulate. Length 1 mm.

Colorado (Garland). This species is apparently represented only by the unique type in the cabinet of LeConte. If the form of the prothorax is as stated in the original description given above, this must be a very singular form, but the tendency of the author referred to is, as I have several times before had occasion to remark, to greatly magnify the length of a part in terms of its width. In the figures accompanying the revision of LeConte (l. c.), the prothorax of *longula* as delineated is as long as wide, that of *impressa* a little wider than long.

3. **V. cavicornis** n. sp.—Oblong-suboval, rather convex, polished, impunctate, the elytra extremely minutely, sparsely and feebly punctulate; pubescence rather sparse, inconspicuous anteriorly, rather long coarse pale and strongly recurved on the elytra, intermingled with a few erect setæ. *Head* much wider than long, broadly impressed basally, the constriction feeble in the depression, the foveæ small and shallow, separated by less than ¼ of the total width, the surface between them and thence anteriorly for a short distance scarcely noticeably convex but closely and asperately punctulate; eyes rather large and convex, somewhat finely faceted; front transversely angulate between the widely distant antennæ, then rapidly declivous to the clypeus, which is very short and rectilinearly truncate; labrum transverse. *Antennæ* barely as

long as the head and prothorax, extremely stout toward apex; basal joint cylindric, not more than $\frac{3}{5}$ longer than wide, not quite as long as the next two but much stouter; second feebly obconic, scarcely $\frac{1}{2}$ longer than wide, shorter than the next two and decidedly stouter; third and fourth cylindric, equal in width, quadrate and distinctly shorter than wide respectively; fifth and sixth subequal in width and fully $\frac{1}{3}$ wider, $\frac{1}{4}$ and $\frac{4}{5}$ wider than long; seventh $\frac{1}{3}$, eighth $\frac{1}{4}$ wider than the sixth, both very short and transverse; ninth and tenth extremely short, transverse and obtrapezoidal, $\frac{1}{2}$ and $\frac{4}{5}$ wider than the eighth, more than twice as wide as long; eleventh $\frac{2}{5}$ wider than the tenth, as long as the preceding three combined, oval, obtusely pointed, with a very large spongy-pubescent cavity internally near the apex. *Prothorax* a little more than $\frac{1}{4}$ wider than long, $\frac{1}{2}$ wider than the head, the sides feebly convergent and straight from near apical third to the base, rounded at apex, the latter broadly arcuate; base transverse; basal angles slightly obtuse but not at all blunt, slightly superposed upon the elytral base within the humeri; disk strongly convex, with five subbasal foveæ, the median transversely dilated, the lateral strongest. Scutellum large, semicircular, slightly rugose. *Elytra* oval, widest at the middle, with the sides parallel and even arcuate, $\frac{2}{5}$ longer than wide, $2\frac{1}{2}$ times as long as the prothorax and fully $\frac{2}{5}$ wider, broadly truncate at tip and individually somewhat anteriorly oblique and rounded toward the sutural angle; humeral plica very minute, the subhumeral impression short and basal; inner fovea very deep and perforate along the scutellar bead, oval with pubescent edges; disk with a feeble impression near the suture nearly throughout the length; suture with a flat and abruptly elevated bead toward base, extending strongly about the scutellum. Dorsal pygidium only partially exposed, parabolic. *Legs* moderate in length, the femora feebly clavate; hind tarsi extremely slender but much shorter than the tibiæ, with the basal joint about as long as the next two. Length 1.25 mm.; width 0.45 mm.

Utah (Park City). Mr. Schwarz.

It is possible that the remarkable cavity in the eleventh antennal joint may be partly sexual in origin, but there is nothing else about the two specimens before me to indicate the male; in fact the rather abbreviated last segments of the abdomen are usually more characteristic of the female.

4. **V. capitata** n. sp.—Oblong, rather strongly convex, polished, impunctate, the sparse and fine punctulation of the elytra scarcely visible, pale rufo-testaceous throughout, the legs and antennæ concolorous; pubescence short, pale and inconspicuous anteriorly, short, sparse and strongly recurved on the elytra, intermingled with sparse erect setæ. *Head* distinctly wider than long, the eyes small and only slightly convex, at their own length from the base, the tempora just visibly convergent and very feebly arcuate behind them to the abrupt but feeble nuchal constriction, the latter strongly and anteriorly arcuate on the upper surface, the foveæ distinct, separated by $\frac{1}{4}$ of the entire width and finely tuberculiferous; intermediate and anterior surface very feebly convex and wholly sculptureless; front broadly subangulate between the

widely separated antennæ, then rapidly declivous, the clypeus very short, broadly arcuate at apex; labrum small, transverse; mandibles large, falcate; palpi slender, the third joint blackish, remainder testaceous. *Antennæ* slightly longer than the head and prothorax, the club very stout and incrassate; first joint oval, ½ longer than wide, as long as the next two, slightly stouter than the second, which is oval, ⅓ longer than wide, as long as the next two and distinctly thicker; third and fourth equal in width, suboval, ⅓ and ¼ wider than long; fifth and sixth a little wider, very slightly, and quite distinctly, wider than long respectively; seventh and eighth still wider and more transverse, equal in width, ½ and ¾ wider than long; ninth and tenth darker in color, blackish, obtrapezoidal, transverse, ¾ and once wider than the eighth, ¾ wider than, and more than twice as wide as, long, respectively; eleventh only slightly wider than the tenth, oval, not as long as wide, not longer than the two preceding, very obtuse, with a large spongiose cavity on the inner side near the apex. *Prothorax* ⅔ wider than long, nearly ¾ wider than the head; sides parallel, broadly rounded anteriorly, straight toward base, the latter broadly, feebly bisinuate, the angles not at all blunt; apex broadly arcuate; disk having a short transverse subbasal impression at the middle, with a small and feeble fovea near it at each side, and a large, deep and oval fovea near each basal angle. Scutellum large, subparabolic, subscabrous, broadly rounded at tip and fully as long as wide. *Elytra* ⅔ longer than wide, parallel, with the sides a little more prominently arcuate at basal ⅔, fully 2½ times as long as the prothorax and ⅓ wider, broadly truncate at tip, with the sutural angle somewhat rounded; humeral plica narrow, strong but short, the subhumeral impression deep, slightly elongate; inner fovea large and deep; disk not obviously impressed along the suture, the latter with a flat and abrupt bead toward base, broadly enveloping the scutellum. Dorsal pygidium only half exposed, broadly rounded. *Legs* slender, the femora very feebly swollen. Length 1.25 mm.; width 0.5 mm.

Pennsylvania (Westmoreland Co.). Mr. Schmitt.

The hind coxæ are separated by about ⅔ of their own width, the metasternum only feebly produced between them and broadly, feebly sinuate in circular arc throughout the width, the first abdominal segment shorter than the next three, the sixth large and parabolic. The metasternum is finely carinate along the middle anteriorly, the carina increasing in elevation until it meets the strong mesosternal keel. The first joint of the hind tarsi is fully as long as the next two combined.

This species can be readily distinguished from *cavicornis* by several strongly accentuated structural differences, which are however in no way generic or subgeneric in nature. The sex of the unique type is not determinable.

5. **V. scitula** Mäkl.—Bull. Mosc., 1852, p. 330 (Eutheia).

Black, shining; antennae, legs and elytra testaceous; prothorax

and elytra obsoletely punctulate, the former subquadrate, finely canaliculate, depressed and bifoveate at each side posteriorly; elytra truncate. Length $\frac{2}{3}$ lin.; width $\frac{1}{5}$ lin.

Alaska (Sitka). It is possible that this may be a true Eutheia, as no mention is made of the foveæ of the vertex so characteristic of Veraphis.

6. **V. cristata** Bndl.—Trans. Am. Ent. Soc., XX, 1893, p. 284 (Euthiodes).

Extremely finely and sparsely punctulate, the head carinate in the middle, and, on either side of the carina, impressed. Pronotum with an abbreviated basal line, a conspicuous fovea $\frac{1}{5}$ the length of the disk from the base, and, on either side in the middle, between the medial and the anteriorly prolonged lateral fovea, there is a deep puncture; basal angles explanate. Length 1.2 mm.

Pennsylvania (Cambria Co.). Mr. Schwarz informs me that he also has taken this species, or one closely allied, in the Alleghany Mountains, and that in his opinion the cephalic carina is not a sexual character.

7. **V. colon** Horn—Trans. Am. Ent. Soc., II, 1868, p. 131; Lec.: Bull. U. S. Geol. Surv., V, No. 3, p. 514 (Euthia).

Testaceous, shining, sparsely clothed with suberect yellow hairs; head scarcely punctured. Prothorax quadrate, moderately convex; sides rounded in front, gradually narrowing behind; hind angles distinct; base truncate with a transverse row of six large punctures. Elytra moderately convex, coarsely punctured, pubescent and with two black spots at the posterior third. Length .04 inch [1.0 mm.]. One specimen from Fort Grant, Arizona. The elytra are of a paler color than the rest of the body and more densely pubescent.

The above is the description of Dr. Horn; that of LeConte is virtually as follows:—

Elongate, ferruginous, shining, clothed with short, sparse and coarse yellowish pubescence. Head punctulate, feebly impressed. Prothorax a little wider than long, rounded on the sides, slightly narrower in front than at the base, which is finely margined at the middle but without a transverse impressed line; disk punctulate; the two large basal punctures [at each side] are confluent, and the middle one is smaller. Elytra distinctly punctulate. Length 1 mm.

Arizona and California (San Diego Co.). Two specimens are known.

EUTHIODES Bndl.

The characters relating to the palpi, which were given by Dr. Brendel to distinguish this genus from Eutheia, may be assumed to be doubtful; it is stated that the third and fourth joints are united in a thick fusiform body sharply pointed. The antennæ are said to be strongly geniculate, and the posterior coxæ very moderately separated—which is the substance of the entire description. In the drawing accompanying the description, the hind body is much inflated, in a way quite foreign to Veraphis or Eutheia, and the fourth palpal joint is represented as large, conical and conspicuous, inserted axially in the tip of the third, the latter short and obconic. The following species is the type:—

1. **E. latus** Bndl.—Trans. Am. Ent. Soc., XX, 1893, p. 283.

Coarsely, faintly and sparsely punctured at the sides of the elytra, otherwise impunctate; vertex without impressions, the pronotum with a median subbasal puncture, a longitudinal elongate fovea near each basal angle, and, between this and the middle one, two confluent punctures. Elytra $\frac{1}{2}$ longer than wide. Length 0.66 mm.

Iowa. The non-foveate head, very moderately separated hind coxæ and minute size, make it highly improbable that this species can be congeneric with the *cristata* of the same author. It may possibly prove to be a species of Ascydmus, in which case that name would have to be replaced by Euthiodes, and the tribe known as the Euthiodiini.

Chevrolatiini.

The single known genus of this tribe contains but few species, exceedingly rare in individuals and distributed perhaps about equally in Europe, northern Africa and eastern North America; it is not known thus far from the Pacific coast regions of the American continent. It is a very isolated type, but aside from the radically different form of the head, seems to have considerable affinity with the Eutheiini, especially through Veraphis.

CHEVROLATIA Duval.

The body is subdepressed, with truncate elytra and a largely exposed and feebly declivous dorsal pygidium as in Eutheiini.

Head feebly declivous, exserted and borne on an elongate and rather strongly but not abruptly constricted neck, almost similar to that of the Lophioderini, and, in an almost similar manner, the dorsal surface of the neck and basal parts of the vertex are deeply excavated. Eyes large, convex, median and prominent; front narrowed and gradually elevated beyond the eyes, the antennæ attached under the tip and approximate at base, moniliform, gradually and feebly incrassate, devoid of distinct club, and equally strongly sculptured and finely, though not densely, pubescent from base to apex. Clypeus very short, not visible from above, broadly and very feebly sinuate at apex, the labrum large, transverse, circularly sinuate at the middle, the apices more narrowly rounded. Mandibles short, very stout, arcuate, somewhat angulate externally near the base, the apices acute but not finely aciculate. Third palpal joint large, stout, finely and densely pubescent, the fourth represented by a large and oblique, feebly convex and spongiose apical truncature; it is attached to the short and stout second joint by a small, abruptly curved and bulbiform peduncle. Labial palpi minute, slightly dilated and strongly setose at apex. Mentum rather small, subquadrate, its surface strongly convex. Maxillary cardo large and conspicuous, the lobe elongate, densely setose at tip and more sparsely and coarsely so along its outer edge. Prothorax strongly carinate at each side toward base, the prosternum well developed, flat, twice as wide as long and densely pubescent before the coxæ, which are ovo-conoidal and contiguous, their cavities confluent, broadly open behind and closed by the mesosternum, which is horizontally and shallowly biexcavated for the reception of the coxæ; anterior margin of the double acetabulum cuspid; trochantin completely wanting. Mesosternum tumid and elevated above the metasternum, slightly prominent along the middle anteriorly but scarcely carinate, sending a long process between the middle coxæ, the latter conical and rather narrowly separated; side-pieces tumid and pubescent as usual. Metasternum large, densely pubescent along its entire anterior margin, finely carinate along the middle, gradually more strongly anteriorly, the carina obsolete posteriorly; parapleuræ concealed by the elytra but turned inward slightly behind to meet the hind coxæ, which are small, oval and very remotely separated, more so than in any other genus of the family, the metasternal edge between them

broadly, feebly and evenly sinuate. First ventral segment longer than the next three together, the latter short; fifth but slightly longer than the fourth, the sixth elongate, parabolic, longer than the first. Legs moderate, the hind trochanters small; femora moderately clavate; hind tarsi filiform, much shorter than the tibiæ, the basal joint $\frac{1}{2}$ longer than the second, the next two equal, the fourth a little shorter, the fifth fully as long as the first two together; joints stout, strongly oblique at apex; ungues slender, moderately arcuate.

1. **C. amœna** Lec.—Proc. Acad. Nat. Sci., Phila., 1866, p. 370.

Somewhat narrow and shining, impunctate, pale rufo-testaceous throughout; pubescence distinct, closely recurved, long and bristling at the basal parts of the head and on the neck. Head a little longer than wide. Antennæ a little longer than the head and prothorax, the basal joint somewhat longer than the next two together; outer joints gradually wider; eight to ten slightly transverse; basal part of the vertex and the neck deeply depressed, longitudinally and feebly ridged along the sides. Prothorax distinctly longer than wide, fully $\frac{2}{5}$ wider than the head, obliquely narrowed anteriorly from near the middle, the sides parallel and straight in more than basal half; disk with a strong longitudinal carina near the base at the middle, and, on each side, transversely impressed, the impression interrupted at outer third. Scutellum small, rounded. Elytra $\frac{1}{2}$ longer than wide, rather more than twice as long as the prothorax and fully $\frac{4}{5}$ wider; sides feebly subprominent just before the middle; humeri quite evident; humeral plica and impression narrow but feeble, the inner fovea large, deep, pubescent at its anterior margin; suture beaded, the bead wide, dilated and enveloping the scutellum at base. Legs moderate in length. Length 2.0 mm.; width 0.63 mm.

Georgia (Savannah). It is not possible to state definitely whether this is the species described by LeConte under the name *amœna*, from Washington, D. C., and the vicinity of New York City; the above description is based upon a specimen borrowed from Mr. Schwarz for the purpose, and has never been compared carefully with the type; it is apparently a male, as the anterior trochanters are obtusely prominent behind. The original description is wholly inadequate, and the statement that the fourth palpal joint is narrow and subulate (Class. Col. N. A., 2 ed., p. 84) is

unaccountably erroneous. But very few examples have ever been taken.

This species apparently occurs only in the low sea-board plains of the Atlantic coast, and thus far exclusively in the neighborhood of large cities; the probability of its European origin may therefore be an open question for the present. The genus seems, however, to be represented in Mexico by a species different from any known in Europe, and recently described by Mr. Croissandeau (Ann. Soc. Ent. Fr., 1893, p. 231).

LEPTOSCYDMINI.

This tribe, though very limited thus far in extent, is important from a taxonomic standpoint, in the fact that it constitutes a bond between the ordinary forms of the subfamily, through the Chevrolatiini, and the exceedingly isolated Eumicrini which follow. Its affinity with Chevrolatiini is proved by the truncate elytra, exposed, flat and declivous pygidium, the latter being however much more inclined than in that tribe, and by the conformation of the metasternal side-pieces, these being narrow and concealed by the elytra but becoming inwardly prominent behind and partially enclosing the coxæ. With the Eumicrini its relationship is indicated by the nearly but not quite vertical pygidium, and slightly arcuate subapical sutures of the abdomen, absence of basal modifications of the elytra, convex form of body and general facies. It differs very radically from both the tribes mentioned in the structure of the front, as explained in the table previously given.

LEPTOSCYDMUS n. gen.

The body in this genus is narrowly suboval and very convex, with trunctate elytra and strongly declivous pygidium. Head well developed, feebly inclined, the neck abruptly and deeply constricted, the constriction perfectly simple and transverse, the eyes small, anterior and on the sides. Antennæ very approximate in insertion, rather short, gradually and strongly incrassate toward tip but with the last three joints forming a rather indistinctly differentiated club. Clypeus flat, porrect, moderate in length, the labrum small, short and transverse. Mandibles moderate in development, dentate within as usual, the portion between the tooth and the apex rather slender, feebly arcuate, very gradually and

finely pointed and apparently extremely minutely and feebly serrulate within to near the apex. Maxillary palpi very moderate in size, the third joint rather slender, ovo-obconic, with the terminal axial button small and obtuse, the labial palpi very minute. Mentum large, flat, polished and sculptureless, trapezoidal. Prothorax subcordate, strongly convex, feebly foveate near the base, the prosternum well developed and pubescent before the coxæ. Scutellum excessively minute but present in both species, only visible under high amplification. Elytra oval, strongly convex, devoid of the feeblest trace of basal impression, fitted evenly and closely against the broadly arcuate base of the prothorax, very narrowly overlapping posteriorly, the apical truncature nearly straight and anteriorly oblique sutureward, the sutural angles extremely minutely denticulate. Mesosternum very strongly carinate, the middle coxæ narrowly separated; hind coxæ distinctly but not remotely separated, the abdominal process truncate; first abdominal segment not as long as the next three, the last two rather short. Legs moderate in length, the femora slightly clavate; hind tarsi much shorter than the tibiæ, with the first joint not quite as long as the next two; second to fourth subequal, the fifth as long as the first two, the four basal joints oblique at apex; claws extremely slender and strongly arcuate.

The two species may be distinguished as follows:—

Body larger, the elytra more elongate; head broader in both sexes; male secondary characters very feeble.....1 **caseyi**

Body much smaller, the head narrow and subelongate in the female, broader and scarcely longer than wide in the male; secondary sexual characters at the ventral apex strongly developed.....2 **cavifrons**

These species were both included in the description of *caseyi* given by Dr. Brendel, *cavifrons* doing duty as the male and *caseyi* as the female.

1. **L. caseyi** Bndl.—Trans. Am. Ent. Soc., XX, p. 282 (Eumicrus).

Narrowly suboval, polished and subimpunctate, pale rufo-testaceous throughout the body, legs and antennæ; pubescence short, rather sparse, evenly distributed and closely recurved, pale in color but not conspicuous. Head distinctly wider than long, strongly narrowed from the front to the neck, the latter scarcely more than $\frac{2}{5}$ of the maximum width; sides evenly and strongly arcuate; eyes small, anterior, on the sides, very inconspicuous and not convex, the facets feebly formed and wanting in the pos-

terior half of the black pigment area; upper surface feebly and evenly convex, finely, sparsely punctulate, evenly covered with short, inclined and coarse hairs, which are evenly and posteriorly oblique in direction at each side of the median line throughout; front broadly truncate, with a small and tumid cusp in the middle. Antennæ very approximate, inserted under the frontal surface, as long as the head and prothorax, stout, incrassate toward tip; basal joint cylindric, $\frac{3}{4}$ longer than wide, but little thicker than the second, slightly longer than the next two; second stout, as long as wide, rounded at the sides, much stouter than the third, which is $\frac{1}{3}$ wider than long; three to eight increasing very slowly in width; nine to eleven equally gradually but more rapidly thicker; all the joints moderately transverse, except the fourth, which is almost as long as wide; ninth scarcely $\frac{2}{5}$ thicker than the eighth; eleventh about as long as wide, not quite as long as the two preceding, obtusely pointed. Prothorax as long as wide, $\frac{2}{5}$ wider than the head, widest at apical third; sides parallel and evenly, circularly rounded, becoming strongly convergent and feebly sinuate toward base; disk very convex, with a small and deep perforate fovea at each side of the middle near the base, and another more minute and lateral. Elytra almost $\frac{1}{2}$ longer than wide, a little more than twice as long as the prothorax and $\frac{1}{2}$ wider, ovulate, widest and more prominent at the sides behind basal third; disk perfectly devoid of impressions. Legs slender, the femora feebly clavate. Length 1.35 mm.; width 0.45 mm.

Pennsylvania (Westmoreland Co.). The description is derived from the male, but the female is nearly similar, having the head a little narrower and as long as wide, more triangular, the sides behind the eyes more feebly arcuate and the small frontal cusp not tumid, the antennæ fully as long but not quite so stout, and the elytra just visibly shorter and more inflated; there is but little sexual difference in the eyes. In the male the last two ventral segments are a little longer than in the female, the fifth in the latter not being longer than the fourth; but in both sexes they are perfectly simple and unmodified, the sixth evenly rounded behind.

2. **L. cavifrons** n. sp.—Narrowly suboval, very convex, polished, subimpunctate, pale rufo-testaceous throughout; pubescence very short, even, rather sparse, decumbent and inconspicuous. *Head* oval, as long as wide, the eyes anterior, rather well developed but only slightly convex, and with the facets

feebly developed; tempora long, feebly convergent and only slightly arcuate behind the eyes to the base and there abruptly constricted, the neck fully ½ of the maximum width; surface finely, sparsely punctulate and sparsely and inconspicuously pubescent in basal half, perfectly smooth and glabrous anteriorly, becoming very slightly concave behind the transverse frontal margin, which is broadly and angularly prominent in the middle. *Antennæ* a little shorter than the head and prothorax, rather slender, the club gradual, with the last two joints notably larger; basal joint cylindric, more than twice as long as wide, nearly as long as the next three, bent toward base, extending under the frontal margin; second but little thinner, oval, rather longer than wide, much thicker than the third, the latter smallest, much wider than long; four to seven subglobular and a little thicker, becoming a little more transverse; eighth decidedly shorter and more transverse but not distinctly wider; eight to ten increasing rapidly in width and length, the latter ¾ wider than long, equal in width to the eleventh, which is subcylindric, closely connected to the tenth, nearly as long as the two preceding and very obtuse at apex; fifth a little longer than the fourth or sixth. *Prothorax* rather distinctly longer than wide, ⅗ wider than the head, widest rather behind apical third, the sides evenly and strongly rounded, becoming convergent and feebly sinuate toward base; disk with a small fovea at each side of the middle near the base, the lateral fovea scarcely visible even as a trace. *Elytra* barely ⅖ longer than wide, scarcely twice as long as the prothorax and ⅖ wider, the sides rather strongly oblique from basal ⅖ to the apical truncature; humeri somewhat evident; disk perfectly even, without trace of basal impressions. *Legs* moderate in length, rather slender, the femora feebly clavate, the anterior somewhat more distinctly so. Length 1.05 mm.; width 0.35 mm.

Pennsylvania (Westmoreland Co.). Mr. Schmitt.

The male described above differs conspicuously from the female, the latter having the head narrower, more parallel, rather longer than wide, equally pubescent throughout, and not concave behind the truncate frontal margin, which is only very feebly and obtusely subprominent at the middle; the eyes are nearly as in the male, the antennæ a little more slender, with the basal joint not quite as long and the fifth joint not evidently larger, but otherwise similar, and the elytra are very slightly shorter and more inflated. In the male the fifth ventral segment has a deflexed and cuspid apical margin, the cusp obtusely angulate and finely pubescent, and the sixth has a large rounded median excavation, which is feebly concave, glabrous and polished, with its edges prominent at the sides posteriorly but not at the middle of the apex. In the female the last two segments are perfectly simple, the fifth not longer than the fourth and the sixth a little longer, evenly and broadly parabolic at apex.

EUMICRINI.

Within this tribe are included forms which differ profoundly from all other Scydmænidæ in the elongation of the posterior trochanters, in the possession of a large vertical and convex pygidium, and in having the segments and sutures of the abdomen arcuate. All of these characters are preëminently and essentially pselaphidous in nature, and show that the Eumicrini make a closer approach to the Pselaphidæ than any other known types of the present family. The Eumicrini include also some of the largest and most specialized forms of the family, having in fact very much the same relationship with the ordinary Scydmænidæ subulipalpi, that the Ctenistini and Tyrini bear to the Bryaxini, for example.

The genera are moderately numerous, and have been involved in considerable ambiguity hitherto. In the recent European catalogue of Heyden, Reitter and Weise, there are included under the head of Scydmænus, the subgenera Microstemma of Motschulsky, having for its type *tarsata* Müll, Eustemmus of Reitter, having as types *antidotus* and some other species, none of which are before me now, and Scydmænus *in sp.*, with *rufus* Müll. and *hellwigi* Fab., for its types among others, and having for a synonym Cholerus Thoms. Eumicrus is alleged to be a synonym of Scydmænus in its comprehensive sense.

Now the most obvious inconsistency in this arrangement comes from the fact that the subgenus Scydmænus of Reitter, contains at least two perfectly distinct genera, one having for its type *rufus*, the type of Cholerus Thoms., with the side-pieces of the metasternum completely covered by the elytra and not approaching the hind coxæ, and the other represented by *hellwigi*, which is constituted throughout exactly like our *zimmermanni*, with distinct met-episterna, which partially enclose the hind coxæ. I would propose, therefore, the following scheme for generic types, which would seem to be sufficiently exact and impartial.

EUSTEMMUS Reit.—type *antidotus* Germ.

EUMICRUS Lap. (syn. Microstemma Mots.)—type *tarsatus* Müll.

CHOLERUS Thoms.—type *rufus* Müll.

For the reasons stated above, *hellwigi* and *zimmermanni*, with congeneric species, must receive a new name, and it is probable that the Australian Heterognathus, of King, will prove to be valid also.

Our genera are three in number and may be thus defined:—

Met-episternum distinct, partly enclosing the hind coxæ; prothorax oval, the prosternum moderately developed before the coxæ; hind body moderately inflated.

Body stouter; scutellum present between the elytra though minute; first joint of the hind tarsi only moderately elongate.....**Eumicrus**

Body smaller and more slender, the met-episternum narrower; scutellum wholly wanting; basal joint of the hind tarsi much elongated, fully as long as the next two combined .....**Acholerops**

Met-episternum entirely covered, the hind coxæ wholly enclosed by the sternum and abdomen; prothorax narrow, strongly conic, the prosternum much longer before the coxæ; hind body greatly inflated.....**Ceramphis**

The species assigned below to Eumicrus coincide completely in habitus and generic structure with the European *tarsatus*, the anterior tarsi being generally dilated in the male in the same manner. Eumicrus and Acholerops are confined to the Atlantic and Sonoran provinces of our fauna, while Ceramphis is purely Sonoran.

EUMICRUS Lap.

Body stout and very convex, with entire and conjointly rounded elytra, which are generally impressed at base but without trace of foveæ. The head is large and thick, borne on a very strongly constricted neck, the constriction appearing in vertical profile as a deep and narrow cleft at each side, simple and transverse above. Eyes well developed and anterior; front narrowed and slightly prolonged in the middle, the antennæ quite approximate at base, long and well developed, rather thick, with the basal joint some what more elongate than usual, and the apical joints forming the 3-jointed, incrassate and very minutely and densely pubescent club characteristic of the tribe; funicle strongly reflexile in the excavated apex of the basal joint. Clypeus simple, porrect, truncate and moderate in length, the labrum short, transverse, bearing an apical series of long stiff setæ, and with a median indentation on the disk. Mandibles quite well developed, the median tooth of the right acute, inclined and well developed, that of the left being short and hollowed in *saginata*. The maxillary palpi are long and well developed, the second joint arcuate, third longer and narrowly obconic, very finely and densely pubescent, the fourth minute, rigidly and axially attached within the apex of the third, obtuse and similarly densely pubescent, the labial with the first joint small, the second elongate and cylindric and the third

short and slender, inserted obliquely in the apex of the second. Mentum trapezoidal, flat, with the basal angles reflexed.

The prothorax is rather long, subparallel and generally broadly rounded at the sides, the latter oblique and straight or nearly so toward base, the pronotum usually with two small foveæ at each side near the base, the prosternum moderately long before the coxæ, pubescent but with a median triangular glabrous area bordering the acetabula, the coxæ large and conovoidal. Middle coxæ large, very approximate, separated only by a narrow laminate carina, the trochanters moderate in length, stout. Posterior coxæ rather widely separated, oval, extending only to the wide met-episterna, which are defined by a very coarse and excavated suture; trochanters long, cylindric and swollen internally toward apex. First ventral segment almost as long as the next three. Legs long, the femora very strongly clavate in apical half or more; tibiæ straight; tarsi slender, the anterior incrassate or dilated toward base.

Our species may be briefly outlined by the following characters:—

Front more broadly and feebly prominent between the antennæ; basal joint of the latter moderate in length; elytra more distinctly impressed at base, with more evident humeri; pubescence denser, moderately long and distinctly recurved on the elytra; head not more pubescent at base; body generally darker in color.

Larger species, more elongate-oval, never less than 2 mm. in length.

Head more strongly transverse, obsoletely elevated longitudinally in the middle toward base; pronotum densely punctured toward base.

Elytra broadly oval, $\frac{2}{3}$ longer than wide, broadly parabolic at apex; third joint of the maxillary palpi stouter, more strongly narrowed at base; body stouter..... ♂ 1 **grossus**

Elytra more narrowly oval and elongate, $\frac{1}{2}$ longer than wide, subacutely rounded at tip; third palpal joint slender, gradually narrowed toward base..... ♂ 2 **occipitalis**

Head feebly transverse or subquadrate; occiput not at all tumid in the middle; pronotum not distinctly punctured near the base.

Femora gradually clavate; elytra very convex, the humeral plica short and obtuse.

Subbasal foveæ of the pronotum smaller and circular but very unequal in size .....3 **vestalis**

Subbasal foveæ large and unequal, the inner transversely oval.

4 **foveatus**

Femora abruptly clavate, the elytra shorter and more depressed, with the humeral plica longer, narrower and more prominent; subbasal foveæ of the pronotum rather small, rounded and subequal.

5 **quadriceps**

Smaller species, much less than 2 mm. in length; femora abruptly clavate. Body stout, the prothorax not longer than wide and subglobular; antennæ stouter, with a stronger and less rapidly incrassate club.
♀ 6 **motschulskii**

Body less stout, the prothorax longer than wide; antennæ long and slender, with a very rapidly incrassate club..... ♀ 7 **floridanus**

Front more narrowly and strongly prolonged between the antennæ, the basal joint of the latter longer; elytra scarcely at all impressed at base, the humeri subobsolete; pubescence of the elytra long, sparser erect and bristling; femora very abruptly clavate; head with a denser tuft of coarse hairs at each side of the base of the occiput; body generally pale in color. Posterior femora simple, strongly clavate as usual but not dentate externally. Sides of the prothorax broadly and evenly rounded, though gradually more convergent anteriorly as usual.

Prothorax longer than wide; antennal club more slender.
♀ 8 **longicollis**

Prothorax not quite as long as wide; antenuæ stouter throughout.
♀ 9 **ochreatus**

Sides of the prothorax swollen and subangularly prominent behind the middle; head relatively smaller, the elytra shorter.....10 **saginatus**

Posterior femora dentate externally near the trochanters, probably in both sexes.....11 **cruralis**

The two principal subdivisions indicated above are almost subgeneric in importance; the second is probably myrmecophilous in habits. The species are rather closely allied among themselves but appear to be distinct as defined above. The male has the sixth ventral segment longer than the female as a rule.

1. **Eu. grossus** Lec.—New Sp. Coleop. 1, Sm. Misc. Coll. 167, p. 26. (Microstemma).

Stout, very convex, polished, dark castaneous, the elytra slightly paler and brighter rufous; legs and antennæ dark rufotestaceous; pubescence rather abundant, shorter and but slightly conspicuous anteriorly, erect, longer and recurved on the elytra. Head from frontal margin to base about $\frac{3}{4}$ wider than long, the eyes rather large but only feebly convex, the tempora $\frac{3}{4}$ longer than the eyes, feebly convergent and broadly rounded behind them to the abrupt basal constriction, minutely, sparsely punctulate with a wide smooth median space, which becomes tumid toward base; hairs directed transversely and inwardly. Antennæ $\frac{1}{2}$ as long as the body, the club incrassate; basal joint much thicker than the second and fully $\frac{1}{2}$ longer, enlarged toward apex and deeply hollowed within for the reception of the second joint when

reflexed, the excavation continued to the base as a shallow canaliculation; second slightly thicker than the third and following joints, obconoidal, $\frac{1}{2}$ longer than wide, $\frac{4}{5}$ as long as the third, the latter $\frac{4}{5}$, fourth $\frac{1}{2}$, fifth 1, sixth $\frac{2}{5}$, longer than wide; seventh and eighth just visibly wider and much shorter, as long as wide and a little wider than than long respectively; ninth as long as the two preceding and $\frac{4}{5}$ wider, obtrapezoidal, longer than wide; tenth still wider, obtrapezoidal, rather closely joined, slightly wider than long; eleventh still wider, gradually pointed, not quite as long as the two preceding. Prothorax large and very convex, fully as long as wide, $\frac{2}{5}$ wider than the head, widest and with the sides broadly arcuate at apical $\frac{2}{5}$, the sides feebly convergent and nearly straight toward base; disk coarsely punctured near the base at each side of the median line, and with two large foveæ in addition, elsewhere impunctate. Elytra rather short, evenly elliptical, $\frac{2}{5}$ longer than wide, $\frac{3}{5}$ wider than the prothorax and barely twice as long, widest just before the middle; sides almost evenly arcuate; humeri rather evident; basal impression short and rather feeble; disk finely, sparsely punctulate; suture very feebly elevated toward base but not at all beaded. Pygidium triangular, as long as wide, narrowly rounded at apex, sparsely and coarsely pubescent, rather distinctly punctured toward base. Legs long and stout, the femora strongly but rather gradually clavate; hind tarsi with the four basal joints cylindric, transversely truncate at apax, the first about $\frac{1}{3}$ longer than the second. Length 2.4 mm.; width 0.8 mm.

Louisiana and Arkansas. The type described above has the sixth ventral very nearly as long as the first and is probably the male. The anterior tarsi are distinctly, although not very broadly, dilated toward base.

2. **Eu. occipitalis** n. sp.—Rather elongate and only moderately stout, polished, subimpunctate, uniformly dark rufo-testaceous throughout, the legs and antennæ not paler; pubescence abundant, evenly distributed, shorter and less conspicuous anteriorly, erect and recurved on the elytra. *Head* transverse, the portion behind the antennæ fully $\frac{1}{2}$ wider than long; eyes well developed, though feebly convex; tempora nearly twice as long as the eyes, feebly convergent and broadly arcuate, becoming parallel for some distance behind the eyes, the truncate base equal to $\frac{3}{4}$ of the total width; upper surface evenly convex, finely, sparsely punctulate and pubescent, the hairs directed transversely, a broad median line impunctate, glabrous and becoming slightly tumid toward base. *Antennæ* rather more than $\frac{1}{2}$ as long as the body, the

basal joint slightly thicker and $\frac{2}{5}$ longer than the second, dilated at apex and grooved above ; second a little thicker and not longer than the third, $\frac{1}{2}$ longer than wide ; third rather more than $\frac{1}{2}$, fourth $\frac{1}{3}$, fifth $\frac{3}{4}$, sixth $\frac{1}{3}$, longer than wide, equal in width and cylindric ; six to eight oblique at apex ; seventh and eighth scarcely visibly wider, equal, slightly wider than long ; ninth as long as the two preceding and $\frac{2}{3}$ thicker, truncate, fully as long as wide ; tenth equal in length but wider, slightly transverse, the eleventh still thicker, gradually pointed, about as long as the two preceding. *Prothorax* as long as wide, nearly $\frac{1}{2}$ wider than the head, widest and evenly rounded laterally near apical third, the sides becoming oblique and straight toward base ; disk very convex, impunctate but becoming coarsely and rather densely punctate toward base at each side of the middle, the two foveæ at each side small. *Elytra* finely, sparsely punctulate, fully $\frac{1}{2}$ longer than wide, $2\frac{1}{3}$ times as long as the prothorax and about $\frac{1}{2}$ wider, together rather narrowly ogival toward apex, widest just before the middle, the sides very evenly arcuate throughout, becoming nearly straight toward base, the humeri scarcely at all evident and but slightly tumid above ; basal impression of each short and rather feeble; suture not elevated toward base. *Pygidium* equilatero-triangular, the apex narrowly rounded ; disk convex, sparsely punctulate toward base ; pubescence denser at the apex. *Legs* long, the femora strongly but gradually clavate ; basal joint of the hind tarsi $\frac{2}{5}$ longer than the second. Length 2.25 mm.; width 0.75 mm.

South Carolina.

The abdomen is minutely and rather densely punctulate as usual. In the single individual before me the sixth segment is about as long as the first and the type is therefore a male; the anterior tarsi appear to be strongly dilated toward base.

This species differs greatly from *grossus* in general habitus, the elytra being much longer, more pointed, rather less convex and with much less evident humeri; it also differs in its slightly smaller and less transverse head and in numerous other details of structure.

3. **Eu. vestalis** Csy.—Cont. Descr. Syst. Col. N. A., II, p. 85.

The female of this species, which has been described in detail at the above reference, differs very much from the male in facies, and in the outline of the head and prothorax. In the female the head behind the antennæ is about $\frac{1}{3}$ wider than long, with the sides subparallel and very feebly arcuate, while in the male it is only slightly wider than long, with the sides convergent and circularly arcuate to the neck. In the female the prothorax is broad, globularly convex, not longer than wide and much wider than the head ; in the male much narrower and nearly cylindrical, only a little wider than the head, distinctly longer than wide, $\frac{1}{2}$ as wide as

the elytra and only slightly wider at apical $\frac{2}{5}$ than at base. The elytra are nearly similar in the sexes, and the femora are strongly but gradually clavate ; the anterior tarsi become strongly dilated toward base in the male. Length 2.2 mm. ; width 0.75–0.8 mm.

Arizona. This species was taken in great abundance by Mr. Morrison, probably near the southern boundary of the Territory.

4. **Eu. foveatus** n. sp.—Stout and convex, the body nearly as in *grossus*, polished, subimpunctate, dark red-brown, the legs and antennæ concolorous ; elytra very slightly brighter rufous ; pubescence abundant, longer, more conspicuous, erect and feebly recurved on the elytra. *Head* subquadrate, behind the antennæ only very slightly wider than long, the eyes moderate in size, feebly convex, the tempora long, twice as long as the eyes and parallel and very feebly arcuate for a long distance behind them, then broadly rounded to the neck; upper surface smooth in the middle, very minutely and sparsely punctulate laterally, with the pubescence directed transversely before and posteriorly behind. *Antennæ* rather slender, the basal joint cylindric, $\frac{3}{4}$ longer than the second and but slightly thicker, only slightly enlarged toward tip, about twice as long as wide and deeply grooved above ; second $\frac{3}{4}$ longer than wide, as long as the third and but slightly wider; three to seven nearly equal in width; third $\frac{3}{4}$, fourth $\frac{2}{5}$, fifth $\frac{3}{4}$, sixth $\frac{1}{4}$, longer than wide, the fifth and sixth more obconic and very slightly thicker; seventh as long as wide; remainder missing in the type. *Prothorax* fully as long as wide or rather longer, not more than $\frac{2}{5}$ wider than the head, widest and broadly rounded laterally near apical third, the sides convergent and nearly straight to the base from before the middle ; disk very remotely and feebly punctulate toward base, with two large and deep foveæ at each side, the inner transversely oval and deepest under its posterior margin, the outer circular. *Elytra* $\frac{2}{5}$ longer than wide, not much more than twice as long as the prothorax and nearly $\frac{2}{3}$ wider, oval, rather obtusely rounded behind, widest and more prominently rounded at the sides well before the middle ; humeri distinct, tumid above, the basal impression rather large and distinct ; subsutural impressions very long but feeble, the suture not modified ; disk not distinctly punctulate. *Pygidium* very convex, equilatero-triangular, the apex rather broadly obtuse ; disk not punctate toward base, with shorter, coarser pubescence along the lateral margin near the apex. *Legs* long, the femora gradually clavate ; hind tarsi with the basal joint nearly $\frac{1}{2}$ longer than the second ; two to four exactly equal in length, the fourth as long as the two preceding. Length 2.2 mm. ; width 0.78 mm.

Tennessee.

The sixth ventral in the unique type is as long as the first, and the sex of the individual described is therefore probably male, but the anterior tarsi are only slightly stouter toward base and not dilated.

As usual throughout, the scutellum is small, narrow, elongate, tumid and rather deep-set, differing greatly from the evenly flat form seen in other tribes.

5. **Eu. quadriceps** n. sp.—Moderately elongate, rather ventricose, polished, subimpunctate, rather pale rufo-testaceous throughout, the legs and antennæ concolorous; pubescence rather abundant, moderate in length, erect and somewhat strongly recurved on the elytra. *Head* quite small, quadrate, behind the antennæ only just visibly wider than long, the eyes well developed and somewhat convex, the tempora twice as long, broadly rounded, becoming subparallel for some distance near the eyes; upper surface minutely, remotely punctate, the sparse pubescence directed transversely and inwardly nearly throughout. *Antennæ* ½ as long as the body, the club moderate in thickness; basal joint more than ½ longer than wide, swollen toward the deeply excavated tip as usual, grooved above, not quite as long as the next two; second and third subequal in length, the former very slightly the thicker and ½ longer than wide; third ½, fourth ⅓, fifth 1, sixth ⅓, longer than wide, the latter obconic; six to eight very oblique at apex; seventh and eighth a little thicker, distinctly wider than long; ninth obtrapezoidal, nearly as long as wide, as long as the two preceding and ¾ thicker; tenth subcylindric, truncate, as long as the ninth and a little thicker, ¼ wider than long; eleventh still thicker, almost as long as the two preceding, gradually pointed. *Prothorax* slightly longer than wide, widest and somewhat subangular laterally behind apical third, the sides thence feebly oblique and straight to the base, ⅖ wider than the head, the disk feebly punctulate laterally near the base; foveæ small and inconspicuous. *Elytra* rather short and broad, ⅖ longer than wide, barely twice as long as the prothorax and fully ⅘ wider, broadly parabolic at tip, widest before the middle but with the sides very evenly arcuate; humeri large and conspicuous, tumid above, the basal impression larger and stronger than usual, giving rise to a distinct humeral plica; subsutural impressions long and feeble, the suture slightly elevated; disk not visibly punctulate. *Pygidium* equilatero-triangular, sparsely pubescent, not punctulate, the upper margin thin and laminate, with a small median emargination. *Legs* long, the femora strongly and quite abruptly clavate, the basal joint of the hind tarsi not ½ longer than the second. Length 2.1 mm.; width 0.75 mm.

Arizona (Tucson).

The single specimen, which I took a few years since, indicates a species somewhat allied to *vestalis*, but differing in its smaller and more quadrate head, shorter, broader and more depressed elytra, and, especially, in its abruptly and not gradually clavate femora. The type has the sixth ventral a little shorter than the first as in the male of *vestalis*, but the anterior tarsi are not dilated appreciably; in the female of the latter the sixth segment is not much more than half as long as the first, and is more emarginated by the tip of the pygidium.

6. **Eu. motschulskii** Lec.—New Sp. Col. 1, Sm. Misc. Coll. 167, p. 26 (Microstemma).

Stout, suboval, very convex, polished, subimpunctate, the ely-

tra sparsely but obviously punctulate, dark red-brown, the legs paler. Head behind the antennæ only slightly wider than long, the eyes rather large and somewhat convex; tempora long, very feebly arcuate and distinctly convergent behind the eyes to the truncate base. Antennæ nearly $\frac{3}{5}$ as long as the body, rather stout, the club stout and incrassate; basal joint cylindric, very nearly as long as the next two and decidedly stouter; second distinctly longer than the third; fifth almost twice as long as wide and about as long as the next two; sixth only very slightly longer than wide, the next two a little shorter than wide, oblique at apex; ninth as long as the two preceding and twice as wide, a little wider than long; tenth still wider and decidedly transverse, the eleventh gradually pointed, as long as the two preceding and still thicker. Prothorax large and globularly convex, fully as long as wide, $\frac{2}{5}$ wider than the head, widest and rounded anteriorly, the sides oblique and straight toward base; disk wholly impunctate, with two distinct subbasal foveæ at each side, the inner somewhat the larger. Elytra short and broad, very convex, scarcely more than $\frac{1}{3}$ longer than wide, not quite twice as long as the prothorax and about $\frac{3}{5}$ wider, widest very near the middle, the humeri large and tumid; basal impression short but distinct. Pygidium equilatero-triangular, very convex, rather asperately punctulate toward base. Legs moderate in length, the femora strongly and quite abruptly clavate. Length 1.6–1.7 mm.; width 0.7 mm.

Louisiana, Illinois and South Carolina. Much smaller than the preceding species and readily known by its short, stout and very convex form and punctulate elytra. The description is taken from the female, but it is probable that the male does not differ to any considerable degree.

7. **Eu. floridanus** n. sp.—Moderately stout and somewhat ventricose, polished, subimpunctate, the elytra sparsely and quite distinctly, though feebly, punctulate; body dark red-brown in color, the elytra more rufescent; legs and antennal club pale brown; pubescence abundant, inconspicuous anteriorly, long, erect and moderately recurved on the elytra. *Head* behind the antennæ about $\frac{1}{3}$ wider than long, the eyes moderately large, scarcely at all prominent, the tempora distinctly convergent, broadly and evenly arcuate to the truncate base; upper surface impunctate, the sparse pubescence transverse. *Antennæ* slender, $\frac{3}{5}$ as long as the body, the club very slender at base but rapidly incrassate; basal joint subcylindric, almost twice as long as wide, $\frac{1}{2}$

longer than the second and thicker, grooved above as usual; second feebly obconic, ¾ longer than wide, a little thicker than the third and much longer, almost as long as the fifth; third ⅓, fourth ⅖, fifth 1, sixth ¼, longer than wide, equal in thickness; seventh and eighth a little wider, very oblique at apex, the former slightly, the latter distinctly, shorter than wide; ninth nearly as long as the two preceding but scarcely ½ thicker, obtrapezoidal, distinctly longer than wide, and, with the next, less minutely and densely pubescent than usual; tenth ⅖ wider, not quite as long as wide; eleventh still much stouter, not as elongate as usual and pointed less gradually, much shorter than the two preceding. *Prothorax* very convex, slightly elongate, ⅓ wider than the head, parallel, very broadly arcuate at the sides, these becoming scarcely straight toward base, widest before the middle; disk very minutely, sparsely punctulate near the basal margin toward the sides, elsewhere impunctate, the two foveæ at each side rather large, deep, circular and subequal. *Elytra* very convex, ⅖ longer than wide, fully twice as long as the prothorax and ⅘ wider, almost evenly rounded at the sides, widest near the middle, narrowly rounded behind; humeri only feebly developed, the basal impression very short but distinct; subsutural impressions wholly obsolete. *Pygidium* equilatero-triangular, strongly convex, reticulate and sparsely punctulate toward base. *Legs* rather long, the femora strongly and abruptly clavate; four basal joints of the hind tarsi decreasing gradually in length. Length 1.65 mm.; width 0.62 mm.

Florida (Crescent City and Enterprise). Mr. Schwarz.

This species, which is described above from the female, is closely allied to *motschulskii*, but differs in its much less obese form, relatively more inflated hind body, and especially in its much narrower and more rapidly incrassate antennal club. A male before me labeled "South Carolina" does not seem to differ specifically; it has the anterior tarsi strongly dilated toward base.

8. **Eu. longicollis** n. sp.—Moderately stout, rather strongly ventricose, polished, impunctate, uniformly dark rufo-testaceous, the legs and antennæ concolorous; pubescence rather sparse, short and inconspicuous anteriorly, long, erect and bristling on the elytra. *Head* behind the antennæ as long as wide, parabolic in outline from the anterior margin of the eyes around the base, the eyes moderate in size, not at all prominent; upper surface more convex behind, finely and rather closely punctulate anteriorly, the pubescence short and decumbent, becoming longer and erect posteriorly, where there is a wide smooth and glabrous median line. *Antennæ* about ½ as long as the body, moderately stout, the club narrow and only very feebly incrassate distally; basal joint subcylindric, more than twice as long as wide, longer than the next two and stouter, feebly enlarged toward apex, not grooved above, but with the usual deep superior cavity for the reflexion of the second joint; two to four almost exactly equal, ⅖ longer than wide; fifth a little longer but not more than ½ longer than wide, somewhat thicker; sixth as long as wide; six to eight very oblique at apex; two to eight subequal in width; seventh and eighth equal, distinctly shorter than wide; ninth about as long as the two

preceding but only ½ wider, cylindric, rather longer than wide; tenth a little wider and longer, oval, narrowed at base, rather longer than wide; eleventh scarcely wider than the tenth, long, slender, obliquely and very gradually pointed, as long as the two preceding. *Prothorax* a little longer than wide, less than ⅕ wider than the head, widest and broadly rounded at basal ⅖, the sides thence gradually convergent and broadly arcuate to the apex and base; apex scarcely ¾ as wide as the base; disk evenly and strongly convex, minutely, feebly rugulose near the basal margin but not punctate, feebly tumid in the middle near the base, and having at each side a large but feeble and somewhat indefinite fovea. *Elytra* scarcely more than ⅓ longer than wide, fully twice as long and twice as wide as the prothorax, very obtusely parabolic at apex, widest a little behind the middle, the sides broadly rounded, obliquely converging to the feebly marked humeri; basal impression obsolete, the suture not elevated. *Pygidium* equilatero-triangular, convex, impunctate but minutely reticulate toward base, sparsely pubescent. *Legs* long, the femora strongly and abruptly clavate; tarsi with the basal joint slightly elongate and with a brush of longer hairs beneath, the anterior not dilated. Length 2.1 mm.; width 0.8 mm.

Virginia (Jones Creek, Lee Co.). Mr. Schwarz.

Very readily distinguishable by the rather long and narrow prothorax, widest behind the middle, somewhat slender and very feebly incrassate antennal club and other structural features. The type described is a female, the sixth ventral segment being short; the anterior tarsi are slender and only just visibly thicker toward base.

9. **Eu. ochreatus** n. sp.—Stout and rather strongly ventricose, polished, impunctate, pale flavo-testaceous throughout, the legs and antennæ concolorous; pubescence sparse, long, erect and bristling on the elytra. *Head* behind the antennæ fully ⅓ wider than long, the eyes well developed but not prominent; tempora long, distinctly convergent and broadly arcuate to the truncate base; upper surface strongly convex posteriorly, finely and indefinitely punctulate, the pubescence stiff; frontal prolongation scabrous toward tip. *Antennæ* more than ½ as long as the body, the club rather abruptly thicker but only slightly incrassate; basal joint more than twice as long as wide, much longer and thicker than the next two; second to fourth subequal, about ⅓ longer than wide; fifth nearly ½ longer than wide; six to eight shorter, oblique, with their inner apical margins emarginate; sixth as long as wide; seventh slightly, the eighth distinctly, shorter than wide; ninth not quite as long as the two preceding and less than ½ thicker, rather longer than wide; tenth a little thicker and somewhat elongate; eleventh long, gradually and obliquely pointed, not distinctly thicker, about as long as the two preceding. *Prothorax* barely as long as wide, scarcely ⅕ wider than the head, the sides parallel and broadly, evenly arcuate, widest at about the middle; apex but slightly narrower than the base, truncate; disk finely scabrous near the basal margin, bifoveate at each side of the middle, the inner fovea large but very feeble and indefinite, the

outer very small and feeble. *Elytra* about ⅓ longer than wide, more than twice as long as the prothorax and about twice as wide, ovoidal, very convex, widest at or slightly behind the middle, the sides strongly convergent and nearly straight to the base, broadly rounded behind; humeri almost obsolete, the basal impression indistinct; subsutural impressions slightly visible toward base. *Pygidium* equilatero-triangular, finely reticulato-scabrous toward base. *Legs* long, the femora very strongly and abruptly clavate. Length 2.0 mm.; width 0.8 mm.

Central Illinois. Mr. Webster.

The description is taken from a specimen having the sixth ventral much shorter than the first; another, which has this segment distinctly longer than the first, has the head visibly less transverse and more strongly narrowed behind; I regard the latter as the male, and, in this example, the anterior tarsi are feebly dilated toward base.

This species differs from *longicollis* in its much shorter prothorax, widest near the middle and less narrowed anteriorly, in its slightly stouter antennæ and still more inflated hind body; it is however very closely allied both to that and to the following species.

10. **Eu. saginatus** n. sp.—Stout and rather strongly ventricose, polished, impunctate, the body, legs and antennæ very pale flavo-testaceous throughout; pubescence short, stiff and distinct on the head, sparse and longer, but very inconspicuous on the pronotum, long, sparse, erect and bristling on the elytra. *Head* moderate in size, distinctly wider than long behind the antennæ, circularly rounded and convergent at the sides from the eyes to the neck; eyes moderate in size, not at all prominent; upper surface convex, minutely and feebly but closely punctulate, the frontal projection densely and distinctly punctato-scabrous. *Antennæ* fully ⅗ as long as the body, the club narrow, long and feebly incrassate; basal joint much stouter than the following, enlarged and deeply excavated at apex, barely twice as long as wide and scarcely longer than the next two; second to fourth subequal, only slightly longer than wide; fifth feebly obconic, not more than ⅓ longer than wide, a little thicker than the preceding but as wide as six to eight, which are short, oblique and deeply excavated within at apex as usual; ninth as long as the two preceding and ½ wider, not longer than wide; tenth a little thicker, suboval with truncate base, rather longer than wide; eleventh long, gradually and obliquely pointed, rather thicker, barely as long as the two preceding. *Prothorax* barely as long as wide, nearly ⅓ wider than the head, widest and more strongly rounded well behind the middle, the sides thence rather strongly convergent and nearly straight to the base, convergent and feebly arcuate to the apex, which is broadly arcuate and quite distinctly narrower than the base; disk convex, impunctate, finely scabriculate along the base, feebly swollen at the middle near the basal margin, and with one small sub-

basal fovea at each side of the middle. *Elytra* short, about ¼ longer han wide, twice as long as the prothorax and about ⅘ wider, oval, widest at the middle, the sides thence strongly oblique and nearly straight to the base, broadly rounded behind; humeri and basal impression nearly obsolete; subsutural impressions slightly evident toward base. *Pygidium* triangular, rather wider than long, feebly rugulose toward base. *Legs* rather short and stout, the femora very strongly and abruptly clavate; basal joint of the hind tarsi ½ longer than the second. Length 1.8 mm.; width 0.75 mm.

Iowa (Iowa City). Mr. Wickham.

The shorter and stouter form of the body, with the prothorax inflated and widest behind the middle, and smaller head, will distinguish this species from *ochreatus*. The single specimen before me has the sixth ventral rather longer than the preceding three combined when measured along the median line, and is doubtless a male.

11. **Eu. cruralis** n. sp.—Stout, the hind body strongly inflated, polished and impunctate, pale rufo-ferruginous throughout, the legs and antennæ concolorous; pubescence sparse, short and coarser on the head, long, erect and bristling on the elytra. *Head* behind the antennæ scarcely visibly wider than long, the eyes well developed but not prominent, the sides strongly convergent, broadly and evenly arcuate to the neck, which is ½ as wide as the head; upper surface convex and broadly tumid behind, minutely, sparsely punctulate, except in the middle toward base, more distinctly punctate on the median prolongation of the front. *Antennæ* rather more than ½ as long as the body, the club long, slender and feebly incrassate; basal joint long, cylindric, more than twice as long as wide, a little longer than the next two and much thicker, excavated above at apex but not grooved; second obconic, a little longer than the fourth but not thicker, ⅔ longer than wide; third and fourth ⅓, fifth scarcely ⅔, sixth ⅓, longer than wide; seventh not quite as long as wide, the upper twice as long as the lower side; eighth also very oblique at tip, much wider than long; ninth distinctly shorter than the two preceding and only ⅓ wider, a little longer than wide; tenth still thicker, similar in form, slightly elongate; eleventh long, not thicker than the tenth, not quite as long as the two preceding, gradually and obliquely pointed. *Prothorax* narrow, scarcely ⅕ wider than the head, slightly elongate, the sides parallel and broadly rounded, widest at the middle; apex much narrower than the base; disk finely rugulose near the basal margin and with two small and feeble subbasal foveæ at each side. *Elytra* ⅓ longer than wide, twice as long as the prothorax and fully twice as wide, widest at the middle, strongly and obliquely narrowed to the base of the prothorax, broadly rounded behind; humeri and basal impression nearly obsolete; subsutural impressions feebly visible near the base. *Pygidium* triangular, much wider than long, sparsely punctulate and minutely, transversely reticulate toward base. *Legs* stout, the femora strongly and abruptly clavate, the posterior with an obtusely triangular tooth on the outer edge near the trochanter; basal joint of the hind tarsi ½

longer than the second, the next three equal; anterior tarsi not dilated. Length 2.0 mm; width 0.8 mm.

Central Illinois. Mr. Webster.

The unique type has the sixth ventral segment large, nearly as long as the four preceding and longer than the first; judging by this and the narrow head, with rapidly converging sides behind the eyes, it is undoubtedly a male, but the femoral tooth is nevertheless probably common to both sexes; the anterior tarsi are only very feebly enlarged toward base. The species is allied closely in general appearance to the others of this section, and especially to *longicollis*.

ACHOLEROPS n. gen.

This genus is closely allied to Eumicrus, but differs constantly in its narrower form of body, obsolete or very indistinct subbasal foveæ of the pronotum, obsolete basal impression of the elytra, broader and less deeply constricted neck and complete absence of scutellum, the latter being minute, but exceedingly persistent in all of the rather numerous species of Eumicrus. It also differs in having the triangular glabrous plate adjoining the anterior coxæ obsolete or very minute and of a different character, the hind tarsi more elongate, with the basal joint as long as the next two, and the anterior slender, but slightly affected sexually and then only in the basal joint. The middle coxæ are narrowly separated by a feebly elevated and obtuse carina, the posterior rather widely separated, the met-episterna narrower than in Eumicrus, but delimited by the same very coarsely excavated suture, and the hind trochanters, although undoubtedly elongate, are less distinctly so than in Eumicrus and are more swollen within. In other characters, including the general habitus of the body, antennal structure, form of the front, palpi and pygidium, the two genera are virtually similar, though the third palpal joint is rather more fusiform and less conical, and only $\frac{2}{5}$ to $\frac{1}{2}$ longer than the second in Acholerops.

The known species of our fauna are as yet few in number, and may be discriminated by the following general characters:—

Hind tarsi very long and slender; elytra without trace of basal erosion; body larger.....1 **zimmermanni**

Hind tarsi shorter; elytra each with a minute suberoded depression at the middle of the basal margin; body very small.....2 **retrusa**

The first of these species differs very greatly from the second in facies and in some structural characters; other forms will be discovered, as the species of Acholerops are much smaller and more obscure, as a rule, than the components of Eumicrus.

1. **A. zimmermanni** Schaum—Analecta Entomologica, 1841, p. 26 (Scydmænus); *punctatus* Csy.: Cont. Descr. Syst. Col. N. A., II, p. 86 (Eumicrus).

Narrowly suboval, very convex, polished, the head subimpunctate; pronotum finely and somewhat sparsely punctulate, the elytra more coarsely and rather sparsely punctured; pubescence short, stiff, sparse, strongly recurved and subdepressed, coarser toward the flanks of the elytra. Head behind the antennæ distinctly wider than long, the eyes well developed, anterior and not prominent; sides behind them parallel and nearly straight, gradually feebly convergent and broadly rounded to the broadly truncate base, the basal angles rather evident; upper surface only moderately convex throughout; antennal prominences distinct, separated by $\frac{1}{4}$ the total width. Antennæ fully $\frac{1}{2}$ as long as the body, the club slender, gradually and feebly incrassate; basal joint cylindric, narrowed toward base, more than twice as long as wide, only slightly thicker than the second and $\frac{3}{5}$ longer; two to eight slender, subequal in thickness, cylindric; second very little thicker, $\frac{3}{5}$, third $\frac{3}{4}$, fourth $\frac{2}{5}$, fifth $\frac{4}{5}$, sixth $\frac{1}{2}$, seventh and eighth equal and just visibly, longer than wide; six to eight only slightly oblique at apex; ninth as long as the two preceding and $\frac{2}{3}$ thicker, obconic, $\frac{1}{4}$ longer than wide; tenth equally long and a little wider, slightly elongate; eleventh still slightly thicker, gradually pointed, much shorter than the two preceding. Prothorax slightly longer than wide, $\frac{1}{4}$ wider than the head, widest and rounded laterally at apical third, the sides thence oblique and straight to the base; surface strongly convex, more coarsely, closely and rugosely punctured toward base, the subbasal foveæ not distinct. Elytra $\frac{1}{2}$ longer than wide, a little more than twice as long as the prothorax and $\frac{2}{3}$ wider, widest just before the middle, the sides very evenly and broadly rounded from base to apex; humeri scarcely visibly tumid above; disk without basal or sutural modification. Pygidium equilatero-triangular, rounded at apex, very convex, sparsely pubescent. Legs long, the femora rather strongly but gradually clavate; hind tarsi $\frac{4}{5}$ as long as the tibiæ, the first joint longer than the fifth. Length 1.45 mm.; width 0.55 mm.

Michigan (Ann Arbor) and Pennsylvania. The description given above is drawn from the original type of *punctatus*. A large series from Pennsylvania agrees well, and in this series I can only distinguish the male from the female by the broader and somewhat larger head and very slightly stouter form; both sexes seem to have the sixth segment very large and longer than the preceding four, and there is generally a small apical and more densely pubescent erosion. The anterior tarsi are rapidly stouter toward base and densely papillose beneath.

If this species is correctly identified, I cannot understand the statement twice made in the original description—"coleopteris . . . confertim punctulatis," and "coleoptera . . . subtiliter punctata"—when the elytra are unusually strongly punctured; it was described by Schaum from a Carolina specimen sent by Zimmermann. Motschulsky states (Études Ent., 5, 1856, p. 11) that the *S. zimmermanni* of Schaum, lives with ants under the bark of old trees, where he took it near Atlanta, Georgia.

2. **A. retrusa** n. sp.—Moderately stout and rather ventricose, polished, the head impunctate; pronotum excessively finely, sparsely punctulate and not more distinctly so toward base, the elytra sparsely and very minutely punctate; pubescence rather sparse, nearly even, short and subdecumbent. *Head* quite distinctly wider than long behind the antennæ, with the sides perfectly parallel, evenly and broadly arcuate throughout, rounding subtransversely for a short distance to the neck, which is about $\frac{2}{3}$ as wide as the head; eyes small and not prominent; surface feebly and evenly convex, the scanty hairs arranged subtransversely; antennal prominences not distinct, the frontal lobe short and broadly rounded. *Antennæ* barely $\frac{1}{2}$ as long as the body, slender, the club rather rapidly incrassate; basal joint narrowed at base, fully twice as long as wide, distinctly thicker than the second but only about $\frac{1}{3}$ longer, the second very slightly thicker and much longer than the third, feebly obconic; second nearly once, third and fourth equal, $\frac{2}{5}$, fifth $\frac{2}{3}$, sixth $\frac{1}{4}$, longer than wide; six to eight oblique at apex; seventh and eighth subequal, scarcely wider, much shorter than wide; ninth rather small, barely as long as the two preceding and only $\frac{1}{2}$ wider, obconic, slightly elongate; tenth much larger, longer than the ninth and $\frac{1}{2}$ wider, obtrapezoidal with rounded sides, about as long as wide; eleventh only just visibly thicker, oval, gradually pointed, much shorter than the two preceding. *Prothorax* rather longer than wide, more than $\frac{2}{5}$ wider than the head, widest and evenly rounded laterally at apical third, the sides thence oblique and straight to the base; surface strongly convex, very feebly and transversely impressed near the basal margin, with two minute and very approximate subbasal foveæ near each side. *Elytra* subrhomboidal, strongly convex, scarcely more than $\frac{1}{3}$ longer than wide, a little more than twice as long as the prothorax and $\frac{3}{4}$ wider, widest and strongly rounded just before the middle; sides strongly convergent and nearly

straight thence to base and to the apex, which is narrowly subtruncate; humeri not evident, the tumid mes-episternum visible in the reëntrant angle, as is frequently the case throughout the family; disk even, the base fitted closely against the arcuate base of the prothorax, with a small erosion at the middle of the basal margin of each. *Pygidium* small, feebly convex, equilaterotriangular with rounded apex, finely punctulate and rugulose, somewhat oblique, not vertical, and visible from above to some extent. *Legs* moderate in length and rather slender, the femora quite feebly and gradually clavate; hind tarsi very much shorter than the tibiæ, with the first joint only moderately elongate but equal to the next two. Length 1.0–1.2 mm.; width 0.4–0.48 mm.

Pennsylvania (Westmoreland Co.). Mr. Schmitt.

The male described above has the anterior tarsi distinctly dilated toward base and papillose beneath, and the sixth ventral segment large, longer than the four preceding, with the apex rather strongly rounded. The female is somewhat smaller than the male, with shorter and more slender antennæ, and relatively shorter and still more obviously rhomboidal elytra which conceal the pygidium, the latter more vertical; the sixth ventral is very much shorter than in the male, and the anterior tarsi are slender and completely undilated. The species appears to occur in considerable abundance.

CERAMPHIS n. gen.

The single species representing this genus is one of the most remarkable types of the family, and differs to an extraordinary degree from Eumicrus and Acholerops, the metasternum extending in one large unbroken expanse from side to side, without trace of the met-episternal suture which is so marked and strongly developed a feature in those genera; this is all the more remarkable when we consider the extremely short and inflated hind body. It also differs profoundly from all other types of the Eumicrini in having the prothorax geometrically conical, with a much larger extent of prosternum before the coxæ, and in the abruptly inflated hind body alluded to, but in the elongated posterior trochanters, short abdomen with arcuate segments, large, vertical and convex pygidium and structure of the front and palpi, it is similar, and therefore cannot be separated tribally; in this connection, it should be stated that in the absence of a met-episternal suture the genus is quite homologous with the European *Cholerus rufus*, although having no special resemblance otherwise with that aberrant ally of Eumicrus and Acholerops.

The head is borne on a deeply constricted neck, the constriction transverse and simple, the upper surface strongly tumid in the middle toward base, the eyes anterior; front truncate, with a feeble median projection, the antennal cavities large, separated by a narrow and entire lamina, the clypeus below rather advanced, broad and conical, approaching the form distinctive of Leptomastax. Labrum short, transverse, feebly arcuate at apex, not impressed, the mandibles moderate, evenly arcuate, acute at apex, each with a slender median tooth internally, that of the right only slightly the longer. Antennæ approximate, the basal joint moderate in length, excavated above at apex for the reflexion of the funicle, the club elongate, 3-jointed and finely pubescent as in Eumicrus. Maxillary palpi long and slender, clothed sparsely with coarse erect setæ and not minutely pubescent, the third joint longer than the second, narrowed gradually toward base, the fourth minute, obtuse, inserted rigidly and axially within its apex, the last joint of the labial slender, oblique and subulate. Mentum trapezoidal and concave, with two discal setæ as usual. Prothorax conical, without trace of lateral margin or subbasal foveæ or impression. Scutellum distinct, triangular, tumid as in Eumicrus but broader. Elytra without basal foveæ, entire and broadly rounded at apex, the pygidium large, convex and vertical. Prosternum very elongate, shining and glabrous before the coxæ, with a densely and longly setose fovea at the anterior margin of each, deeply and circularly emarginate at apex. Middle coxæ very approximate, the mesosternum between them apparently not carinate. Hind coxæ rather small, transversely oval, mutually separated by rather more, and each from the sides of the body by rather less, than their own width. Abdomen very short, the basal segment much longer than the next four, which are extremely short. Legs well developed, the hind trochanters much elongated and feebly obconic, the femora distinctly but gradually clavate, the tarsi short and stout, gradually thickened toward base throughout, the anterior not particularly dilated in the male.

1. **C. deformata** Horn—Trans. Am. Ent. Soc., XII, 1885, p. 138 (Scydmænus).

Very stout, convex and ventricose, polished, impunctate, dark rufo-testaceous throughout, the elytra rather brighter rufous; legs and antennæ paler testaceous; pubescence sparse, pale, coarse, inconspicuous anteriorly but dense and bristling from the sides of

the occiput, suberect, moderately long and distinct on the elytra. Head behind the antennæ $\frac{3}{5}$ wider than long, the eyes well developed, convex and prominent; sides behind them converging and rounded to the neck; surface strongly tumid and elevated toward the median line, especially toward base. Antennæ $\frac{3}{4}$ as long as the body, rather stout, irregular, the club slender and feebly incrassate; basal joint scarcely $\frac{1}{2}$ longer than the second and only slightly thicker, $2\frac{3}{4}$ times as long as wide; second subcylindric, $\frac{4}{5}$ longer than wide, almost as long as the next two, which are obconic, slightly longer and shorter than wide respectively; fifth dilated, wider than long, angulate at the external apical angle and deeply excavated at the apex externally; next three joints subequal, not wider than the fourth, scarcely modified, wider than long; ninth very feebly obconic, not quite as long as the two preceding and scarcely more than $\frac{1}{4}$ wider, fully $\frac{1}{4}$ longer than wide; tenth obconic, as long as the two preceding and fully $\frac{1}{2}$ thicker than the ninth, nearly $\frac{1}{3}$ longer than wide; eleventh suboval, thicker than the tenth but less than $\frac{1}{2}$ longer, obliquely pointed in apical half, gradually oblique externally toward base. Prothorax evenly conic, as long as wide, apex $\frac{3}{4}$ as wide as the base, the latter equal in width to the head; sides perfectly straight throughout the entire length; disk transversely and slightly tumid before the basal margin toward the middle. Elytra about as long as wide, $\frac{4}{5}$ longer than the prothorax and a little more than twice as wide, widest and more strongly rounded at the middle; humeri rounded but distinctly exposed at base, not tumid above; disk with a large shallow impression at the base of each, evenly convex and not otherwise modified. Pygidium impunctate, pubescent, equilatero-triangular, obtuse at apex. Legs rather long, the femora gradually and moderately clavate; basal joint of the hind tarsi barely as long as the next two, the apex of the tibiæ with a fringe of spinules. Length 1.5 mm.; width 0.73 mm.

California (Los Angeles) and Arizona. Apparently not rare; the description is taken from the male, but the sixth ventral is not much elongated and is very much shorter than the first; in the female the antennæ are probably simple. The most important structural characters of this species were overlooked by Dr. Horn, and the fourth palpal joint is not subulate as stated by that author, but the figure (l. c., plate) is quite accurate in outline.

CLIDICINÆ.

This subfamily is but scantily represented in the United States by a single genus, containing species which are moderate or small in size, and contrasting greatly in this respect with the large and vigorous members of the genus Clidicus inhabiting Java and adjacent warm regions of the world, or even with Mastigus, which is well represented in southern Europe. The fourth palpal joint varies in structure even more than in the Scydmæninæ, from the fused and indistinct form of Leptomastax, to the large, oval and nearly free form of Mastigus, these types of structure affording good criteria for tribal separation. The three tribes represented before may be distinguished by the following characters:—

Last joint of the maxillary palpi very indistinct, forming an oblique, convex, feebly and excentrically pointed surface at the apex of the third, with which it is completely fused, the two forming a stout and evenly suboval mass, which is very minutely and densely pubescent; prosternum greatly developed before the coxæ; elytra striato-punctate.....LEPTOMASTACINI

Last joint small and conical but distinct, rigidly inserted within the tip of the third, with which it is broadly fused, not oblique or only feebly so; prosternum moderately developed before the coxæ; elytra striato-punctate.

CLIDICINI

Last joint large, oval, wider than, and almost as long as, the third, with which however it is united by a rather broad and subanchylosed base; prosternum moderately developed before the coxæ; elytra confusedly punctured.

MASTIGINI

The first and third of these tribes are purely European and are introduced merely for comparison; the Mastigini lead toward some probably extinct form in the gradual development and isolation of the fourth palpal joint. The association of Leptomastax and Ablepton with Mastigus in a single tribal group, as proposed in the recent catalogue of Heyden, Reitter and Weise, is not philosophic or in accordance with the radical nature of the palpal differences.

Leptomastax is devoid of all trace of eyes, having the head large, rounded and depressed, the clypeus forming an extremely short transverse piece between the front and the large, corneous and emarginate labrum, and the mandibles extremely long, slender and evenly arcuate, while Ablepton has the head very small and the mandibles much less developed, the eyes being present but extremely rudimentary, consisting of a single small convex facet. Mastigus has the body very strongly convex, with the head longi-

tudinally impressed, the eyes well developed, the basal joint of the antennæ greatly, and the second also notably, elongate, and the labial palpi stout and subinflated; it is one of the most isolated types of the family and should undoubtedly form a distinct tribe.

The genus Hecotus of Sharp (Biologia Centrali-Americana, II, pt. 1, 1887, p. 70), is sufficiently abnormal not only to render its affinity with Clidicus very doubtful, but even to suggest some question of its being a member of the Scydmænidæ. Nothing further will be necessary than to invite attention to the abdomen, which is said to have five segments, and to the scutellum, which is shown distinctly in the drawing through unmentioned in the description. There is generally no distinct trace of a scutellum between the elytra in the Clidicinæ, and no scydmænid is known to me having less than six perfectly formed ventral segments.

Clidicini.

The genus Clidicus and related forms are much less abundant in subarctic faunal regions than the Leptomastacini, but Papusus will probably contain a limited number of species distributed through the arid regions of Mexico. It is not possible to present a table of genera on account of the paucity of material.

PAPUSUS n. gen.

The body in this genus is elongate-oval in form and rather convex, the head large, borne on a deeply and simply constricted neck, which is rather broad, the eyes well developed, on the sides at or just before the middle, feebly convex, not prominent and consisting of very coarse and convex lenses, the antennæ inserted in small and remotely separated foveæ at the summit of the long and feebly declivous front, just before the middle of the length; they are strongly geniculate, with the basal joint elongate, not quite equal to the next three in length, and the remainder are feebly and gradually incrassate to the tip, with but the feeblest trace of a 5-jointed club. The clypeus is short, transverse, continuing the feeble slope of the front and separated therefrom by a straight transverse suture, the apex transversely and very broadly truncate, the labrum much narrower, short, transverse, polished, corneous, emarginate at apex and bearing only some six long setæ in a transverse and arcuate subapical series. Mandibles moderately large, very stout, straight toward base, gradually bent

toward apex. Maxillary palpi long and rather slender, well developed, the second joint feebly bent, gradually enlarged and rather coarsely pubescent, the third distinctly longer, narrowly and evenly obconic, minutely and densely pubescent, the fourth rather more than $\frac{1}{3}$ as long as the third, conic, not quite as wide at base as the tip of the third and similarly pubescent; the labial palpi are moderate in length, slender, the second joint moderately elongate and feebly fusiform, the third slender, oblique and subulate, the second with a short and erect seta projecting from the side of the apex, suggestive of the enormously developed spines of Leptomastax. Mentum transverse, flat, trapezoidal, polished and glabrous. Gular sutures separated rather widely at the neck, very rapidly and arcuately diverging anteriorly.

The prothorax is strongly obovate, broadly rounding at base, without lateral margin or subbasal modification of any kind, the prosternum before the coxæ flat, about twice as wide as long, circularly emarginate at apex and finely, uniformly and moderately densely pubescent, the margins of the acetabula minutely elevated, the coxæ stout and conovoidal. Elytra elongate-elliptical, punctato-striate, entire, apparently connate, not at all impressed at base, the scutellum not visible. Mesosternum large, not carinate, widely enclosing the coxæ at the sides, the side-pieces flat and not tumid, the coxæ very large, globular, extremely approximate. Metasternum very short, the episterna triangular, distinctly exposed, becoming very widely so behind and almost, but not quite, attaining the coxæ as in Leptomastax, the hind coxæ very small, widely separated, globular, with a short truncate extension, the trochanters small and triangular. Abdomen very long and well developed, broadly convex, almost twice as long as the remainder of the hind body, with the sutures straight and transverse, the first segment almost as long as the next three, the last as long as the preceding two and narrowly rounded, entirely enclosed within the elytra. Legs moderate in length, rather stout, the femora strongly and rather gradually clavate, the tibiæ straight, densely pubescent, the anterior tarsi slender, gradually thicker toward base, the intermediate a little longer but thick, cylindric and very minutely, densely pubescent, the posterior much longer and very slender, filiform, $\frac{2}{3}$ as long as the tibiæ, the four basal joints decreasing almost evenly, the first $\frac{2}{5}$ longer than the second; claws moderate in length, feebly arcuate and very minutely setose or pectinate within throughout the length.

The resemblance of this genus to Leptomastax is evident principally in the elongate form and peculiar habitus of the body, in the structure of the legs, hind coxæ, metasternum and its parapleuræ, and in the mode of antennal insertion. In Ablepton the antennæ are inserted in much larger and more perpendicular frontal cavities, and the clypeus and labrum, as well as the mandibles, are altogether different from the corresponding parts in Leptomastax. Papusus differs from Clidicus not only in the much smaller size of its species, *Clidicus grandis* being some 7 mm. in length, but apparently in the more elongate second antennal joint and well developed eyes.

1. **P. macer** n. sp.—Elongate, rather convex, shining, impunctate anteriorly, the elytra with regular and feebly impressed series of small shallow punctures toward the suture, which become finer and confused toward the sides; pubescence fine, very short and decumbent on the head, coarser, subdecumbent, equally dense but more conspicuous on the prothorax, coarse, very strongly inclined and recurved, moderate in length and abundance and longer toward the sides and tip on the elytra, pale in color. *Head* triangular, as long as wide, the sides toward base including the eyes parallel and evenly arcuate; eyes at their own length from the base, which is broad, the constriction deep above; neck ½ as wide as head; upper surface finely impressed along the median line from the antennæ to the base; antennal prominences very small, the cavities minute beneath them. *Antennæ* ½ as long as the body, rather slender, gradually and feebly incrassate distally, separated at base by about ½ the maximum width, strongly geniculate, the basal joint slender, gradually narrowed toward base, as long as the second, third and ½ of the fourth joints and distinctly thicker, smooth, with decumbent pubescence; second distinctly longer and just visibly thicker than the third, obconic, fully twice as long as wide; third ⅔, fourth ½, longer than wide; three to six gradually a little thicker, constricted at base, obconic; fifth ⅔, sixth ½, longer than wide; seventh to tenth from as long as wide to a little wider, more triangular, with strongly rounded sides; seven to eleven forming a very indistinct club; eleventh not as long as the two preceding, longer than wide, very obliquely and acutely pointed at tip. *Prothorax* fully as long as wide, scarcely perceptibly wider than the head, widest and strongly rounded laterally at apical fourth, the sides thence strongly oblique and nearly straight to the base, which is rounded and scarcely more than ⅔ as wide as the broadly arcuate apex; disk evenly and moderately convex throughout, without trace of subbasal modification. *Elytra* elongate and subelliptical, widest near basal ⅖, ⅗ longer than wide, 2½ time, as long as the prothorax and scarcely ⅔ wider, gradually more pointed apically, the sides almost evenly arcuate; humeri obsolete, the sides broadly rounding and oblique to the base of the prothorax; disk not at all impressed or modified. *Legs* moderate in length, rather stout, the posterior longer and slender; femora gradually clavate, the four anterior rather strongly, the posterior moderately. Length 1.8 mm.; width 0.55 mm.

California (Palm Springs, Colorado Desert).

A single specimen of this interesting species was taken by Mr. H. C. Fall under a stone; its sex is not apparent. There is another species of this genus still undescribed in the cabinet of Mr. Schwarz; it is larger and stouter than *macer*.

NOTES.—The *S. bicolor*, referred to by Schaufuss in suppressing the name *bicolor* Lec., is evidently the *Anthicus bicolor* of Fabricius, from South America, and not the *S. bicolor* of Denny, as I surmised (ante, p. 371). *Anthicus bicolor* is said by Erichson to be allied to *clavipes* Say (Schaum, Mon., p. 18), but there seems to be too much doubt connected with the subject to warrant a change of name for the present, and I would therefore advocate the retention of the name given by LeConte.

The species placed in Euconnus by Dr. Sharp (Biologia Cent.-Amer.) will, I think, be forced ultimately into several distinct genera. On looking over the admirable figures on the plate, it seems natural to place *giraffa*, *mutandus* and *guatemalenus*, for example, in one genus, and *cheriquensis* and *germanus* in another, the latter distinguished by peculiarities of pronotal sculpture and an unusually elongate antennal club. *Calvus*, as before remarked, will probably enter the genus Pycnophus, although the third joint of the maxillary palpus, as figured, is different from that of *P. rasus*, the type of the genus; it is possible, however, that this may be an oversight on the part of the artist. *Gracilicornis*, *incultus* and some others appear to form each the type of a distinct genus.

The genus Napochus of Thomson, is in all probability closely allied to Connophron, but differs apparently in the more prominent tempora and transverse eyes, and also in having a distinct plica at the sides of the thoracic base.

ADDENDA.

There are several described species in this family within our faunal limits, which I have not been able to place satisfactorily in the tables previously given; these are added as follows for the sake of completeness:—

Scydmænus consobrinus Lec.—Proc. Acad. Nat. Sci., Phila., 1852, p. 154. —Piceous-black, the head glabrous; prothorax rather long, pilose, rounded and narrowed anteriorly, transversely impressed at the base; elytra sparsely pilose, foveate at the base; antennæ clavate, with the penultimate joints rounded. Length .05 inch. New York.

Precisely similar to *clavipes* but differing in the antennæ, these being somewhat longer than the head and prothorax, with joints three to six equal, closely connected and not longer than wide; seven a little larger and slightly conical, eight to ten rounded, not longer than wide; eleven about ½ longer and subacute.

This species may be placed immediately after *Euconnus clavipes* in the table.

Scydmænus mississippicus Zimm.—Trans. Am. Ent. Soc., 1869, p. 251.—Ferruginous-brown, very shining and smooth although tolerably thickly clothed with hair, the head especially thickly covered behind with erect hairs. Prothorax not longer than wide, narrowed in front, with a slight transverse impression behind in which four deep foveæ are visible. Elytra with one longitudinal impression in front near the suture and a fovea near the sharply defined humeral carina. Front thighs much thickened, the front tibiæ strongly compressed toward tip, and, on the inner side, furnished with a brush of hairs. Length nearly $\frac{2}{3}$ line.

It is evident that this species should be placed among those members of the genus Euconnus, which I have designated by the subgeneric name Scopophus, but I cannot identify it with any of those described.

Scydmænus gravidus Lec.—Proc. Acad. Nat. Sci., Phila., 1852, p. 155.—Piceous, pubescent, the prothorax narrowed anteriorly, transversely impressed at the base; elytra shorter than usual, ovate, foveate at the base; antennæ slender, the three last joints rounded and abruptly larger. Length .04 inch. Louisiana.

Stout, piceous, pubescent, the head rounded, with the antennæ a little longer than the head and prothorax, the joints three to eight equal, not elongate , nine and ten more than twice as thick, globular, eleven a little longer, obtuse. Prothorax wider than the head, trapezoidal, narrowed anteriorly, the sides almost straight; base with a strong transverse impression. Elytra somewhat rufous, ovate, twice as wide as the base of the prothorax and forming with it a very indistinct angle, moderately convex; base strongly foveate. Thighs slightly clavate, the tarsi testaceous.

May be placed just before *Connophron trinifer* in the table of that genus; it differs in the transverse impression of the prothorax.

Scydmænus obscurellus Lec.—l. c., p. 153.—Piceous, briefly pubescent, the prothorax rather long, narrowed slightly anteriorly; elytra very slightly impressed at the base; antennal joints rounded, the legs rufescent. Length .045 inch. Georgia (Liberty Co.).

A small species, easily distinguishable by its piceous color and elongate prothorax. Head convex, smooth, strongly pilose at the posterior angles. Antennæ a little longer than the head and prothorax, the joints after the second globular, the four last about $\frac{1}{3}$ thicker than those which precede. Prothorax pilose, not wider than the head, $\frac{1}{2}$ longer than wide, very slightly narrowed in front; apex truncate; sides straight. Elytra $\frac{1}{2}$ wider than the prothorax and forming an almost indistinct angle with it, obliquely narrowed behind the middle, slightly pubescent; base scarcely foveate; feet rufous, the thighs clavate.

This species was taken at the same locality as the unique type of *clavatus*, and the two descriptions are very similar. Those

forms of Connophron having the prothorax almost imperceptibly wider than the head are extremely rare, and there may be reason to suppose that *obscurellus* is extremely closely allied to *Connophron clavatum*, if, indeed, not identical. The length of the prothorax is, of course, overstated in the description of LeConte.

Scydmænus mariæ Lec.—l. c., p. 151.—Rufo-piceous, sparsely pubescent, the vertex bifoveate; prothorax campanulate, obsoletely impressed before the base, foveate at the sides; elytra oval, sparsely and obsoletely punctulate. Length .065 inch. Michigan (St. Mary's River.)

Very similar to *subpunctatus*, but the prothorax is more rounded on the sides anteriorly and distinctly narrowed behind, the basal impression hardly visible and the lateral foveæ less deep. Elytra wider and much less distinctly punctured, the base marked as in that species with four punctures, causing the humeri and suture to appear elevated.

There is reason to believe that this species does not differ from *Scydmænus subpunctatus*.

Scydmænus minimus Bndl.—Entomologica Americana, V, p. 193. Iowa.

As before stated, this species is possibly not distinct from *Opresus misellus* Lec.; its length is said by the author to be .45 to .5 mm., and, if correct, this would prove it to be quite different from *O. luteus*, which I have described from the mountains of Pennsylvania. At any rate, it may be placed next to *misellus* in the table of Opresus previously given. In the figure of Dr. Brendel, the antennæ are very strongly clavate.

Scydmænus ovithorax Bndl.—Trans. Am. Ent. Soc., XX, 1893, p. 283.—Brown, impunctate, thinly pubescent. Head ¾ as wide as the prothorax, nearly quadrate, the front margin tripartite by short impressed lines, declivous anteriorly, the eyes very flat, small, anterior, on the sides and scarcely distinguishable. Antennal club 3-jointed. Prothorax obovate, with rounded sides and no impressions. Elytra elliptical, the humeri obsolete, each feebly depressed at the middle of the base, the sutural lines feebly indicated at basal fourth. Anterior coxæ contiguous; posterior small, mutually remote; femora clavate. Last ventral segment very large, as long as the three preceding. Length 0.8 mm. California (Sta. Clara Co.).

In the figure accompanying this description the fourth palpal joint is shown to be distinct, aciculate and subulate, and there can be no reasonable doubt that *ovithorax* will form the type of a new genus belonging to the tribe Opresini, but differing greatly from any other in the widely separated hind coxæ.

Cephennium breve Schfs.—Berl. Ent. Zeit., XXXI, p. 319.—Breviusculum, nitidum, pallidum, supra pallide pilosum; capite lævi, ante oculos maiores nodulifero; thorace lato, angulis rectis, obtusis, supra visis anticis

rotundatis, lateribus integris, basi bisinuata; elytris ovatis, basi truncata, medio transversim et longitudinaliter quadri-impressa. Long. 1⅕ mm.; lat. ⅗ mm. Hab.—Amer. Sept.

It is not possible to give any useful suggestions concerning this species. The type is in the Berlin museum.

Eumicrus lucanus Horn—Coleop. Baja Cal., 2, Proc. Cal. Acad. Sci., 2, vol. V, p. 235.—"Reddish brown, sparsely clothed with paler, semi-erect hair. Antennæ slender, longer than half the body, fifth joint as long as the preceding two and slightly longer than the two following. Head shining, very minutely sparsely punctate. Thorax longer than wide, apex narrower than base, sides regularly arcuate, widest one-third from apex, disc convex, sparsely and minutely punctulate, at base moderately quadrifoveolate. Elytra not wider at base than the thorax, a slight depression within the humeri, widest at middle, disc convex, surface indistinctly punctulate. Tarsi slender, longer than half the tibiæ. Length .06 inch ; 1.5 mm.

"The male has the anterior tarsi slightly dilated. This species is evidently allied to *commilitonis*, as described and figured by Dr. Sharp (Biol. Cent.-Amer., II, pt. 1, p. 67 ; pl. 2, fig. 22), but is of more elongate form and with more slender antennæ. One specimen, San José del Cabo, with which I associate two from Arizona in my cabinet."

There are but few characters given in this description which are not distinctive of the entire genus, and it is therefore impossible to make any useful comparative statements. The two specimens from Arizona, associated with *lucanus* by the author, are probably not identical, as the species of Eumicrus quite closely resemble each other in general appearance and are decidedly local in habitat in our arid and broken southwestern country. It may be placed just before *motschulskii* in the table of Eumicrus previously given.

STAPHYLINIDÆ.

TRICHOPHYA Mann.

Eumitocerus Csy.

As remarked by Rey, this genus is singularly isolated from its nearest relatives, and constitutes a bond in several directions between the Tachyporini and Aleocharini, resembling the former in mode of antennal insertion, and the latter in its less inclined head, undefined epipleuræ and other characters. Although so similar to Habrocerus in antennal structure, the palpi, epipleuræ, point of antennal insertion and hind coxæ differ profoundly, and the two genera cannot be associated in the same subtribal group.

The three species of the United States, which are represented in the material before me, may be readily separated as follows:—

Labrum broadly sinuato-truncate at apex.

Third joint of the maxillary palpi very much shorter than the fourth; abdomen bristling with long erect setæ toward tip; anterior and intermediate tarsi strongly dilated toward base in the male (Eumitocerus).

tarsalis Csy.

Third joint nearly as long as the fourth; abdomen with but few erect setæ toward tip.....**pilicornis** Gyll.

Labrum larger, subcircularly rounded, narrowly sinuato-truncate at the middle of the apex; third palpal joint quite elongate, though distinctly shorter than the fourth; abdomen without erect setæ toward tip.

lativentris n. sp.

Of the last two species only females are accessible to me at present. *Tarsalis* is rare on the Pacific coast north of San Francisco; it is the smallest of the three. *Pilicornis* is represented by two specimens, taken some years ago near New York City by Mr. H. H. Smith, and may be a recent importation. The third species is much the largest and broadest, and is described below.

T. lativentris.—Stout, elongate-elliptical in outline, moderately convex, blackish, the elytra feebly rufescent; legs and antennæ blackish-piceous, the first two joints of the former, tarsi and trochanters paler; pubescence rather long, moderately dense; surface finely reticulate throughout, shining, rather finely, subasperately and not very densely punctate throughout. *Head* triangular, much wider than long, evenly convex, the eyes basal, convex and finely setose; antennæ inserted far before the eyes at the sides within a large concavity, the foramen adjoining the sides of the scarcely differentiated clypeus; they extend fully to apical third of the elytra, the first two joints stout, each with one or two long erect setæ; remaining joints extremely slender, setose, the outer joints gradually somewhat thickened. *Prothorax* $\frac{4}{5}$ wider than long, the apex truncate, $\frac{3}{4}$ as wide as the base, the latter transverse, with the sinuation before the scutellum very pronounced; disk broadly convex, widest slightly behind the middle, the sides evenly rounded; surface feebly, obliquely subdeplanate toward the sides posteriorly. *Scutellum* rather small, triangular, asperate, nearly as long as wide. *Elytra* shorter than wide, $\frac{1}{2}$ longer than the prothorax, and, at apex, distinctly wider; sides feebly oblique and nearly straight; apex broadly, angularly emarginate; disk broadly impressed at the suture behind the scutellum. *Abdomen*, when contracted, only $\frac{1}{2}$ longer than the elytra and fully as wide, ogival in form, the sides evenly rounding throughout; apex of the fifth segment scarcely $\frac{2}{3}$ the maximum width; segments short and subequal throughout; border moderate in depth. *Legs* slender, the femora slightly thickened; tarsi slender throughout. Length 2.8 mm.; width 0.85 mm.

Colorado (Colorado Springs, 6,000–7,000 feet; June). Mr. Wickham.

Besides the absence of long bristling setæ toward the abdominal apex, this species differs from the other two in lacking the long, erect lateral seta near the base of each elytron, in having the abdominal segments equal in length, the fourth and fifth being more elongate in *tarsalis* and *pilicornis*, and in the more evenly rounded sides of the prothorax.

PSELAPHIDÆ.

Faronini.

MEGARAFONUS n. gen.

In this genus the third antennal joint is very small, as in the European Faronus, the metasternum extremely short, the abdomen large, with the first three dorsals subequal in length, the fourth larger and the first not modified on the disk. From Rafonus it differs in its more abbreviated elytra, still larger first dorsal, in having the antennal tubercles separated by an anterior extension of the frontal pit, and the third antennal joint much smaller; it further differs in having the fourth palpal joint more broadly oval and compressed. Other generic characters are included in the description of the single known species below.

M. ventralis n. sp.—Rather broadly subcuneiform and depressed, gradually wider from the front to near the tip of the abdomen, polished, impunctate and dark rufo-testaceous throughout, the legs and antennæ paler; pubescence moderate in length, rather coarse and abundant, recumbent. *Head* somewhat small, exclusive of mandibles rather wider than long, scarcely $\frac{4}{5}$ as wide as the prothorax, the eyes moderate in size, slightly convex and somewhat prominent, at rather more than their own length from the base, the tempora behind them circularly rounded to the neck, slightly less prominent than the eyes and becoming parallel near them; surface moderately convex, with two strong nude and isolated foveæ at basal fourth, separated by $\frac{1}{3}$ of the entire width; frontal fovea deep and abrupt, with its floor minutely rugose and flat, prolonged posteriorly and narrowed to a slight terminal enlargement at the centre of the vertex, and narrowed anteriorly, crossing the frontal margin, the latter wide between the antennæ, the tubercles extremely feeble; clypeus extremely small, being simply a fine porrect and strongly rounded margin at the foot of the subvertical front between the antennal cavities; labrum strongly transverse, broadly arcuate and subcarinate at apex, except at the sides, which are obliquely and briefly produced and bristling with coarse sparse setæ, the base much narrower than the apex; mandibles very strongly thickened and externally angulate at base, the apical portion subtransverse and finely acuminate, the internal edge very minutely subserrulate; under surface evenly convex, without trace of axial suture, the neck deeply impressed, transversely and

feebly biimpressed at the middle; surface deeply, transversely impressed behind the buccal opening; mentum rather large, flat, quadrate, the apex arcuate; ligula small, the labial palpi small, with the first joint subcylindric and longer than wide, the second smaller, oboval, slightly narrowed at base, with an axial apical setigerous puncture, the seta long and arcuate; the third joint projects as a minute slender cylinder forward from the apex of the third at nearly right angles; maxillary cardo large, triangular, somewhat exserted, the lobe small, setose; maxillary palpi large and well developed, the first joint small, second obconic, twice as long as wide, third fully as long as wide, slightly wider than the second, somewhat narrowed at base, fourth large, oval, as long as the preceding three, fully twice as wide as the third, narrow at base, compressed and more pubescent toward tip. *Antennæ* nearly $\frac{2}{5}$ as long as the body, the basal joint thicker, cylindric, $\frac{1}{2}$ longer than wide; second narrower, oval, longer than wide; third minute, globular; four to eight equal, nearly as thick as the second, subglobular, moniliform; ninth and tenth transverse; nine to eleven wider, forming a distinct club; eleventh but little longer than wide, much shorter than the two preceding. *Prothorax* slightly wider than long, widest and strongly rounded near the middle, the sides strongly and subequally convergent to apex and base, feebly sinuate toward base; apex scarcely $\frac{3}{4}$ as wide as the base; disk moderately convex, with a large, deep and transverse foveiform impression at basal third which is narrowly produced anteriorly for some distance, and a smaller pit at each side near basal fourth, continued posteriorly to the base; there is also a smaller isolated nude fovea near the basal margin at lateral fourth. *Elytra* short and transverse, only very slightly longer than the prothorax and about $\frac{1}{3}$ wider, the sides divergent and feebly arcuate from the just visibly exposed and obtuse humeri; disk completely devoid of humeral plica or basal impression, flat, with two longitudinal impressions on each from behind the base to or behind the middle, the outer near the flank and short, the other near the middle and becoming deep basally; sutural stria deep, with an external fovea at base. *Abdomen* much more than twice as long as the elytra, and, toward tip very much wider, the sides nearly straight and continuing the divergence of the elytral flanks, the border very wide, strongly inclined; apex abruptly narrowed. *Legs* moderate in length, the femora feebly fusiform; third joint of the hind tarsi twice as long as the two basal joints combined; claws well developed; middle coxæ separated by a narrow lamina. Length 2.65 mm.; width 0.8 mm.

Oregon (Portland). Hubbard and Schwarz.

The type is a male, the sixth ventral segment being sinuate at tip, the surface feebly impressed toward the middle, the impression smooth, polished and limited laterally by small erect and sublaminiform tubercles near the apex; the seventh is in the form of an elongate-oval, strongly convex pygidium with its posterior extremity minutely foveate. I cannot perceive that the male modifications in this species are at all asymmetric. This is by

far the largest member of the tribe known thus far from North America.

EUPLECTINI.

A renewed study of the species aggregated under the name Ramecia, shows that they are not in any way closely related to Euplectus, but are allies of Trichonyx, and, at the same time, the close general resemblance to Euplectus in bodily form, in conjunction with the well developed second tarsal claw, goes far to demonstrate the impropriety of proposing two distinct tribal groups for the genera clustering about Trichonyx and Euplectus; at any rate, if we admit two tribes, we must also recognize several others. The species of Ramecia exhibit considerable diversity in general habitus, *crinita* being quite depressed, with two strong, short basal carinæ on the first three tergites; the remainder are more convex in form, much smoother in sculpture and with less developed abdominal carinæ, though in *decora* the latter are also visible on the first three tergites, becoming very minute however on the third. At present, therefore, I can see no reasonable ground for generic disintegration of Ramecia.

PYCNOPLECTUS n. gen.

The species forming the first division of Euplectus, as previously defined by the writer (Col. Not., V, p. 454), are not in reality congeneric with Euplectus as represented by the last two subdivisions, and should receive a separate name as suggested above. The species are stouter, less parallel and much more convex in the body, with more remotely separated and pubescent cephalic foveæ, connected by a more deeply excavated ambient sulcus, rather more elongate antennæ and much more widely exposed met-episterna. They agree with Euplectus in the structure and carination of the abdomen, and in the complete absence of erect capitate setæ on the lower surface of the head.

P. tenellus n. sp.—Linear and nearly parallel, though quite convex, shining, pale rufo-ferruginous throughout, the pubescence rather short, coarse, subdecumbent and moderately dense, with the usual bristling setæ at the sides of the abdomen toward tip. *Head* but slightly wider than long, as wide as the prothorax, the eyes rather prominent and well developed, at somewhat less than their own length from the base, the tempora strongly convergent and rounded behind them; surface impunctate in the middle but rugosely subpunctate along the elevated supra-orbital surface from base to apex; foveæ near basal third, separated by ⅓ the total width, the connecting ambient sulcus

very large and deep throughout; occiput impressed at the middle; antennæ nearly as long as the head and prothorax, the club gradual in formation; ninth and tenth joints moderately transverse, the fifth slightly larger than the other joints of the funicle. *Prothorax* smooth and subimpunctate, strongly convex, fully $\frac{2}{5}$ wider than long, widest near apical third, where the sides are more strongly rounded, thence moderately convergent, broadly arcuate and but slightly uneven to the base; neck about $\frac{1}{2}$ the maximum width; discal fovea rather small, elongate-oval in form, the lateral large and deep, the connecting sulcus strongly biarcuate, coarse and deep toward the middle. *Elytra* nearly quadrate, $\frac{2}{3}$ longer and $\frac{1}{3}$ wider than the prothorax, the sides parallel and broadly arcuate; surface moderately convex, subimpunctate, the discal stria short, not extending to the middle. *Abdomen* narrower than the elytra, the sides straight and parallel; dorsals equal in length, the carinæ of the first two straight, fine, strongly divergent and separated by about $\frac{1}{4}$ the total width. *Legs* moderately short and thick, the third joint of the hind tarsi about as long as the two basal joints combined, with the claw fully $\frac{1}{3}$ as long as the entire tarsus. Length 1.1 mm.; width 0.35 mm.

Pennsylvania (Westmoreland Co.). Mr. Schmitt.

In the male type the fourth ventral seems to be unmodified, the fifth with a small, deep and circularly rounded anterior emargination, but otherwise scarcely modified, the sixth with a broad, sublunate and feeble impression, slightly tumid anteriorly near its extremities; the seventh is rhomboidal, very convex, minutely and sparsely punctate and with a fine, strongly elevated and somewhat asymmetric median carina. The female differs but little, except that the head is distinctly narrower than the prothorax.

This species, which is one of the smallest of the genus, differs from *hudsonicus* in its larger eyes, more convergent tempora, smooth pronotum with short and non-sulciform discal pit, narrower bodily form, and in many other characters.

P. imperfectus n. sp.—Rather large and somewhat stout, convex, elongate, dark rufo-testaceous throughout, impunctate and polished, the pubescence moderately long and coarse and rather sparse. *Head* scarcely as wide as the prothorax, the eyes only moderately large and not very prominent, shorter than the tempora, which are distinctly convergent and broadly arcuate behind them; occiput convex, very obsoletely impressed at the middle; foveæ deep, separated by nearly $\frac{1}{2}$ the total width or twice the distance from either eye, the sulcus large, very deep and parabolic; supra-orbital edges rather distinct, somewhat rugose; antennæ not quite as long as the head and prothorax, the second joint much shorter and narrower than the first, three to eight small and moniliform, eight and nine wider, eleventh still wider and as long as the preceding three combined. *Prothorax* $\frac{2}{5}$ wider than long, widest and prominently rounded at apical third, the sides thence convergent and broadly arcuate to the base, minutely emarginate at the foveæ; disk convex, the discal fovea

very small, lateral large, the connecting sulcus very fine but with a large deep and posteriorly sinuous median portion. *Elytra* quadrate, ⅗ longer than the prothorax and nearly ½ wider, parallel and broadly arcuate at the sides ; surface convex, the discal stria extending not quite to the middle. *Abdomen* longer and only very slightly narrower than the elytra, the sides parallel and feebly arcuate ; dorsals equal in length. the first two impressed at the middle of the base but not carinate. Length 1.5 mm. ; width 0.45 mm.

District of Columbia.

The single female, representing this species, was formerly regarded by me as the female of *congener ;* it cannot have that status, however, as the abdominal carinæ are well developed in *congener* and the pubescence much denser; it may be placed near *congener* for the present.

The measurement of *congener*, previously given, is a little too great, the male type being about 1.35 × 0.4 mm. in size.

EUPLECTUS Leach.

The following species may be placed near *confluens* for the present, differing in the structure of the pronotum.

E. disjunctus n. sp.—Linear, parallel and depressed, polished and bright rufo-testaceous throughout, the pubescence subdecumbent, coarse, moderate in length and rather abundant. *Head* large, much wider than the prothorax and wider than long, the eyes rather well developed and convex, at their own length from the base, the tempora circularly rounded behind them to the neck, which is distinctly less than ½ the maximum width ; surface impunctate along the middle, sparsely punctured toward the sides, with two small and nude foveæ just behind the middle, separated by the eye-distance of either, and connected by a groove in the form of a horse-shoe ; antennæ not as long as the head and prothorax, the three outer joints gradually wider, the last rather longer than the three preceding. *Prothorax* relatively rather small, feebly convex, subimpunctate, only ¼ wider than long, widest and rather narrowly rounded at apical third, the sides thence gradually convergent to the base and feebly bisinuate ; apex more than ½ the maximum width, and fully ¾ as wide as the base ; discal pit narrow and elongate, tending to coalesce with the median subbasal pit, which is moderate in size, but rounded and not joined to the well developed lateral foveæ by a visible transverse sulcus. *Elytra* as long as wide, not quite as long as the head and prothorax, distinctly wider than the head, the sides subparallel and broadly arcuate ; discal stria very short, attenuate, extending to about basal third. *Abdomen* parallel and straight at the sides, slightly longer and narrower than the elytra, the first three dorsals equal, the fourth much longer ; first two each with two short feeble and divergent basal carinæ, separated by less than ⅓ the total width ; border well developed, flat and inclined. *Legs* short and stout ; third joint of the hind tarsi about as long as the second, the claw well developed. Length 1.38 mm.; width 0.4 mm.

Virginia (Lee Co.). Mr. Schwarz.

Represented by a single female example, hitherto confounded with *confluens*, which it resembles somewhat in form and size; in *confluens* the subbasal median pit of the pronotum is extended laterally in a feeble arcuate groove to the lateral foveæ, and, in the present form, the head is larger and more sparsely punctate, and the discal stria of the elytra shorter. The last ventral segment is broadly and arcuately lobed at apex, the surface ascending apically and convex.

BIBLOPLECTUS Reit.

In this genus the body is narrow, linear and subdepressed as in Euplectus, and the mesosternal side-pieces are divided in the same way into two nearly equal triangular sclerites by fine sutures; but in Euplectus the met-episterna are slightly wider anteriorly, while in the present genus they are very narrow, parallel, linear and entirely covered by the elytra, the anterior pubescent foveæ of the metasternum being much smaller and more punctiform. It differs from Euplectus in its more narrowed front, in its 5-jointed antennal club, this beginning really with the seventh joint, and in the type of male sexual form of the seventh ventral segment. As in Euplectus, the middle tibiæ of the male have a distinct internal uncus at apex, but, unlike that genus, the hind tibiæ in the same sex are broadly grooved externally toward tip; the tarsi are much shorter and thicker in the female than in the male. The under surface of the head is completely devoid of erect capitate setæ, but there are four remarkable spiniform appendages arranged in a transverse line anteriorly, one at each apical angle of the mental support, and one at each outer posterior angle of the buccal opening. The first four dorsal segments are exactly equal in length, the fourth not longer as it is in Euplectus.

The species are all minute, and the one described below is closely allied to *integer*.

B. sobrinus n. sp.—Slender and moderately convex, shining, piceous-black throughout, the head slightly paler; legs and antennæ testaceous; pubescence fine, short, decumbent, and not very abundant. *Head* very nearly as wide as the prothorax, but slightly wider than long, the eyes moderate in size, convex, at about their own length from the base, the tempora behind them parallel, rounded and as prominent as the eyes; occiput broadly sinuate,

minutely impressed at the middle ; surface subimpunctate toward base, subscabrous toward the frontal margin ; foveæ small, pubescent, situated slightly behind the middle and separated by ⅓ the total width ; from each extends anteriorly a fine, deep and arcuate groove, the two gradually becoming parallel and uniting by a strongly arcuate moderate impression between the antennal tubercles, which are small but pronounced ; antennæ shorter than the head and prothorax, slender, the first two joints larger and equal, three to six equal, minute and feebly transverse, seventh and eighth wider, equal, ninth and tenth successively still wider and more transverse, the eleventh wider, conoidal, as long as the four preceding combined. *Prothorax* about ¼ wider than long, the sides parallel and straight from apical fourth to basal fifth, there strongly convergent and sinuate to the base, rounded and rapidly convergent at apex ; disk broadly, feebly convex, finely, unevenly and not very densely punctate, without trace of discal pit, the lateral foveæ large, united with the transversely triangular median subbasal depression by fine grooves ; from near the centre of the disk a fine carina extends to the basal margin, crossing the median depression. *Elytra* subquadrate, feebly convex, slightly punctulate, ½ longer and ⅔ wider than the prothorax, the sides parallel and broadly arcuate ; three basal foveæ of each strongly developed, the outer continued posteriorly for a very short distance by a feeble and gradually evanescent sulcus. *Abdomen* very nearly as long and wide as the elytra, parallel and nearly straight at the sides, moderately convex transversely, the first two dorsals each with a very feeble basal impression in median third of the entire width, but not carinate. Length 0.8 mm.; width 0.28–0.3 mm.

Rhode Island (Boston Neck).

The male of this species differs from that of *integer* in its slightly larger head, with less abbreviated antennæ and more widely separated foveæ, in the more transverse prothorax, much less broadly rounded and convergent at the sides toward apex, and in the narrower impression of the basal tergites, which, on the second segment of *integer*, appears to extend through nearly half the total width, though so feeble as to be scarcely definable; the pubescence is a little shorter and denser in *integer*. The described type is a male, the female scarcely differing however in general form. The series before me is quite extended, and there is scarcely any variation in size; the males seem to be much less abundant than the females.

The genera allied to Trimium, forming section 12 of the table previously published by me (Col. Not. V, p. 442), and section A_1 B_2 of the arrangement of Mr. Raffray in the "Étude," require very much more elaboration than has hitherto been accorded them. Trimioplectus, which is now represented before me by a good series taken by Mr. Schmitt, must be associated with these

genera, although the eleventh antennal joint is relatively smaller, and the ninth and tenth joints larger than usual; it is evidently homologous in this respect with the African Periplectus of Raffray. The antennæ are short throughout this peculiar group of exceedingly minute and obscure forms, widely separated at base and with the last joint large, relatively abrupt and elongate-ogival in form; the body is less linear than in the allies of Euplectus, elongate-oval and always distinctly convex. I would suggest the following arrangement of genera, those not North American being marked with an asterisk:—

Antennæ 11-jointed.
- Ninth and tenth antennal joints very short, lenticular and transverse, the tenth frequently excentric and transversely triangular.
  - Last joint of the maxillary palpi normal, much longer and thicker than the third.
    - Elytra with a post-humeral pit, from which an acutely elevated cariniform line extends to the apex.
      - The elytra with a discal stria extending to about the middle; pronotum with a well defined lateral edge toward base, and two large lateral foveæ connected by transverse posteriorly cuspiform groove.
        - Tenth antennal joint scarcely at all modified and generally symmetric; head never wider than the prothorax, with two parabolically connected foveæ distant from the eyes; dorsal segments equal in length toward base..... **Actium**
        - Tenth antennal joint abnormal, transversely triangular.
          - Head very large, with two connected foveæ distant from the eyes; dorsal segments equal in length toward base....* **Trimiopsis**
          - Head small, with two very widely separated foveæ near the eyes; first dorsal segment longer than the second, with two long and conspicuous carinæ..... **Actiastes**
      - The elytra without a discal stria, but having instead a large elongate basal fovea as in Trimium.
        - Pronotum with well defined lateral edges and a large pubescent fovea at each side at some distance from the margin, connected by the usual transverse sulcus; first dorsal longer than the second; tenth antennal joint transversely triangular... **Cupila**
        - Pronotum without well defined lateral edges, and without definite pubescent foveæ.
          - First dorsal longer than the second; tenth antennal joint transversely triangular; pronotal sulcus not continued down the flanks, the conformation as in Trimium..... **Simplona**
          - First dorsal not longer than the following, non-carinate and scarcely at all modified at base; tenth antennal joint normal

and symmetric ; pronotal sulcus continued down the flanks as in Melba.....***Zolium**

Elytra without trace of a post-humeral fovea, frequently having a fine oblique pleural line proceeding from a point on or near the side margin to the apex, which line may or may not be homologous with the elevated carinal line of Actium and allies ; elytra without a discal stria, but having a large, more or less elongate and rapidly attenuate basal impression.

Prothorax narrowed at base but unconstricted ; abdomen not constricted at base.

First dorsal segment much elongated.

The first dorsal deeply impressed at the middle of the base ; pronotal sulcus not continued down the flanks, but ending abruptly in small nude enlargements near the margin. ***Trimium**

The first dorsal without trace of a median depression ; body shorter and stouter ; pronotal sulcus continued down the flanks as in Melba.....**Trimiomelba**

First dorsal shorter, equal in length to the following, not impressed at base ; pronotal sulcus continued down the flanks.....**Melba**

Prothorax deeply constricted at the sides before the base ; abdomen feebly constricted at base, the first dorsal slightly elongate ; pronotal sulcus as in Melba.....**Dalmosella**

Last joint of the maxillary palpi not, or but slightly, larger than the third ; cephalic foveæ elongate but not connected ; prothorax apparently as in Trimium ; dorsal sagments subequal [Brendel].....**Basolum**

Ninth and tenth joints larger, much less transverse and symmetric, the eleventh relatively not so large ; elytra with a discal stria.

Elytra with two basal foveæ but without post-humeral fovea, the prothorax toward base as in Trimium ; first dorsal and second ventral elongate, not modified at base.....**Trimioplectus**

Elytra with three basal foveæ. Zanzibar.....***Periplectus**

Antennæ 10-jointed, the ninth produced and acuminate internally. Singapore.....***Prophilus**

This particular group of trimiiform genera appears to be much more abundant and structurally diversified in the American continents than in the old world, and will prove to be very extensive, as the species have been but seldom collected hitherto owing to their minute size and secluded habits.

Remarks.

Actium Csy.—This genus will include *californicum*, *politum*, *robustulum*, *testaceum*, *candidum*, *marinicum*, *pacificum*, *brevipenne*, *globifer*, *parabolicum* and the two species described below. It is much better represented on the Pacific coast than in the At-

lantic regions, but *angustum* seems to be perfectly congeneric with the west coast forms. I am somewhat doubtful in regard to *globifer* and *parabolicum*, which are not represented in the material before me; they appear to have the discal stria of the elytra much more abbreviated than usual.

A. angustum n. sp.—Narrow, elongate, convex and moderately ventricose, polished, impunctate and pale rufo-testaceous throughout; pubescence moderate in length and rather sparse, subdecumbent. *Head* very slightly narrower than the prothorax, a little wider than long, the eyes well developed, convex, prominent, at about their own length from the base, the tempora much less prominent, feebly convergent and broadly arcuate behind them; occiput feebly impressed at the middle; foveæ deep, slightly pubescent, just behind the middle, separated by fully $\frac{2}{5}$ of the total width, the connecting impression shallow and angular in form, the antennal prominences strongly tumid; antennæ $\frac{1}{2}$ longer than the head, the last joint elongate, gradually ogival and almost as long as the preceding five joints, the tenth $2\frac{1}{2}$ times as wide as long, slightly oblique and a little more developed toward the outer side. *Prothorax* as long as wide, widest and moderately rounded near the middle, the sides broadly and rather deeply sinuate thence to the base; surface convex, the lateral foveæ not very large but deep and subpubescent, connected by a deep transverse groove which is posteriorly enlarged at the middle. *Elytra* almost as long as wide, very convex, $\frac{2}{5}$ longer and fully $\frac{4}{5}$ wider than the prothorax, the sides divergent from the rather widely exposed humeri, becoming strongly arcuate behind; basal foveæ two in number; discal stria fine and extending almost to the middle. *Abdomen* about as long as the elytra and slightly narrower, the sides parallel and feebly arcuate; basal segment equal to the following, with two short basal carinæ separated by $\frac{1}{3}$ of the discal width. *Legs* moderate in length, the femora feebly and equally inflated. Length 1.2 mm.; width 0.4 mm.

Pennsylvania (Westmoreland Co.). Mr. Schmitt.

A number of specimens were sent to me under the name *Trimioplectus parabolicus*, but according to the description and figure, that species, the locality of which was not indicated by the author, must be quite different. The description is from the male, in which sex the sixth ventral is broadly and feebly impressed, and the oblong-oval flat enclosed pygidium of the seventh is much smaller than in the Pacific coast forms. The female is less ventricose than the male, with a slightly smaller head and very much smaller eyes.

A. bifoveatum n. sp.—Elongate, the hind body wider, convex, polished, subimpunctate, the elytra minutely, subrugosely punctulate, rufo-testaceous in color, the pubescence subdecumbent, rather short and moderately abundant. *Head* small, very much narrower than the prothorax, fully as long as wide, the

eyes moderate in size, convex, at more than their own length from the base, the tempora behind them much less prominent, parallel and scarcely arcuate to the truncate base, the latter very feebly and minutely impressed at the base of the occiput ; foveæ slightly behind the middle, large, deep and separated by ½ the total width ; antennæ partially missing in the type. *Prothorax* slightly wider than long, widest and somewhat prominently rounded before the middle, the sides thence convergent and not at all s nuate to the base ; foveæ large and deep, connected by a very coarse and deep transverse sulcus, which is angularly dilated posteriorly at the middle ; median line finely and feebly impressed. *Elytra* not quite as long as wide, ⅖ longer and nearly ⅘ wider than the prothorax ; humeral plica rather prominent ; sides nearly parallel, broadly and evenly arcuate throughout ; disk broadly convex, the sutural stria deep and straight ; discal stria distinct, extending well behind the middle ; basal foveæ two in number, the intra-humeral depression large. *Abdomen* decidedly narrower and somewhat longer than the elytra, parallel and very feebly arcuate at the sides ; segments equal in length toward base, convex, minutely and sparsely punctulate basally, the basal carinæ rather short, straight, parallel and separated by fully ⅓ of the discal width ; secondtral ven segment nearly as long as the next two combined. Length 1.6 mm. ; width 0.6 mm.

California (Siskiyou Co.).

This very isolated species can be distinguished at once from any other, with bifoveate elytral base, by its large size, very small head, finely impressed median line of the pronotum, finely rugulose elytra with an unusually long discal stria and by many other characters. It is represented by a single female in rather poor condition.

Trimiopsis Reit.—The type of this genus is *T. claviceps* Reit., from Colombia (Deutsch Ent. Zeits., XXVI, 1882, p. 150), an insect of rather large size for the present group, and having a remarkable cephalic development. Most of the minute species, subsequently placed here by Reitter, belong to other genera ; *specularis*, for instance, is assignable to Melba and *eggersi*, which I erroneously regarded as typical of Trimiopsis (Col. Not. V, p. 462), must form the type of another genus named " Zolium " in the table. Some of the characters given in the table in defining Trimiopsis are assumed, as no allusion to them is made in the original description, such as the presence of a post-humeral fovea, isolated lateral pronotal foveæ and elongate discal stria of the elytra, for example. There seems to be a tendency in the large terminal joint of the antennæ to split at apex along an axial plane in many of these minute trimioid forms, and the notice which I formerly drew to this character in *specularis* (l. c.) is of no significance from a generic viewpoint.

Actiastes n. gen.—Founded upon a minute species previously referred by me to Actium, but differing so much in the arrangement of the cephalic foveæ, more elongate basal segment of the dorsum and other characters, as to demand a separate genus. Its type is *Trimium foveicolle* Lec., which I have taken abundantly in Rhode Island, and also received through Mr. Schmitt, from the mountains of Pennsylvania. *Costalis*, of Brendel, undoubtedly belongs to this genus, and may be identical with *foveicollis*; but if his measurements are correct, it must be materially larger.

Cupila n. gen.—This distinct genus has for its type the *Trimium clavicorne*, of Mäklin, a male of which, from Astoria, Oregon, was kindly given me by Mr. Schwarz. The black color of the body alone might have led to the inference of generic divergence from Actium, in which the species are all pale, as this difference in the coloration would tend to indicate marked differences in habits and environment. The genus departs from Actium in its less convex and more linear form of body, complete absence of discal elytral stria, this being replaced by the elongate basal fovea of Trimium, in its elongate basal segment of the dorsum, this having two extremely minute and parallel basal carinæ separated by scarcely $\frac{1}{5}$ of the discal width, and other characters as related in the table. The sparse subdecumbent pubescence of the abdomen streams outward in a remarkable manner, and the male ventral characters are very striking and confined to the third segment; this segment is profoundly excavated to its base at about lateral third, the excavations apparently confluent beneath the median ligula, which is dilated at apex and impressed laterally. The hind tarsi are long, with the second joint fully $\frac{2}{3}$ longer than the third. The under surface of the head has exceedingly few erect setæ, their extremities minutely capitulate as usual.

Simplona n. gen.—The transverse pronotal sulcus in this genus terminates laterally in slightly dilated, very deep and perfectly nude foveæ near the rounded and indefinite lateral margin, as in Trimium, and the tenth antennal joint is as strongly triangular in a transverse sense as in Trimiopsis, and more so than in Trimium. From the latter genus it is distinguishable at once by the large and deep post-humeral fovea and pleural carina, which are there completely wanting. The single type is described as follows :—

S. arizonica n. sp.—Slender and linear, though quite convex, shining, the elytra subalutaceous, very pale flavo-testaceous in color throughout, the head and prothorax minutely, sparsely and asperately subpunctate, the elytra scarcely visibly, sparsely and very minutely punctulate; pubescence short, decumbent and moderately dense. *Head* as wide as the prothorax, rather wider than long, the eyes well developed, at rather less than their own length from the base, the tempora less prominent and circularly rounded behind them to the neck; base broadly sinuato-truncate, not obviously impressed at the middle; foveæ rather small but deep, just behind the middle and separated by $\frac{2}{5}$ of the entire width, united transversely by a very broadly subtriangular groove extending anteriorly only half way to the interantennal line, the frontal margin throughout broadly tumid, the antennal tubercles not well defined; antennæ very short, scarcely $\frac{1}{2}$ longer than the head, the eleventh joint large, conoidal, as long as the five or six preceding joints combined and twice as wide as the ninth, the base oblique, tenth triangular; erect capitate setæ of the under surface rather short and few in number. Prothorax but slightly wider than long, widest and not very prominently rounded at about the middle, the sides broadly arcuate and convergent anteriorly, convergent and sinuate toward base; transverse sulcus strongly flexed posteriorly at the middle or biarcuate; disk convex and even. *Elytra* not quite as long as wide, scarcely $\frac{2}{5}$ longer and about $\frac{3}{4}$ wider than the prothorax, the humeri quite well exposed at base; sides feebly divergent and broadly arcuate throughout from base to apex; disk moderately convex; sutural stria very coarse and deep; basal pit slightly elongate. *Abdomen* longer than the elytra and but little narrower, the sides feebly arcuate; surface broadly convex, the first visible dorsal with two short basal carinæ separated by rather less than $\frac{1}{3}$ of the total width and limiting a decided basal depression, distinctly longer than the second; two to four diminishing gradually in length. *Legs* short, the femora only moderately stout. Length 0.95 mm.; width 0.28 mm.

Arizona (Williams). Mr. Wickham.

The abdomen in the single female type is strongly extended and perfectly straight in profile, not deflexed toward tip.

Zolium n. gen.—The body in this genus is very nearly as in Melba, being similarly short and convex, rather ventricose and with the pronotal sulcus continuous down the flanks without trace of foveæ, but here there is a small but well developed posthumeral fovea and pleural cariniform line as in Actium. The type is *Trimiopsis eggersi* Reit., from the island of St. Thomas. In this species the pleural cariniform line is paralleled above by a series of small punctures, each of which bears a short squamiform hair, and the foveæ of the head are discal, remote from the eyes and wholly isolated; the head is about equal in width to the prothorax. The sixth antennal joint of the male is slightly dilated,

and the ventral characters are somewhat as in *Cupila clavicornis* Mäkl, the third segment having a large rectangular lamina at lateral third, from beneath which projects obliquely and laterally a singular wart-like elevation, bearing at its summit a cluster of remarkable squamules; the sixth segment is much longer than the fifth, scarcely modified, and the seventh, or ventral pygidium, is small and transversely fusiform; ventrals two to five decrease rather rapidly in length. The last joint of the maxilliary palpi is elongate, gradually swollen within toward base, and is longer than the entire basal portion.

Trimium Aubé—This genus appears to be exclusively palæarctic, and does not occur at all in the American continents. As represented by *brevicorne*, the body is more elongate than in Melba, and differs altogether in the formation of the basal parts of the prothorax, the transverse dorsal sulcus not extending at all down the flanks, but terminating at some slight distance within the rounded lateral edges, in small deep and glabrous enlargements; the foveæ of the head are nude, rather widely separated and feebly connected by a large shallow ambient depression; tenth antennal joint slightly asymmetric and transversely triangular or cuneiform. Elytra with an elongate discal fovea at base, without trace of a post-humeral fovea, but with a very fine pleural line extending parallel to the side margin from before the middle to the apex, its anterior point of origin entirely indefinite. First dorsal elongate, with a median depression at base, the second ventral nearly as long as the next three combined. Tarsi slender and densely clothed with very short stiff hairs, the terminal claw quite small, slender and feebly arcuate.

Trimiomelba n. gen.—Greatly resembles Melba in the form of body, but differs in the elongate first dorsal and second ventral segment, which character is accompanied by a larger head, flatter above, with the sides more abruptly vertical, the foveæ more remote; the head is frequently, or perhaps always, more or less modified in the male, which seems never to be the case in Melba. The penultimate antennal joints are small, lenticular and symmetric. The hind tarsi are long and slender, the second joint twice as long as the third, the claw very small and slender. The species are three in number as follows:—

Prothorax shorter, not longer than wide, less rounded at the sides anteriorly, the apex but slightly narrower than the base.....**lævis** n. sp.

Prothorax narrower, fully as long as wide, the sides more arcuate and the apex somewhat narrower when compared with the base.

Front obtusely rounded between the antennæ ; cephalic foveæ small and subperforate.....**convexula** Lec.

Front more narrowly subangulate, the head more punctulate toward the sides ; foveæ larger, more widely impressed and rather less remotely separated ; pubescence a little coarser.....**dubia** Lec.

The characters of the table are drawn from the female throughout. The genus is confined, so far as known, to the Atlantic coast regions.

T. lævis.—Strongly convex, highly polished, impunctate and uniformly pale flavo-testaceous throughout, moderately ventricose, the pubescence very fine, short, decumbent and rather inconspicuous though somewhat abundant. *Head* rather large, fully as wide as the prothorax, almost as long as wide, feebly convex, the eyes very small, slightly prominent, at nearly twice their own length from the base, the tempora less prominent behind them, long, feebly convergent and but slightly arcuate to the basal angles, which are obtusely rounded ; occiput not visibly impressed ; foveæ slightly behind the middle, large, separated by more than ½ the entire width, the ambient sulcus large but shallow, becoming lost anteriorly in the shallow depression between the moderate antennal prominences, the sulcus with some scattered coarse punctures near the prominences ; antennæ ½ longer than the head, the last joint very large, conoidal, almost as long as the six preceding joints combined. *Prothorax* as long as wide, widest but not very prominently rounded at the middle, the sides thence feebly convergent and broadly arcuate to the apex, more rapidly so and sinuate to the base ; transverse sulcus deep, strongly angulated at the middle, continued down the flanks. *Elytra* distinctly shorter than wide, nearly as long as the head and prothorax and about ⅘ wider, the sides divergent from the slightly prominent humeri to the apex and rather strongly, evenly arcuate ; intra-humeral fovea deep, vanishing at about basal fourth ; sutural stria fine. *Abdomen* slightly narrower and somewhat longer than the elytra, the sides feebly convergent and slightly arcuate, the apex parabolic ; first dorsal nearly as long as the next two, with two slender parallel basal carinæ ⅓ or ¼ as long as the segment and separated by ⅕ the entire width ; second ventral rather longer than the next three combined, with two slender parallel basal carinæ nearly ⅓ as long as the segment. *Legs* and tarsi slender, the femora but slightly inflated in the female. Length 0.8 mm. ; width 0.35 mm.

District of Columbia.

This species is allied to *convexula*, which was described from Tampa, Florida, my representative being from Crescent City. It differs from *convexula*, as compared in the female, in its rather

smaller eyes, longer, less arcuate and less converging tempora, unimpressed occiput, broader head and prothorax with less rounded sides of the latter, and in several other features.

As usual in the present genus, the elytra have at the sides a fine line beginning at the base, extending posteriorly, very gradually receding from the edge, more rapidly toward tip and attaining the elytral apex; this line does not seem to be entirely homologous with the very strong post-foveal carina of Cupila and related genera. The sutures defining the side-pieces of the mesosternum are obliterated, but there is a fine straight longitudinal carina extending from the apical margin to the hind limits of the middle coxæ; at some slight distance externally from them, and just external to this carina at its posterior limit, there begins a large and deeply impressed channel, extending obliquely outward and vanishing at about the middle of the metasternum at a considerable distance from the side margins. In Melba the conformation of these parts is nearly similar, but the oblique channel is very short and the elytral flanks have an oblique line extending from near the middle of the lateral edges to the apex.

Melba n. gen.—This genus will include *Trimium thoracicum* and *puncticolle*, and, in all probability, also *parvulum*, *gracile*, *laticolle*, *majus* and *discolor*, which I have not seen. The head is not quite so large as in Trimiomelba, and is apparently not modified in the male, the last antennal joint large and conoidal, the two penultimate joints small, lenticular, gradually wider and virtually symmetric. The first dorsal segment is not elongate and is not narrowed at base as it is in Dalmosella, the second ventral not as long as the next two and bi- or triexcavate sublaterally at base, the sixth large in the male, the seventh enclosing a large, oblong-oval, liguliform pygidium. In the male the anterior, and especially the intermediate, femora are greatly swollen, while in Trimiomelba this character is scarcely noticeable. In *Melba sulcatula* the intermediate male tibiæ are obtusely but strongly prominent within just beyond the middle, this character not being observable in the corresponding sex of any other species which I have seen. In *puncticollis* the abdominal carinæ are very short and separated by about $\frac{1}{2}$ the discal width; in *thoracica*, which is nearly similar, the carinæ are slightly longer and are separated by only about $\frac{1}{5}$ of that width. *Trimiopsis specularis* Reit., from

the island of St. Thomas, may be assigned to this genus for the present, although the male sexual characters are of a slightly different order, the ventral pygidium being much shorter and semicircular, the second and third ventrals tuberculate sublaterally, and the anterior and intermediate femora not particularly swollen; the anterior femur is foveate on the posterior edge just beyond the middle, and the corresponding edge of the middle femur is carinate at the middle.

The species of Melba are all very small in size and may be assigned to four groups by the following characters:—

Basal intra-humeral fovea of the elytra short.
  Pronotum impunctate.
    Occiput impressed or canaliculate at the middle .....Group 1
    Occiput not impressed .....Group 2
  Pronotum finely and asperately punctate .....Group 3
Basal fovea large and elongate; species rather less minute .....Group 4

The first group comprises *parvula*, *texana*, *sulcatula*, *laticollis* and *discolor*, the second *gracilis* of Brendel, the third *puncticollis* and *thoracica*, and the fourth *maja*, *fossiger* and *uniformis*. *Discolor* is said to have no occipital impression by Dr. Brendel in his paper on the genus Trimium (Tr. Am. Ent. Soc., XIX, p. 166), but is particularly defined by its channeled occiput in the monograph of the Pselaphidæ by that author (Nat. Hist. Bull. Univ. Iowa, II, pp. 32 and 34); the latter statement is in agreement with the description of LeConte.

The four species which follow appear to be undescribed hitherto.

M. texana n. sp.—Moderately ventricose, strongly convex, polished and impunctate, pale testaceous throughout, the pubescence fine, short, decumbent and rather dense. *Head* slightly though distinctly, narrower than the prothorax, as long as wide, with two rather small nude foveæ just behind the middle, separated by nearly ½ the entire width, the ambient connecting depression very shallow and feeble throughout; antennal tubercles somewhat small but pronounced; eyes rather small, at much more than their own length from the base, the tempora behind them a little less prominent, very feebly convergent and straight, somewhat abruptly rounded at base, the occipital impression rather short and feeble; antennæ normal, nearly as in *parvula*. *Prothorax* slightly wider than long, widest and a little more strongly rounded at the middle, the sides moderately convergent and arcuate thence to the apex, sinuate toward base and parallel in basal fourth; sulcus distinct, broadly biarcuate. *Elytra* distinctly shorter than wide, nearly ½ longer and ⅘ wider than the prothorax, the sides strongly divergent from the moderately exposed

humeri and distinctly arcuate, the disk moderately convex, widest behind the middle, the basal fovea short but deep. *Abdomen* slightly longer and narrower than the elytra, the sides parallel and feebly arcuate, parabolic as usual at apex; dorsal segments equal, the first with two extremely minute basal carinæ $\frac{1}{5}$ or $\frac{1}{6}$ as long as the segment and separated by b t little more than $\frac{1}{5}$ the discal width; between each and the side margin there is a series of small elevated detached granules along the basal margin. Length 0.85 mm.; width 0.33 mm.

Texas (Columbus). Hubbard and Schwarz.

The intermediate femora in the male type described above, are greatly swollen, the upper edge very strongly arcuate, the lower feebly sinuate, the tibiæ simple; the fifth ventral is notably short, scarcely visible except laterally, the sixth large, slightly flattened toward the middle and the horizontal pygidium rather large, as wide as long, circularly rounded behind, nearly flat and quite impunctate. In the female the head is slightly smaller but similar otherwise. Two specimens.

Texana is closely related to *discolor*, but differs in color, that species being described as chestnut-brown with the abdomen darker; *discolor* is said by LeConte to occur in Louisiana.

M. sulcatula n. sp.—Moderately stout, convex, shining, impunctate and pale brownish-testaceous throughout, the pubescence very short, fine, decumbent and abundant. *Head* slightly narrower than the prothorax, convex, not quite as long as wide, the eyes small but rather prominent, at slightly more than their own length from the base, the tempora behind them less prominent, slightly convergent and somewhat arcuate to the base; occiput with a long median channel; foveæ moderate in size, deep, just behind the middle, connected by a deep angulate sulcus, separated by rather less than $\frac{1}{2}$ the entire width; supra-antennal prominences pronounced, crossed obliquely by a narrow groove; antennæ $\frac{1}{2}$ longer than the head, slender, the second joint larger and more oval than the first, eleventh very large, conoidal, more than twice as thick as the tenth and as long as the five preceding. *Prothorax* distinctly wider than long, the sides parallel and almost evenly rounded, strongly narrowed at base, the sides becoming parallel in basal third or fourth; disk strongly convex, the sulcus deep, strongly angulated at the middle, continued uninterruptedly down the flanks. *Elytra* distinctly shorter than wide, $\frac{2}{5}$ longer and $\frac{3}{4}$ wider than the prothorax, the sides moderately divergent from the slightly prominent humeri to the apex and broadly, rather strongly arcuate; intra-humeral fovea deep, evanescent before basal third, the sutural stria fine and feeble. *Abdomen* rather longer than the elytra and nearly as wide, the sides parallel and feebly arcuate; apex broadly parabolic; dorsals equal, the first with two short fine parallel carinæ at base, separated by about $\frac{1}{5}$ of the entire width. Length 0.8 mm.; width 0.3 mm.

Pennsylvania (Westmoreland Co.). Mr. Schmitt.

Besides the tibial character before referred to, the anterior femora of the male above described are moderately, the intermediate very strongly, swollen, the upper contour of the latter strongly arcuate, the lower very feebly sinuate toward the middle; the posterior trochanters are acute at tip, the abdominal characters extremely feeble and the ventral pygidium large. The female differs but little, the head being only slightly smaller than in the male.

This minute species is allied to *parvula*, but differs in the elongate occipital impression, which takes the form of a fine sulcus extending anteriorly to a point midway between the foveæ. In *parvula*, which was described from a unique taken in the neighborhood of Charleston, S. C., the transverse sulcus of the pronotum is said to be nearly straight; in *sulcatula* it is distinctly though broadly angulate. It is probable that the *Trimium parvulum*, described by Dr. Brendel in his revision of the genus Trimium, is the present species or one closely allied.

M. fossiger n. sp.—Moderately stout and ventricose, strongly convex, polished and impunctate throughout, pale brownish-testaceous, the legs and antennæ slightly more flavate; pubescence rather coarse, short, subdecumbent, only moderately abundant. *Head* very slightly narrower than the prothorax, as long as wide, the eyes moderate in prominence, rather small, at much more than their own length from the base, the tempora behind them but slightly less prominent, long, feebly arcuate and but just visibly convergent to the base, the angles well defined though rounded; base distinctly impressed at the middle, the impression not prolonged forward to the vertex; foveæ large, moderately deep, nude, situated just behind the middle and separated by nearly ½ the total width, united by a very feebly impressed ambient sulcus, which is not materially enlarged behind the slightly tumid frontal margin; antennal prominences small but rather distinct; antennæ ½ longer than the head, the second joint oval, distinctly larger than the first, ninth but little wider than the preceding, transversely cuneiform, tenth distinctly wider, very short and transversely lenticular, virtually symmetric, the eleventh as long as the five preceding combined and twice as wide as the tenth. *Prothorax* distinctly wider than long, the sides parallel and circularly arcuate anteriorly, strongly convergent and sinuate toward base, the sulcus strong, only moderately cuspid posteriorly at the middle. *Elytra* distinctly shorter than wide, ½ longer and more than ¾ wider than prothorax, the sides strongly divergent, strongly arcuate especially behind the middle, where they are materially wider than at apex; humeri slightly exposed, the plica narrow and pronounced; basal fovea large, elongate, gradually attenuate and extending fully to the middle of the disk. *Abdomen* a little longer and narrower than the elytra, convex, the dorsals equal toward base, the first with two slender, flat,

gradually pointed and feebly converging carinæ in less than basal third, separated by about ⅕ of the discal width. *Legs* rather slender, the femora moderately dilated. Length 1.0 mm.; width 0.4 mm.

New York.

Described from a single female example and evidently closely related to the Iowan *maja*, of Brendel, in the large and elongate basal fovea of the elytra; although elongate this fovea does not assume the form of a stria however. The sutural stria is deep and straight, and is gradually shallowed externally but without indication of any particularly distinct punctures, as alluded to in the description of *maja*.

M. uniformis n. sp.—Strongly convex, moderately ventricose and impunctate, resembling the preceding in color and vestiture. *Head* about equal in width to the prothorax, fully as long as wide, the eyes rather well developed, moderately convex and prominent, at scarcely more than their own length from the base, the tempora behind them slightly less prominent, quite distinctly convergent and continuously arcuate to the base; occiput distinctly impressed at the middle, the impression carried forward, gradually becoming feeble nearly to the line of the foveæ, the latter rather large and deep, nude, at basal ⅖ and separated by nearly ½ the total width, connected by a feeble ambient sulcus; antennal prominences small but strong; antennæ nearly as in *fossiger*, except that the ninth joint is but little larger than the eighth and almost perfectly symmetric, the tenth not so broad and less than ½ as wide as the eleventh. *Prothorax* slightly wider than long, the sides circularly arcuate, becoming abruptly straight and parallel in rather more than basal fourth, the sulcus broadly biarcuate and rather deep, not dilated at the median flexure. *Elytra* nearly as in *fossiger* but rather less abbreviated, with the sides not quite so divergent from the moderately prominent humeri, the basal fovea large, rather abruptly evanescent and extending through basal ⅖ of the length; sutural stria not obviously punctured externally, except very minutely and feebly toward tip. *Abdomen* as long as the elytra and obviously narrower, convex, the dorsals equal, the first with two flat triangular parallel carinæ in less than basal third, separated by less than ⅕ of the discal width. *Legs* rather slender, the femora moderately inflated. Length 1.0 mm.; width 0.4 mm.

Rhode Island (Boston Neck).

Also described from the female and closely related to the preceding, differing in its less elongate and more rounded tempora, more anteriorly extended occipital sulcus, relatively somewhat smaller prothorax, shorter, deeper and more abruptly defined basal fovea of the elytra and some other characters. It is rather remarkable that of the sixteen examples before me not one is a male, and, so far as I know, the male in this peculiar group, having a more elongate basal fovea of the elytra, remains unknown.

Dalmosella n. gen.—The general form of the body in this genus is nearly as in Melba, but narrower and slightly less convex. The antennæ differ quite distinctly in structure, being shorter and more compact, with the ninth and tenth joints larger, the latter transversely triangular and the eleventh more evenly and acutely conical; the cephalic foveæ are larger and strongly pubescent, the eyes more developed and the abdomen slightly narrowed or constricted at the base. The mesoparapleuræ are obliquely divided by a fine suture, the epimeron much the larger, with its posterior margin strongly defined by a transverse, anteriorly arcuate suture extending from the coxæ to the elytral margin; adjoining this line posteriorly, there is a large pubescent fovea. The flanks of the elytra have a fine line extending from about basal third to the apex and parallel throughout to the side margin. Dalmosella includes some of the most minute of the Pselaphidæ, and, besides the type described below, I am inclined to assign to it the *Trimium americanum* and *T. simplex* of LeConte, the former being 0.6, the latter 0.5 mm. in length.

D. tenuis n. sp.—Narrow, subparallel, moderately convex, impunctate, pale brownish-testaceous throughout, the pubescence moderately short, subdecumbent, quite coarse and not very dense. *Head* a little narrower than the prothorax and quite distinctly wider than long, the eyes rather large and well developed, convex, finely faceted and at about ½ of their own length from the base, the tempora much less prominent, convergent and obtusely rounded behind them; occiput just visibly impressed at base but not sulcate; foveæ large, deep, pubescent, at about the middle of the length and separated by a little less than ½ the entire width, united by a very feeble arcuate impression scarcely extending ½ the distance to the frontal margin, the latter arcuate at tip; antennæ very short, scarcely ½ longer than the head, the two basal joints larger as usual and subequal, the second somewhat angularly prominent within, three to seven equal in width, short and compactly joined, eighth a little wider, transversely oval, ninth still wider, lenticular, almost symmetric, tenth wider and transversely triangular, eleventh conical, only ⅓ wider than the tenth, as long as the five preceding combined. *Prothorax* slightly wider than long, widest at about the middle, the sides convergent and rounded anteriorly, the transverse biarcuate sulcus distinct, deep on the descending flanks constricting the prothorax between basal third and fourth, the surface bordering the stricture anteriorly not very prominent but more strongly pubescent; sulcus not dilated at the middle; disk even. *Elytra* not quite as long as wide, ⅔ longer and ¾ wider than the prothorax, the sides broadly arcuate, nearly parallel and but feebly divergent from the slightly exposed humeri, widest behind the middle; disk moderately convex, the sutural groove rather deep, the discal reduced to a large subelongate basal fovea as in Trimium. *Abdomen* rather

longer than the elytra and only just visibly narrower, widest at the middle, the sides parallel and somewhat strongly arcuate ; first dorsal a little longer than the second, with two short parallel basal carinæ, ⅓ as long as the segment and separated by rather more than ⅓ of the discal width, the intervening surface somewhat more impressed ; ventrals two to four rather long, rapidly decreasing in length, the fifth much shorter. *Legs* slender, the femora but slightly inflated, the hind tarsi rather elongate, with the second joint nearly twice as long and thick as the third ; claw very small. Length 0.7 mm.; width 0.27 mm.

Pennsylvania (Westmoreland Co.). Mr. Schmitt.

The only specimen known to me is a female. The under surface of the head has but few very short capitate setæ, and the ventral sutures are straight and transverse throughout.

Basolum n. gen.—This name is proposed for a genus which appears to be rendered necessary to fit the published characters of *Trimium impunctatum* of Brendel, from the middle Atlantic regions. The head is said to have two oblong isolated foveæ, the ambient sulcus wholly obsolete, the first antennal joint elongate, being twice as long as wide, the maxillary palpi small, with the third joint obliquely rounded and larger than the fourth, which is obliquely conoidal; the elytra are said to have a fine discal stria extending to the middle. The described characters of the maxillary palpi are extraordinary and wholly exceptional among the genera allied to Trimium and Actium ; this, and the elongate basal joint of the antennæ, would necessitate its generic isolation under any circumstances, and I am by no means certain that it will prove to be allied to Trimium at all. For the present I would also place in this genus the *Trimium durum* of Brendel, (Tr. Am. Ent. Soc., XIX, p. 166), in the description of which it is stated that the frontal sulcus is interrupted at the middle, that the discal stria of the elytra extends to the middle and that the third joint of the maxillary palpus is globular, half as thick as the fourth, the latter but little longer than wide. If *durum* is not a Basolum it will require a distinct genus, on account of palpal structure. I have been unable to study either of these remarkable species. On request, Mr. Ulke, of Washington, sent me what he stated to be the only example of *T. impunctatum* in his cabinet. This proves to be merely a representative of a species of Actium, apparently identical with *angustum*, described above, having the basal joint of the antennæ rather smaller than the second, the cephalic foveæ united by a deep parabolic sulcus and the palpi perfectly normal.

I can scarcely imagine, however, that Dr. Brendel could have made three such radical mistakes in his description of *impunctatum*, and therefore leave the matter for further development.

Trimioplectus Bndl.—The body in this genus, as represented by *T. obsoletus*, the type and only known species, is convex and formed nearly as in Melba, the mesoparapleuræ and metasternal fovea as in Dalmosella, the flanks of the elytra wholly without trace of post-humeral fovea, but with a fine line parallel to the side margin in apical half. The biarcuate pronotal sulcus is almost exactly as in the European Trimium, being at a greater distance from the base than in the related American genera owing to the greater elongation of the prothorax, and ending near the lateral edges in slight, nude, punctiform dilatations. The head is smaller than the prothorax, wider than long, with large well developed eyes and short tempora, and with two small, nude, widely separated and wholly isolated foveæ at some distance behind the middle, the frontal margin rather wide and separated from the vertex by a feeble transverse sulcus, which is feebly and posteriorly arcuate and disconnected in every way from the foveæ; the palpi are normally trimiiform. The antennæ are much longer than in any of the allies of Trimium or Actium, and the joints are less transverse and more loosely connected, the tenth joint of the male about $\frac{1}{2}$ wider than long, the eleventh but little longer than the preceding three combined. The long bristling setæ of the under surface do not seem to terminate in knob-like enlargements, but to have their extremities asperate for a short distance. The discal impression of the elytra extends broadly impressed and substriiform to or beyond the middle. The abdomen is formed in quite a different manner from that characterizing the allies of Melba and Trimium, the segments decreasing in width from the apex of the first; the first dorsal is notably longer than the second, with a feeble transverse impression at base extending through nearly $\frac{1}{2}$ the discal width and limited by abrupt but scarcely cariniform lateral extremities, the formation nearly as in Trimium. The second ventral in the male is nearly as long as the next four combined along the middle, but much shorter at the sides, the seventh in the form of a transverse semicircular pygidium, and the third has a small pubescent tubercle at the apex and lateral fourth or fifth.

The genus is remarkably isolated among the American forms,

but seems to be allied, as before stated, to Periplectus, from the east coast of southern Africa.

BATRISINI.

BATRISUS Aubé.

The possession of a long terminal appendage of the hind tibiæ characterizes by far the greater number of forms inhabiting the Atlantic coast regions, and, if the genus is to be divided, this will perhaps prove to be a better criterion than the pronotal sculpture assumed by Reitter; the genus Arthmius, which is constantly assumed by Reitter and Raffray to be a subgenus of Batrisus, is in no way closely related, as I have previously pointed out; the South American species with strongly modified front in the males possibly do not belong to Arthmius at all. In some of the eastern species of Batrisus there are sexual differences in the pygidium analogous to those known to exist in the California representatives. In *schaumi*, for example, the pygidium of the male is semicircular and merely tumid, while in the female it has a short but acutely elevated discal carina; in that species the long slender spine of the intermediate legs projects from basal third or fourth of the femur of both sexes, and is not confined to the male or attached to the trochanter as stated by Brendel.

B. temporalis n. sp.—Rather slender, convex, polished, pale rufo-testaceous in color throughout, minutely and sparsely punctulate, the punctules of the head and pronotum feebly asperate; pubescence moderate in length, strongly reclined, coarse and somewhat sparse. *Head* distinctly narrower than the prothorax and rather longer than wide, the eyes moderate in size, convex and prominent, at a little less than their own length from the base, the tempora nearly parallel, feebly arcuate and less prominent behind them to the basal angles, which are well defined; upper surface but slightly convex, shining behind, dull in nearly apical half owing to very coarse polygonally crowded punctures which extend to the transverse crest of the front between the antennæ; there the front becomes declivous in about 45 degrees, and narrowed between the large antennal cavities, with the apex broadly and feebly bilobed; the surface of the sloping portion is deeply and broadly excavated, polished and impunctate, and has at the middle a triangular elevation prolonged anteriorly into a fine process projecting in the feeble sinus of the apical margin; the triangular elevation bears two pairs of acute setigerous tubercles both arranged transversely, the posterior much the larger, the anterior very approximate and minute; the clypeus beneath has a double edge, with a medial cariniform setigerous elevation, the apex of which appears at a slight distance before the sinus of the bilobed frontal edge and at the same level; posteriorly

there are two large deep nude and widely separated foveæ at basal third, the oblique attendant impressions large and feeble, not confluent anteriorly, also a strong median carina extending from apical to basal third and a fine arcuate carina at some distance above the eyes. *Antennæ* distinctly longer than the head and prothorax, perfectly simple, except the basal joint, which is cylindrical, minutely punctate, with the basal margin abruptly dilated; second joint about as long as the third and but little thicker; outer three joints gradually wider; tenth as long as wide; eleventh scarcely as long as the two preceding. *Prothorax* about as long as wide, widest and rather strongly rounded anteriorly, the sides gradually convergent toward base, sinuate opposite the lateral foveæ which are large, deep and nude, with a portion of their external margin cariniform and elevated; they are prolonged anteriorly for a considerable distance in a gradually evanescent impression, but are wholly isolated transversely; an acute spiniform process arises nearly midway between each and the median line, which is deeply grooved throughout, except near the base, where the groove becomes a feeble carina; a feeble longitudinal ridge extends anteriorly from each spiniform process. *Elytra* nearly ½ longer and ¾ wider than the prothorax, convex, the sides divergent and strongly arcuate; humeral plica strong but not spiniferous, the discal impression large but rapidly evanescent; three basal foveæ deep, nude and perforate. *Abdomen* rapidly narrowed from base to apex, the latter very narrowly rounded; sides very feebly arcuate; basal carinæ fine but strong, parallel, fully ⅓ as long as the segment and separated by ⅕ the discal width. *Pygidium* rather small, but slightly transverse, feebly and evenly tumid, rather sparsely and subasperately punctulate. *Legs* moderate in length, the anterior femora subcarinate along the lower edge, especially near basal fourth, but not otherwise modified, the anterior tarsi short and thick. Length 1.75–2.0 mm.; width 0.55–0.65 mm.

Pennsylvania (Westmoreland Co.) Mr. Schmitt.

The description applies to the male only, and the female is quite different, being sensibly smaller, with the eyes a little smaller and less prominent, the tempora longer and distinctly convergent, with the basal angles very obtuse, the antennæ shorter and more slender, the front unmodified and merely coarsely scabro-punctate on the apical slope, the prothorax relatively narrower and not wider than the head, the abdominal carinæ shorter and slightly more widely separated, the pygidium a little shorter and more transverse, rather more tumid and with coarser elevated punctures and the anterior tarsi longer and more slender. The modification of the anterior femora is similar to that of the male. The last ventral of the male has a large and very shallow impression, the lateral limits of which are slightly tumid. *Scabriceps*, to which the present species is allied, is larger and differs radically in the structure of the front and tempora, and in having the small eleva-

tion immediately behind each lateral fovea of the pronotum acute and not rounded as it is in *temporalis*.

B. fossicauda n. sp.—Moderately stout and strongly convex, polished, blackish-piceous in color, the legs and antennæ testaceous, the elytra and anterior parts also sometimes paler; integuments subimpunctate, the pubescence rather long, subdecumbent, coarse, pale and rather sparse. *Head* equal in width to the prothorax, rather longer than wide, the base circularly rounded from eye to eye, the latter rather small but convex and prominent, at distinctly more than their own length from the base; upper surface moderately convex, with a feeble carina at some distance above each eye, the median carina subobsolete; foveæ moderate in size but very deep, nude and punctiform, situated rather behind the eyes and remote, separated by nearly ½ the entire width, the impressions subobsolete; the surface begins gradually to slope from far behind the line of the antennæ, but at a point which is entirely undefined, the slope continuing gradually and uniformly in a large flat surface to a broadly and subcircularly arcuate apical margin far before the antennæ, attaining and only a slight distance above the apical margin of the clypeus, the shallow vertical wall separating the two edges perfectly smooth and slightly concave; the flat and feebly sloping front becomes slightly elevated along the antennal cavities, and its sculpture consists of rather distant anastomosing elevated lines, somewhat smoother sublaterally and merging gradually into coarse polygonal punctures posteriorly. *Antennæ* very short, not longer than the head and prothorax, the basal joint stout but short, broadly swollen beneath, becoming impunctate; second somewhat shorter but a little thicker than the third; sixth as long as wide; seventh a little shorter; eighth not wider but shorter; ninth decidedly wider, slightly transverse, obtrapezoidal; tenth much wider and decidedly transverse; eleventh not quite as wide as the tenth, a little longer than the preceding two combined; the tenth has on the under surface a large circular cavity, extending from the base to apical fourth. *Prothorax* nearly as long as wide, widest and rather strongly rounded well before the middle, the sides strongly convergent and broadly sinuate toward base; disk with three large, deep, feebly and arcuately connected foveæ and two erect spiniform processes in a transverse line near the base, the lateral foveæ continued anteriorly for some distance in feeble evanescent depressions, the spines in fine feeble subcariniform ridges; median line finely impressed, not extending to the apex, finely carinate between the fovea and the base. *Elytra* distinctly shorter than wide, ⅖ longer and ¾ wider than the prothorax, the sides divergent and very strongly arcuate throughout; humeral plica small but acutely spinose; discal impression not extending to the middle; three basal foveæ perforate. *Abdomen* longer than the elytra, not quite as wide, acutely ogival in form; basal carinæ short, triangular, enclosing nearly ⅓ of the discal width. *Pygidium* rather transverse, circularly rounded beneath, the surface strongly convex, sparsely punctate, with a broad, deep, smooth and polished concave excavation bordering the lower margin throughout the width. *Legs* rather long, the femora stout, the anterior tarsi ½ as long as the tibiæ, slender and compressed. Length 2.1 mm.; width 0.6–0.7 mm.

Pennsylvania (Westmoreland Co.). Mr. Schmitt.

The female differs from the male, above described, in having the pygidium a little larger and more transverse, rather less convex, with the groove along the lower margin narrower but rather deeper and with its upper margin more acute and subcariniform; the last ventral is broadly convex, while in the male it has a rather small and elongate-oval median impression, smooth and of moderate depth. In the female the structure of the front does not differ greatly from that of the male but the sculpture is finer and denser and the antennæ are simple, the last three joints gradually wider; the foveæ are less basal and somewhat less widely separated and the basal carinæ of the abdomen are still shorter and separated by fully $\frac{1}{3}$ of the discal width. In the general form of the body the sexes do not differ greatly, but the elytra in the female are less abbreviated and about as long and wide as the abdomen.

This species may be placed near *lineaticollis* and *bistriatus*, differing from both in the less tumid pygidium with transversely excavated lower margin. The last named species are mutually very closely allied, differing slightly in antennal structure and form of the elytra, these being more elongated and with less arcuate sides in *lineaticollis*; in *bistriatus* the canaliculate median line of the pronotum of *lineaticollis* is almost or quite completely wanting; the male sexual characters are nearly identical, but the front before the antennæ in the male of *lineaticollis* is slightly longer and more concave than in the corresponding sex of *bistriatus*.

B. uncicornis n. sp.—Rather stout, polished and subimpunctate, the elytra sparsely and feebly, though somewhat coarsely, punctato-rugose; body pale rufo-testaceous throughout; pubescence rather long, subdecumbent and moderately abundant. *Head* large, much wider than the prothorax, wider than long, the eyes rather well developed, convex and prominent, at nearly their own length from the base, the tempora behind them much less prominent, very strongly convergent and broadly arcuate to the neck; upper surface polished and convex, impunctate, except the supra-antennal regions and declivous front, which are coarsely punctate, the punctures mutually separated, the median and lateral carinæ fine, long, straight and parallel; foveæ large, deep, nude and separated by $\frac{1}{2}$ the total width, each continued forward in a broad shallow sulcus, the two feebly arcuate and convergent, becoming approximate on the line of the antennæ but not confluent; front gradually and moderately declivous in a convex surface, the sides before the antennæ straight and convergent to a simple, acute and rectangular point, bristling at and toward the

apex with coarse yellowish setæ along the edge, the apex extending immediately above the truncate apical margin of the clypeus, the latter with a double concave apex. *Antennæ* ½ as long as the body, moderately stout, the basal joint nearly twice as long as wide, slightly swollen beneath toward base; second longer than wide, as long as the third and thicker; three to seven subsimilar, feebly obconic and longer than wide, the eighth of equal thickness but not quite as long as wide; ninth distinctly thicker, not quite as long as wide, the tenth still thicker, obtrapezoidal, about as long as wide, with a deep internal excavation toward tip, the eleventh very long, somewhat bent, nearly as long as the preceding four combined, the base oblique and prolonged internally in a long posteriorly oblique corneous process, which is receivable in the large excavation of the tenth joint. *Prothorax* not quite as long as wide, widest and prominently rounded at the sides only very slightly before the middle, the sides convergent and sinuate thence to the base, rounded anteriorly; disk very convex, with three large nude foveæ, the median slightly the smallest, and two feeble spiniform protuberances all in a transverse line near the base, the foveæ not connected, the lateral prolonged forward in feeble, gradually evanescent depressions, the median in a deep abrupt groove not extending quite to the apex, the spines in fine short longitudinal carinæ. *Elytra* almost as long as wide, ½ longer than the prothorax and nearly twice as wide, the sides divergent and strongly, evenly arcuate from base to apex, the humeral plica large but short and not very prominent, not spinose; surface convex; discal impression moderate, rapidly evanescent, the three basal foveæ deep, punctiform and equal. *Abdomen* convex, shorter and narrower than the elytra, the basal carinæ stout, rapidly acuminate, more than ¼ as long as the segment and separated by a little less than ⅓ of the discal width. *Pygidium* simple, smooth, feebly convex, circularly rounded, ⅘ wider than long. *Legs* moderately long, the middle and hind trochanters finely spiniform at tip; femora distinctly swollen beyond the middle, the anterior scarcely at all modified; anterior tibiæ somewhat dilated and feebly excavated beneath toward tip, the anterior tarsi slender and unmodified, fully ½ as long as the tibiæ, with the second and third joints equal; apical appendage of the hind tibiæ rather short, straight and acuminate. Length 1.7 mm.; width 0.65 mm.

New York City and vicinity.

The ventral characters of the male type, described above, are exceedingly feeble, the last segment being moderately large, with the surface evenly and feebly convex transversely and wholly unmodified. The female differs but little in general form or size, the head being less obviously wider than the prothorax, with the antennæ shorter and simple, the front rapidly declivous before the antennæ to the broadly angulate simple apex of the clypeus, the declivous surface feebly tumid along the middle, the abdomen as wide as the elytra and nearly as long and the pygidium similar to that of the male. The terminal appendage of the hind tibiæ

seems to be a little longer in the female, and the last ventral is more obviously prolonged at apex in a short rounded lobe, as in many Euplecti.

This species is allied to *riparius*, but in the latter the antennæ of the male are shorter, with a much larger and more globose tenth antennal joint, and it differs further in having a more convex, more finely and asperately punctate, steeper and setigerous frontal declivity, smaller foveæ, which are united by a continuous feeble ambient sulcus, a narrower and more trapezoidal pygidium, a longer and more contorted apical tibial process, and in numerous other features. *Riparius* is common in the Ohio valley, from the headwaters of which, in Westmoreland Co., Pa., I have a small series taken by Mr. Schmitt; the present species is its homologue from the Atlantic maritime regions.

B. harringtoni n. sp.—Rather stout and strongly convex, clear and very pale rufo-testaceous throughout, shining, the elytra minutely, sparsely punctulate, the head granularly and subrugosely, the pronotum and basal parts of the tergum finely, sparsely and asperately; pubescence moderate in length, coarse, recurved and somewhat sparse. *Head* slightly transverse, distinctly wider than the prothorax, convex, shining toward base, densely and coarsely sculptured anteriorly, the punctures umbilicate, the foveæ large, deep, nude, subbasal and separated by but little less than ½ the entire width, the intervening surface strongly convex, finely carinate; sublateral carinæ fine and feeble; eyes moderately large, very convex and prominent, at nearly their own length from the base, the tempora behind them not at all prominent, very rapidly convergent and broadly arcuate to the neck; dorsal impressions feeble, only extending a short distance from the foveæ, there being no trace of a circumambient sulcus; frontal surface convex, without trace of antennal tubercles, obtusely truncate with a median sinus from a vertical viewpoint, the apex just before the line of the antennæ vertical and deeply and smoothly excavated, the excavation subsemicircular in form, with its lower edge produced in the middle in a quadrate horizontal process, deeply bifid at tip; at the extreme lateral limits of the excavation the sides extend downward in a lamelate setose process, partially enclosing the antennal cavities, and, between this, and the central bifid process, there is a small, acute, suberect and setiferous tubercle; clypeus broadly produced in the middle in a rounded lobe, with the surface very convex, the summit posteriorly feebly carinate under the bifid process of the front, the carina bearing some long sparse radiating setæ; mandibles stout, the inner margin multi-serrulate, the arcuate tip moderately produced and aciculate. *Antennæ* rather less than ½ as long as the body, somewhat slender, the club only moderately thick, the basal joint less than ½ longer than wide, flattened and punctate within, the lower contour rounded toward base, the upper surface emarginate at apex for the reflexion of the funicle about half way to the base; second joint not quite as long as the third

but thicker and more pubescent, longer than wide ; joints three to seven subequal, elongate and closely joined; eighth a little shorter and narrower; ninth distinctly thicker, obtrapezoidal, fully as long as wide; tenth similar in form but much larger, rather longer than wide, with a large and very deep circular perforate fovea on the under surface, extending from the base to the middle, the surface thence to the apex more oblique than the corresponding surface externally ; eleventh as long as the preceding two, as thick as the tenth, obliquely flattened externally toward tip, the latter acute. *Prothorax* nearly as long as wide, widest and rather prominently lobed at the sides just before the middle, sinuately narrowed toward base, with the usual three foveæ and two spiniform processes near the base, the arcuate impressions before the processes almost obsolete, the lateral longitudinal impressions deep, sulciform and almost entire, the median groove deep and extending almost to the apex; longitudinal carinæ very fine and feeble. *Elytra* nearly as long as wide, ½ longer and ⅘ wider than the prothorax, the sides only moderately divergent and arcuate, humeral plica elongate and strong but not spinose, the impression broad, rapidly evanescent; three basal foveæ deep and perforate. *Abdomen* distinctly narrower and very much shorter than the elytra, the carinæ very broad at base, rapidly finely acuminate, ¼ as long as the segment and separated by nearly ⅓ of the discal width at base, the impressions deep. *Pygidium* moderately convex, somewhat transverse, the lower edge with a minute sinuation receiving a small apical lobe of the last ventral, the surface adjacent to the sinus with a narrow, arcuate and extremely deep transverse excavation, the upper limiting line of which is an acute edge. *Metasternum* swollen in the middle, the slope toward the intercoxal edge rapid and densely pubescent. *Legs* rather long and slender, the femora swollen ; tarsi all slender. Length 1.8 mm. ; width 0.68 mm.

Canada (Ottawa—Mr. W. H. Harrington); Wisconsin (Bayfield—Mr. Wickham); Pennsylvania (Westmoreland Co.—Mr. Schmitt).

The male characters of the venter consist simply of a shallow impression of the last segment, the lateral limits of which are tumid, prominent and setose. The legs do not seem to be modified sexually. The three males before me represent a species which may be placed near *frontalis*. I have not seen the female.

B. cavicornis n. sp.—Rather slender, strongly convex, polished and impunctate throughout, pale and bright rufous in color, the abdomen but little darker and more brownish; pubescence moderate in length and coarseness, pale, rather abundant and strongly recurved. *Head* but just visibly wider than the prothorax, about as long as wide, the eyes small but convex and prominent, at fully ½ more than their own length from the base, the base circularly and continuously rounded behind them, the tempora very convergent; foveæ rather small, nude, near basal third, very widely separated, the ambient sulcus deep and well defined except at the middle anteriorly, where it merges with the

nearly flat and feebly declivous superior surface of the front; included surface very strongly convex, smooth and sculptureless, having, however, posteriorly, a large oval median area which is flattened or feebly indented, the lateral limits of which are feebly cariniform; supra-orbital carinæ fine and rather feeble; surface exterior to the ambient sulcus flattened and coarsely, rugosely sculptured, becoming anteriorly gradually feebly declivous and minutely, sparsely, subgranularly punctate, with the sides before the antennæ nearly straight and strongly convergent to the obtusely subangulate tip; viewed anteriorly, the frontal surface is nearly simple, greatly narrowed between the antennal cavities, the steeper part short and separated from the short, broadly rounded and simple clypeus by a very feeble short impression joining the antennal cavities. *Antennæ* obviously longer than the head and prothorax, moderately slender, the basal joint cylindrical, not distinctly modified or swollen beneath; second and third subequal, slightly elongate; four to seven about as wide as the third, subequal, closely joined, not quite as long as wide; eighth still shorter and just visibly wider; ninth distinctly wider but not longer than the eighth, strongly transverse; tenth large and subquadrate, its under surface with a large, profound, oval, feebly transverse and abruptly defined excavation occupying medial $\frac{4}{5}$ and basal $\frac{3}{4}$ of the extent, its bottom, somewhat nearer the internal than external edge, still more deeply perforate and radially setulose; eleventh joint very large, still wider than the tenth, as long as the preceding three combined, obliquely pointed at tip, its inner side angularly subprominent just beyond the middle, the under surface feebly impressed from the middle of the base, the impression smoother and less pubescent. *Prothorax* about as long as wide, subinflated and rather prominently rounded laterally well before the middle, the sides convergent and broadly sinuate thence to the base; surface with a large but not very deep subpubescent fovea continued anteriorly in a rapidly evanescent impression at each side, and a large nude deep and more basal median fovea, feebly connected with the lateral by shallow arcuate sulci anterior to the usual moderate spiniform processes; median impression broad and shallow, becoming gradually narrower and evanescent near apical fourth; cariniform elevation before the spiniform processes very short. *Elytra* convex, nearly as long as wide, barely $\frac{1}{2}$ longer and $\frac{3}{4}$ wider than the prothorax, the sides moderately divergent and broadly, evenly arcuate from the rather prominent and broadly angulate but non-spinose humeral plicæ to the apex; intra-humeral impression rather shallow; three basal foveæ deep and punctiform. *Abdomen* but slightly narrower than the prothorax and almost as long, the small basal carinæ separated by rather more than $\frac{1}{3}$ of the discal width; lateral margin rather wide at base. *Pygidium* simple, smooth, moderate in convexity. *Legs* rather long, the femora somewhat feebly swollen. Length 1.7 mm.; width 0.6 mm.

Pennsylvania (Westmoreland Co.). Mr. Schmitt.

The male type has no secondary crural modification, and the venter is nearly simple, the last segment being moderate in length, feebly convex and without trace of impression or central

flattening. The chief peculiarity of this species resides in the abnormal outline and medial impression of the eleventh antennal joint; it may be placed near *foveicornis* in the lists.

B. schmitti n. sp.—Rather strongly ventricose, polished, impunctate, piceous-black throughout, the legs somewhat paler, the antennal club pale; pubescence rather abundant, pale in color, long, suberect and bristling. *Head* large, wider than long, very much wider than the prothorax, the eyes rather small but convex and prominent, at distinctly more than their own length from the base, the tempora behind them very rapidly convergent and circularly arcuate to the neck; foveæ only moderate in size, near basal third, pubescent, widely separated, united by a rather narrow but deep, entire and semicircular ambient sulcus, the enclosed surface strongly convex, perfectly smooth and polished, with a short central carina; supra-orbital carinæ feeble; surface exterior and anterior to the sulcus flattened, horizontal and coarsely, densely punctato-rugose, the frontal margin broadly and obtusely subangulate; viewed anteriorly, this margin is feebly double, the intervening concavity very slight and obliterated at the middle, the lower edge thinner, more acute, briefly porrect and feebly and minutely sinuate at each side of the middle; clypeus rather abbreviated, very broadly subtruncate, with an entire double edge at apex, the middle point of the upper edge bearing an obliquely erect liguliform process arising just before the middle of the frontal edge; excavation between the clypeus and front extremely deep, the clypeus sparsely studded with short setæ, the lower frontal edge bristling with longer setæ directed downward. *Antennæ* slightly longer than the head and prothorax, stout, the club very strong; basal joint extremely large, inflated and subcompressed beneath, the flattened inner surface minutely and densely pubescent; second joint small, quadrate, attached to the outer side of the apex of the first at nearly right angles with the axis, only slightly stouter and longer than the third; three to eight equal in width, closely joined, slightly transverse; ninth shorter and distinctly wider, strongly transverse; tenth large and subglobose, as wide as the eleventh, nearly as long as wide, almost its entire under surface occupied by a very large and deep excavation, the inner slope of which has a large and deeper perforation clothed with short radiating setæ; eleventh about as long as the three preceding combined, obliquely pointed at tip. *Prothorax* relatively small, scarcely as long as wide, the sides broadly rounded anteriorly, moderately convergent and but feebly sinuate behind the middle; marginal hairs in the form of long stiff close-set and posteriorly arcuate setæ; disk with two large sublateral foveæ near the base, connected to the median and more basal fovea by shallow arcuate sulci each before a stout spiniform process; lateral and median sulci very deep and almost entire; intermediate carinæ strong but shorter, the lateral sulci turned outward near the apex, and here, at each side of the middle, there is a small deep fovea. *Elytra* $\frac{2}{3}$ longer and fully $\frac{1}{5}$ wider than the prothorax, not quite as long as wide, the sides moderately divergent from the very large, prominent and obtusely angulate but not spinose humeral plicæ to the apex and broadly arcuate; surface convex; three

basal foveæ deep and perforate; intra-humeral impression large, evanescent slightly before the middle. *Abdomen* rather shorter and narrower than the elytra, very convex, the basal carinæ small and separated by less than ⅓ of the discal width. *Legs* of the usual length, the femora only moderately inflated; tarsi slender throughout. Length 1.75 mm.; width 0.65 mm.

Pennsylvania (Westmoreland Co.).

This is one of the more interesting of the numerous important discoveries of Mr. P. Jerome Schmitt, and is dedicated to him with the liveliest appreciation of the continual increase in knowledge of our microcoleoptera due to his skillful and patient researches in the mountains of Pennsylvania, the treasures of which are only beginning to be unfolded. The single example before me is a male, with, however, no special secondary marks other than those described, the last ventral and pygidium even, being perfectly simple and unmodified. The species may be placed near *striatus* in our lists.

ARIANOPS Bndl.

The two species of this remarkable inquilinous genus before me may be readily distinguished as follows:—

Pubescence dense; prothorax shorter than wide, more inflated anteriorly, and much more than ½ as wide as the elytra, the latter distinctly longer than the prothorax, with the sutural impression feeble throughout. ♀ Pennsylvania.....**amblyoponica** Bndl.

Pubescence sparse, more erect and much longer; prothorax longer than wide, less inflated anteriorly, and not more than ½ as wide as the elytra, the latter not evidently longer than the prothorax, much shorter and more transverse, with the sides more arcuate and divergent, the suture strongly depressed posteriorly. ♀ Carolinas.....**plectrops** n. sp.

As far as known the genus is confined to the Appalachian Mountain system, where it represents the European Amaurops.

A. plectrops.—Moderately slender, strongly convex, highly polished, impunctate and uniform dark rufo-testaceous throughout, the hind body elongate-oblong and moderately stout; pubescence long, suberect and somewhat sparse. *Head* longer than wide, about equal in width and length to the prothorax, semicircularly rounded behind the erect, compressed triangular spicules representing the eyes, the spicules each continued forward in a fine carina at the lower margin of the antennal cavities to the base of the mandibles; upper surface convex, with two deep nude foveæ near basal fourth, separated by about ⅔ of the maximum width, each at the posterior limit of a broad and moderately deep sulcus, the two uniting anteriorly in a large gradually declivous smooth and polished frontal depression between the antennal prom-

inences, which are large and somewhat roughly sculptured; front before the depression more rapidly and subvertically declivous and strongly narrowed by the antennal cavities to the very short and more porrect clypeus, which is very broadly subparabolic at apex; labrum transverse, broadly sinuate at tip and bearing some stiff discal setæ; mandibles rather small, stout. *Antennæ* about as long as the head and prothorax, moderately slender, but slightly irregular, the club 3-jointed; basal joint short and thick, but slightly longer than wide, the apex above moderately emarginate for the reflexion of the funicle; second much narrower, elongate, rather longer and slightly thicker than the third; two to seven gradually somewhat narrower and less roughly sculptured, all longer than wide and subcylindric, the eighth narrowest of all, quadrate; ninth and tenth subequal and nearly similar, moderately transverse, scarcely as wide as the basal joint; eleventh much thicker, large, conoidal and gradually very acute to the tip, rather longer than the three preceding joints combined. *Prothorax* slightly elongate, widest and evenly rounded at the sides anteriorly, the sides gradually and moderately convergent posteriorly, becoming only very feebly sinuate; surface evenly convex, with three large deep nude and isolated foveæ near the base, the lateral partially confluent with another smaller fovea nearer the basal margin, the median flanked on either side by a small and feebly prominent spinule and only slightly prolonged anteriorly for a short distance in a rapidly evanescent impression; at the base in the middle there is a small elevated and more rugosely sculptured triangle, flanked by single smaller foveæ. *Elytra* very short and transverse, as long as the prothorax and nearly $\frac{4}{5}$ wider, nearly $\frac{3}{4}$ wider than long, the sides very strongly divergent and strongly evenly arcuate, from the extreme base to the apex, the surface strongly convex, not foveate at base but each with two feeble impressions adjoining the elevated basal margin, the fine sutural striæ lying in a broadly impressed sutural region which becomes very deep toward tip; flanks deep, without trace of post-humeral fovea but with a fine cariniform line parallel to the margin in more than apical half; humeral plica or prominence wholly wanting. *Abdomen* more than twice as long as the elytra from a vertical viewpoint, and, at the middle, rather wider, the sides parallel and feebly arcuate; border only visible on the basal segment, narrow, slightly oblique and feeble; basal segment with three wide shallow basal impressions separated by feebly cariniform elevations; second and third short and equal, the fourth longer than the first three combined, very convex, becoming gradually vertical at tip; fifth ventral short but longer than the third or fourth, the apical margin oblique at the sides, disappearing laterally under the third dorsal. *Legs* long and well developed, the femora moderately swollen; tibiæ long, the posterior calcarate at tip. *Prosternum* before the coxæ elongate and almost horizontal. Length 2.8–3.0 mm.; width 0.8–0.85 mm.

North Carolina (Round Knob). Hubbard and Schwarz.

The description applies to the male, the exserted œdeagus being large and of remarkable form. In the female the head is more distinctly wider than the prothorax, the latter about $\frac{1}{2}$ as wide as the elytra, the abdomen shorter with more arcuate sides, the first

dorsal much longer than the next two combined, the fourth but little longer than the first; behind the fourth there is a short dorsal part of the large exsertible sixth ventral, which dorsal part may be completely hidden at times under the fourth dorsal; behind this again there is a short transverse pygidium. In the male the dorsal pygidium is large, transversely oval, with two deep perforate cavities on the median line, the lower the larger, and is strongly exsertible, the sixth ventral very mobile but fixed at base, fitting in a large circular emargination of the fifth, with its apex broadly sinuate, the sinus cusped at the middle. The spiracle of the large fourth dorsal is at the middle of the lateral edge and is at the summit of a small oblique tubercle. The female of *amblyoponica* in my cabinet, which I owe to the kindness of Mr. Schmitt, is 2.85 × 0.88 mm. in size, so the measures of Dr. Brendel are probably somewhat too great, though the female is rather smaller than the male, as in many Batrisi.

Bryaxini.

DECARTHRON Bndl.

The following species is sufficiently common, even in Massachusetts, but seems to have been unaccountably overlooked:—

D. laurenticum n. sp.—Black and polished throughout, the elytra generally not paler, ventricose; pubescence long, abundant, erect, bristling and rather dark in color. *Head* nearly as wide as the prothorax, the eyes large and prominent, the tempora short; foveæ distinct, separated by scarcely more than ⅓ the entire width; antennal prominences large. *Antennæ* black, stout, bristling with long erect setæ, scarcely longer than the head and prothorax; joints three to six subglobular and equal; seventh and eighth a little wider than the preceding, transverse and equal; ninth nearly twice as wide as long. *Prothorax* rather small, slightly wider than long, less than ½ as wide as the elytra, widest a little behind the middle; apex more than ½ the maximum width; median fovea small but deep and punctiform, the lateral wholly obsolete. *Elytra* short, fully ⅓ wider than long, the sides strongly divergent from the base, broadly arcuate throughout; discal stria extending to apical third. *Abdomen* as wide as the elytra and distinctly shorter, the first segment broadly arcuate at tip, a little more than twice as wide as long; carinæ arcuate, feebly divergent, extending beyond the middle of the segment. *Legs* moderate, dark brownish-rufous in color throughout. Length 1.25 mm.; width 0.7 mm.

Canada (Ottawa—Mr. W. H. Harrington); Massachusetts (Lowell—Mr. Blanchard).

A small species, comparable only with *abnorme*, but differing in its smaller size, shorter and black elytra, black antennæ and darker pubescence. The intermediate femora of the male are modified nearly as in that species, but the second antennal joint is subglobular, wider than the first and wider than long, and not narrower, cylindric, and fully as long as wide as it is in *abnorme*. The description is taken from the male.

There are three examples before me from Los Angeles Co., California, which I cannot clearly separate from *brendeli* Csy. It is possible that the females from Albuquerque, New Mexico, described by Brendel under the name *discolor*, may belong to the same species.

BRYAXIS Leach.

The following species belongs to the group containing *foveata*, *terebrata*, *intricata*, and others having the second dorsal segment indented in the male :—

B. arguta n. sp.—Rather strongly ventricose and convex, shining, subimpunctate, the elytra very sparsely and obsoletely punctulate ; body and antennæ dark piceous, the elytra slightly, and legs and antennæ distinctly, paler ; pubescence moderately short, subdecumbent and not at all dense. *Head* but slightly narrower than the prothorax, the eyes large, strongly convex and prominent, the tempora very short and convergent behind them ; three foveæ equal and normal. *Antennæ* obviously longer than the head and prothorax, moderately slender, the club gradually but rather rapidly formed ; first three joints decreasing slightly in width, the first but little longer than wide ; second cylindric, feebly elongate ; three to eight equal in thickness ; third and fifth not quite ½ longer than wide ; fourth, seventh and eighth as wide as long ; sixth a little longer than wide ; ninth and tenth obtrapezoidal, increasing, similar in form, slightly transverse. *Prothorax* minutely, feebly and sparsely punctulate, nearly ½ wider than long, widest and rather prominently rounded at the middle, the three spongiose foveæ subequal and well developed. *Elytra* almost ⅔ wider than long, twice as wide as the prothorax, the sides distinctly divergent from the base and broadly, evenly arcuate ; striæ strong and normal. *Abdomen*, from above, slightly narrower than the elytra and much shorter, the carinæ straight, divergent, about ½ as long as the segment and separated by ⅔ of the entire width. *Legs* normal, rather slender. Length 1.25–1.35 mm. ; width 0.7–0.75 mm.

Michigan—Mr. J. Croissandeau ; Pennsylvania (Westmoreland Co.)—Mr. Schmitt.

The male serving for this description has the apical margin of the first dorsal only very feebly deflexed but emarginate in circular arc in median fifth or sixth, the sinus fully twice as wide as

deep; from the bottom of the sinus projects posteriorly in the same plane a flat, gradually narrowing cluster of agglutinate sericeous setæ, extending slightly beyond the general apex of the segment, its apex emarginate; second segment having a shallow simple rounded indentation with ill-defined margins, occupying rather less than median third and extending almost to the posterior edge; the anterior margin of the indentation lies far under the apex of the first, and, by longitudinal vision, seems to be reflexed as is usual in the species of this section. Remainder of the abdomen simple, the last ventral very short. The female is a little smaller and darker in color, with the elytra still shorter, more divergent and straighter at the sides and less convex, the abdominal carinæ shorter and apparently less divergent.

REICHENBACHIA Leach.

The species aggregated below under this name form a perfectly natural and isolated division of the Bryaxini, which must consequently have generic value. It is probable, moreover, that this generic weight will prove constant throughout the geographic range, and that the so-called connective bonds which have been noted will form types of intermediate genera. Decarthron, Nisaxis and Anchylarthron, of our own fauna, are instances of these. The genus is very extensive within the boundaries of the United States, and will prove troublesome on this account to the student.

In the following table all the known species are included, with the exception of three, which will be alluded to below, and the characters throughout are those of the male, except when the other sex is specially designated. In the cases of *inepta*, *nevadensis*, *complectens* and *subtilis*, the female is the only sex known, but, in the first of these, the distinguishing features are non-sexual, and in the last two there are characters of taxonomic value in the female antennæ, which will be expressed in conjunction with corresponding characters of the same sex in their allies; the position of *nevadensis* will be more or less uncertain until the male is discovered, although it undoubtedly belongs to the division with aberrant male antennæ.

Antennæ unmodified in either sex; abdominal carinæ very variable in degree of separation.....2

Antennæ dissimilar in the sexes, the intermediate joints of the funicle being modified in the male but normal in the female; abdominal carinæ always well separated; pubescence short and subdecumbent.....20

Antennæ dissimilar in the sexes but with the median joints of the funicle abnormal in both; pubescence short; abdominal carinæ widely separated; body ferruginous in color throughout.....30

2—Abdominal carinæ approximate and divergent, separated at base by a transverse distance which never notably exceeds the maximum mutual separation of the sutural striæ measured across the suture (strial interspace).....3

Abdominal carinæ less approximate, always separated at base by distinctly more than the strial interspace, but never by more than ¼ of the entire abdominal width.....8

Abdominal carinæ separated by ⅓ of the entire abdominal width, or very nearly; pubescence always short and strongly recurved.....14

3—Pubescence short and strongly recurved; body frequently very small in size.....4

Pubescence longer, bristling and semi-erect.....7

4—Pronotum quite deeply and conspicuously punctate; abdominal carinæ long and separated at base by the strial interspace.....5

Pronotum inconspicuously punctate or subimpunctate.....6

5—Prothorax strongly transverse and strongly rounded at the sides; body brown in color with paler red elytra (*canadensis* Bndl.)...**gemmifer** Lec.

6—Antennæ moderate in length.

Elytra short and transverse, generally sparsely punctate and subrugose, though polished, the sides strongly divergent from the base, with very feebly developed or obsolete humeri; body dark red-brown or blackish in color, the elytra generally not paler, the abdomen sometimes darker.

Abdominal carinæ of the female separated at base by the full strial interspace; pronotum impunctate or very nearly so.....**divergens** Lec.

Abdominal carinæ of the female extremely approximate, separated at base by ½ the strial interspace; elytra more obsoletely sculptured, the pronotum sensibly punctulate (*gemmifer* Bndl. nec Lec.).

subsimilis n. sp.

Elytra with obvious humeri, longer, the sides less divergent; abdominal carinæ separated at base by fully the strial interspace, occasionally by rather more. Middle Atlantic maritime regions.

Rufo-testaceous, the abdomen sometimes darker; pronotum almost wholly devoid of any trace of punctuation, the median fovea very small.

congener Bndl.

Piceous-black when mature, with rufous elytra, but varying much in color and frequently pale straw-yellow throughout from immaturity; pronotum quite distinctly punctulate, the median fovea distinct (*divergens* Bndl. nec Lec.).....**facilis** Csy.

Antennæ unusually elongate and slender, almost as long as the head, prothorax and elytra combined; abdominal carinæ separated at base by much less than the strial interspace.....**cylindrartus** Bndl.

7—Body red-brown in color, the elytra paler; abdominal carinæ unusually long, separated at base by exactly the strial interspace.

atlantica Bndl.

8—Pronotum deeply cribrate and subopaque over its entire surface, the punctures polygonally crowded; pubescence short; abdominal carinæ moderate in length, separated at tip by about 1/5 the entire width.

scabra Bndl.

Pronotum deeply and conspicuously punctate, the punctures not in actual contact and the lustre alutaceous; pubescence short; abdominal carinæ nearly 1/2 as long as the segment, straight, divergent, separated at tip by nearly 1/4 of the entire width..... **cribricollis** Bndl.

Pronotum never deeply punctate and at most with small, rather distant and moderately distinct punctures..... 9

9—Pubescence long, suberect and bristling; abdominal carinæ rather long and strongly marked; elytra distinctly shorter than wide.....10

Pubescence shorter, strongly recurved or subappressed.....11

10—Abdominal carinæ fully 1/2 as long as the segment and separated by 1/5 the entire width or rather more.

The carinæ divergent and feebly arcuate..... **rubicunda** Aubé

The carinæ parallel, slightly everted toward tip..... **kansana** n. sp.

Abdominal carinæ straight or very nearly so, slightly less than 1/2 as long as the segment, more or less divergent and separated at tip by 1/5 the entire width or less; last ventral of the male much more deeply concave.

The carinæ distinctly divergent; prothorax relatively broader, more than 1/2 as wide as the elytra ..... **gracilis** Csy.

The carinæ just visibly divergent and separated by but little more than 1/6 of the entire width; prothorax smaller and less transverse, about 1/2 as wide as the elytra..... **ursina** n. sp.

11—Pubescence long and very coarse but strongly recurved; antennæ rather short and stout, with joints 8–10 distinctly transverse; abdominal carinæ strong, 2/5 as long as the segment, perfectly straight, strongly divergent, separated by about 1/5 of the entire width; elytra much shorter than wide, very coarsely but not densely punctate and rugose, polished; male with the last ventral moderate in length, broadly and feebly impressed in the middle, the last dorsal strongly transverse, the apex 1/3 as wide as the base and deeply sinuate with narrowly rounded angles.

semirugosa Bndl.

The pubescence only moderately short, notably coarse and strongly recurved; abdominal carinæ rather feeble, much less than 1/2 as long as the segment, straight, parallel and separated by less than 1/5 of the entire width; antennæ slender though not much exceeding the average in length; last ventral of the male short and unimpressed, the last dorsal with a small and deep semicircular notch which is limited by acute angles.

gracilicornis Csy.

The pubescence very short, inconspicuous and decumbent or strongly recurved; abdominal carinæ variable in length and development but always divergent; elytra never very roughly sculptured.....12

12—Abdominal carinæ straight, separated at tip by about 1/4 of the entire width; body rather minute in size and pale in color..... **inepta** Csy.

Abdominal carinæ much more approximate, separated at tip by about 1/6 of the entire width or less; body larger; antennæ moderate throughout.....13

13—Last ventral of the male large, broadly concave toward tip; eyes larger, situated at much less than their own length from the base.

Terminal dorsal of the male very broadly truncate at tip, the truncature feebly sinuate toward the middle, its surface strongly punctate; abdominal carinæ distinct, nearly straight, separated at tip by scarcely more than a seventh of the entire width.....**insolita** n. sp.

Terminal dorsal with the apex broadly rounded, scarcely more than 1/2 as wide as the base, broadly rounded at the sides, broadly and very moderately sinuate at tip, the surface feebly and sparsely punctulate; abdominal carinæ 1/3 as long as the segment, distinct, evenly arcuate and divergent and separated at tip by fully 1/6 the total width.....**sodalis** n. sp.

Last ventral of the male moderately large, simply flattened, occasionally with the plane slightly ascending toward tip; terminal dorsal with a broad and decidedly deep sinus nearly in the form of a circular arc with more or less narrowly rounded limiting angles; eyes smaller, at their own length from the base or nearly so.

Abdominal carinæ nearly 1/2 as long as the segment, distinct, strongly divergent and straight.

Prothorax rather large, more than 1/2 as wide as the elytra.

fusciventris n. sp.

Prothorax moderate in size though unusually elongate, 1/2 as wide as the elytra and much more distinctly punctulate.....**peregrinator** n. sp.

Abdominal carinæ extremely short, fine and indistinct, straight and separated by 1/6 of the entire width; prothorax shorter and more transverse.....**furtiva** Csy.

14—Intermediate tibiæ of the male normal.....15

Intermediate tibiæ of the male strongly bent in arc in about basal 2/3 of their length, the arcuate part clothed externally with long erect hairs.....19

15—Pronotum strongly and closely punctured, especially toward the central parts of the disk; abdominal carinæ short but distinct, straight and parallel; body black with rufous elytra, legs and antennæ.

puncticollis Lec.

Pronotum not conspicuously punctured though occasionally quite perceptibly punctulate.....16

16—Body black or piceous-black with bright red elytra, the hind body strongly inflated, the elytra always fully twice as wide as the prothorax; abdominal carinæ feebly divergent; last ventral of the male broadly concave.....17

Body pale in color throughout, sometimes uniformly but occasionally with the elytra still a little paler or more flavate.....18

17—Last dorsal of the male having at apex a very broad, circularly rounded sinus, which is 1/2 as wide as the base.....**corporalis** n. sp.

Last dorsal of the male with a much narrower and very feebly sinuate apical truncature; body much smaller.....**borealis** n. sp.

18—Hind body normally ventricose, the elytra twice as wide as the prothorax. Abdominal carinæ ⅓ to ⅔ as long as the segment, distinct and divergent, feebly so in *demissa* ; body small in size.

Last ventral of the male short, along the median line not much longer than the three preceding combined, flat, the last dorsal short, narrowly and extremely feebly sinuato-truncate at apex.....**demissa** Csy.

Last ventral twice as long and broadly concave along the middle; last dorsal longer, with less convergent sides, the apical truncature just visibly sinuate and nearly ½ as wide as the base ; elytra uniformly pale.....**distans** n. sp.

Last ventral with a longitudinal impression, the last dorsal truncate ; elytral suture darker in color [Brendel].....**litoralis** Bndl.

Abdominal carinæ extremely short and rather thick, scarcely more than appearing beyond the tips of the elytra, straight and parallel ; last ventral of the male with a large rounded concavity, the last dorsal rather broadly emarginate in circular arc, the sinus with well-defined though blunt limiting angles.....**inopia** Csy.

Hind body relatively narrower, the elytra much less than twice as wide as the prothorax and much shorter than wide ; body elongate, uniform pale piceous-brown in color throughout and highly polished ; abdominal carinæ fine and feeble, scarcely ⅓ as long as the segment, straight and feebly divergent.....**procera** n. sp.

19—Abdominal carinæ scarcely more than ¼ as long as the segment, fine, straight and parallel, separated by ⅓ of the width of the segmental disk, but by noticeably less than ⅓ of the entire width ; size rather large.

arcifer n. sp.

20—Posterior tibiæ simple and uncompressed in the male.....21

Posterior tibiæ of the male dilated and compressed in about apical half, the dilated part longitudinally excavated on the compressed surface.....27

21—Second antennal joint dilated and otherwise modified in the male, the front also abnormal in one or both sexes.....22

Second antennal joint not abnormally dilated in the male.....23

22—Front not trilobed, having in both sexes, in place of the usual large single fovea, two minute nude foveæ separated by a longitudinal, feebly tumid, strongly and densely punctate area, which descends gradually upon the clypeus, becoming more prominent and hairy.

Enlarged second joint flat or feebly convex on its under surface throughout its extent.....**deformata** Lec.

Enlarged second joint deeply excavated beneath, the apical transverse margin of the excavation acutely cariniform ; body much smaller (*deformata* Csy. et Bndl. nec Lec.).....**taphrocera** n. sp.

Front trilobed by two small deep emarginations, at least in the male ; female not examined [Brendel].....**depressifrons** Bndl.

23—Head with but two foveæ, probably in both sexes, the frontal fovea wanting and replaced in the male of *compar* by a large transversely oval punctulate and pubescent area on the subvertical wall of the truncate front, and, in the male of *fundata*, by two setiferous tubercles in the same position ;

front truncate, probably in both sexes ; antennal funicle feebly modified in the male.....24

Head in the male with the usual two vertexal foveæ, the frontal fovea replaced by a large, rounded, feebly depressed and densely punctate area on the feebly sloping upper surface of the front ; antennal funicle very strongly modified in the male.....25

Head in the male with the usual three foveæ at the apices of a nearly equilateral triangle, the frontal, however, frequently larger than the others...26

24—Basal joint of the male antenna normal and cylindroidal ; funicle but slightly modified ; male with the front transversely truncate ; female not examined (*franciscana* Csy.).....**compar** Lec.

Basal joint of the male antenna large, subtriangular and irregular; funicle feebly modified ; truncate front in the male feebly produced and subbilobed at the middle, excavated transversely beneath ; female with the front declivous and unmodified but without trace of frontal fovea (*albionica* Bndl. nec Motsch.—Ent. News, V, p. 195).....**fundata** Csy.

25—Male antennal joints 5–7 greatly dilated, successively more strongly, the seventh the widest.....**falli** n. sp.

Male antennal joints 5–7 strongly dilated and subequal in width, the sixth much shorter than the fifth or seventh.....**turgidicornis** n. sp.

26—Abdominal carinæ long and distinct, more or less divergent, sometimes nearly ½ as long as the segment ; frontal parts of the head subimpunctate.

Antennal funicle very conspicuously modified in the male.

Male antennæ with the basal joint oval, minutely rugose on the convex lower surface ; second smaller, cylindric ; third slightly wider, obtrapezoidal ; 4–7 dilated and transverse, successively less strongly, the fourth widest ; front subprolonged and angulate, the frontal fovea small and nude but situated at the bottom of a very large depression.

tumorosa Csy.

Male antennæ with joints 1–4 normal ; 5–8 more or less strongly dilated and transverse ; seventh slightly wider and shorter than either of the two preceding ; eighth narrower ; three cephalic foveæ normal, equal, circular and spongiose.....**tumidicornis** Csy.

Male antennæ with the basal joint somewhat swollen, the convex under surface not rugose ; 2–3 normal ; 4 large, transverse and strongly dilated, concave beneath ; 5–8 subequal, not much modified ; club large and very elongate, the eleventh joint long and obliquely conoidal ; frontal fovea pubescent but situated in a large concavity, the frontal margin subangulate between the antennæ.....**sagax** Lec.

Male antennæ with joints 1–4 normal; 5 slightly elongate, not dilated; 6 very large, triangular, longer than wide, compressed, the remainder but slightly modified.....**arthritica** Bndl.

Antennal funicle only slightly modified in the male ; joints 5–7 just visibly incrassate ; fifth longer than wide, the next two somewhat wider than long ; cephalic foveæ equal, moderate in size, spongiose and perfectly normal.....**informis** Csy.

Abdominal carinæ very short, scarcely ¼ as long as the segment, acuminate,

parallel ; frontal parts of the head conspicuously punctulate, the frontal fovea situated within a transverse depression ; females only known.
nevadensis Csy.

27—The male tibiæ strongly dilated and spatuliform toward tip.....28
The male tibiæ very feebly and gradually dilated in rather more than apical half.....29

28—Male antennæ with the joints immediately succeeding the sixth decidedly narrowed, the fifth and sixth relatively much dilated.
Joints beyond the fifth obstrapezoidal and almost bilaterally symmetric. Sixth joint fully as wide as the fifth.....**albionica** Mots.
Sixth joint distinctly narrower than the fifth.....**binodifer** n. sp.
Joints beyond the fifth oblique, short and strongly pointed within.
articularis n. sp.
Male antennæ with the joints beyond the sixth scarcely narrower ; hind tibiæ more feebly bent.
Body larger, the hind body more inflated, piceous-black, with bright red elytra. California.....**fusticornis** n. sp.
Body smaller and narrower, generally dark piceous throughout. Ontario.
spatulifer n. sp.

29—Male antennæ with the fifth joint rather strongly dilated, the sixth less so and more pointed within, both transverse. Massachusetts and Michigan.....**propinqua** Lec.
Male antennæ with the fifth and sixth joints "a little thicker than the fourth, slightly longer than wide." New York [Brendel].....**polita** Bndl.

30—Fifth joint of the female antennæ much shorter than the next two combined.
The fifth and sixth joints, from a lateral viewpoint, distinctly thicker than the fourth ; body larger and stouter.....**complectens** Lec.
The fifth and sixth joints subequal in width to the fourth ; elytra relatively a little shorter and more transverse.....**tumida** Lec.
Fifth joint of the female antennæ as long as the next two combined.
Female with the fifth antennal joint slightly swollen ; cephalic foveæ fully visible from above, forming a triangle which is wider than long.
wickhami Bndl.
Female with the fifth joint not swollen, the anterior fovea on the obliquely sloping surface of the front and not fully visible from above, the three forming an equilateral triangle ; body smaller.....**subtilis** Lec.

The three species not included in the table are *radians* and *trigona* of LeConte, and *bicolor* of Brendel. The first two are not adequately described, the few words attached to the names by the author being barely sufficient to establish their status as published species. In regard to the former, it is more than possible that the elongate median elevation in the broad concavity of the last two ventrals, alluded to by the anthor, may simply be adherent foreign matter; if not, it is a character altogether unique in the

genus; the body is said to be 1.5 mm. in length, ferruginous, with long abdominal lines proceeding from a small rounded fovea, and the species is from Illinois. *Trigona* is larger, 1.8 mm. in length, ferruginous, with approximate and diverging abdominal lines proceeding from a triangular tubercle, the last ventral of the male having a deep and sharply defined but not large oval fovea; it is from Missouri. Both of these species may be placed, for convenience, near *divergens*, but it is impossible to state anything definite about them in the absence of the types. *Bicolor* seems to be a remarkably aberrant species in its short and stout antennæ, with the eighth joint three times as wide as long and the next two transverse, in its small and non-prominent eyes, very conspicuous median fovea of the pronotum, and in the peculiar coloration and habits; its position among the other members of the genus is altogether uncertain, and it may be placed at the end of the series as generically doubtful.

The identity of *canadensis* with *gemmifer* is a surmise, and may prove to be incorrect. Dr. Brendel was in error, however, in attributing short abdominal carinæ to *gemmifer*, and the species identified by him under that name is probably that which is named *subsimilis* in the table; *gemmifer* has long abdominal lines, a transverse, deeply punctate prothorax, strongly rounded at the sides, and seems to agree in all characters of the description with *canadensis*. My previous reference of *canadensis* to *divergens* was an inadvertence, as the prothorax in the latter is virtually impunctate and smooth, and my allusion to the prothorax as sparsely punctate (Col. Not. V, p. 482) was an error due to confusing that species with *subsimilis*. *Litoralis* Bndl., which I previously regarded as identical with *inopia*, is apparently different, the abdominal carinæ as described being much longer. The small, uniformly pale, ferruginous species, of which this is one, are somewhat abundant; the four already known are *demissa*, *distans*, *litoralis* and *inopia*.

Of *congener* I have one example which is labeled "Illinois," but this is possibly an error. The characters of *semirugosa* are taken from the male type kindly communicated by Mr. Schmitt. *Peregrinator* is the species referred to by me formerly (l. c.) as *cribricollis*; I have since obtained the true *cribricollis*, which is quite a different thing and more western in habitat. *Minuta* Bndl., is synonymous with *Nisaxis tomentosa*, as I learned some

time since by letter from the author. No allusion to the form of the hind tibiæ in *polita* Bndl., is made in the original description, and I can only guess at its affinities as stated in the table; it quite possibly does not differ from *propinqua.*

The last four species of the table have been previously defined at greater length (l. c., p. 486), but the figures on the plate there presented are not exactly correct, there being no such difference in the relative proportion of the third and fourth joints of the antennæ of *complectens* and *tumida*, and the median joints in the female of *tumida*, as figured, are too much swollen. These two species are very much alike in the female, but probably diverge more in the male.

The abdominal carinæ constitute a useful character, but frequently differ notably in length and distance asunder in the two sexes, and all references to them in the table are consequently confined to the male except when the contrary is stated. There also seems to be some individual variability in these carinæ independent of sex, the extent of which I have had no available opportunity to determine as yet.

The divisions of the genus by the primary characters laid down in the table are apparently not only taxonomically natural, but geographic as well. For example, the first division is confined to the continent east of the Rocky Mountains, and does not extend at all further to the westward as far as known. The second division consists of two sections, one with simple tibiæ in both sexes, which is confined entirely to the Pacific coast regions of California and thence somewhat to the northward, and another, with spatuliform hind tibiæ in the male, which extends entirely across the northern portion of the continent from the Atlantic to the Pacific. The third division is confined to the arid regions of the southwest, or the so-called Sonoran province, and is apparently the only type of the genus occurring there.

The species announced as new in the table are described below in the same succession, and in every case from the male type only.

R. subsimilis.—Moderately ventricose, the hind body distinctly elongate and suboblong, dark rufo-testaceous throughout, the elytra not paler, the abdomen somewhat darker; pubescence ashy, moderately short and abundant and rather coarse. *Head* distinctly narrower than the prothorax, impunctate, the foveæ strong, deep and forming an equilateral triangle; eyes convex and well developed, at less than their own length from the base. *Antennæ* a little longer than the head and prothorax, the second joint but slightly

narrower than the first, a little longer than wide; three to eight narrower, equal in width, feebly obconic, the eighth parallel; third fully ½, fourth and sixth ¼, fifth nearly ½, longer than wide; seventh quadrate; eighth ½ wider than long; ninth a little wider, ⅓ wider than long; tenth similar but larger; nine to eleven increasing rapidly, the latter nearly as long as the preceding four. *Prothorax* ⅔ wider than long, widest before the middle, the sides not acutely rounded, rather strongly convergent and feebly arcuate toward base, finely, sparsely punctate; median fovea distinct and perforate. *Elytra* nearly ½ wider than long, the sides strongly divergent and broadly arcuate from base to apex; humeral plica feeble; sutural stria deep, the discal more feeble; intermediate basal fovea deep, strong and circular; disk sparsely punctulate and feebly undulato-rugulose, highly polished. *Abdomen* minutely and sparsely punctulate, as wide as the elytra, the first segment more than ½ as long as the latter, the carinæ ⅔ as long as the segment, distinctly divergent, arcuate and very approximate. Length 1.2 mm.; width 0.65 mm.

Iowa (Iowa City).

The male has the first and last ventrals subequal in length, and each broadly and just visibly impressed in the middle, the latter broadly and arcuately lobed at apex to fit the broad and rather deep sinuation, with broadly rounded limiting angles, at the apex of the last dorsal.

In the male the abdominal carinæ are separated at base by the full strial interspace, but in the female they are separated by only about ½ of this distance, and are withal distinctly shorter and nearly straight through equally divergent. In the female of *divergens* they are separated at base by the full strial interspace.

This species is allied rather closely to *divergens*, but may be known from it, not only by the female abdominal carinæ, but by the larger eyes, more punctate pronotum and less sculptured elytra and also by the somewhat smaller size. *Divergens* is common about Massachusetts Bay.

R. kansana.—Moderately ventricose, strongly convex, highly polished and impunctate throughout, rather pale rufo-testaceous, the head scarcely, the abdomen perceptibly, darker; pubescence long, erect and bristling, moderately abundant. *Head* notably narrower than the prothorax, the eyes prominent, moderately large, situated at rather less than their own length from the base. *Antennæ* distinctly longer than the head and prothorax, the funicle slender; club gradually formed, becoming stout toward tip; second joint oblong, a little narrower than the first; three to eight equal in width and much narrower; third ½, fourth and sixth ⅔, fifth ¾, seventh ⅓, longer than wide; eighth about ⅓ wider than long, cylindric; ninth feebly obtrapezoidal, fully as long as wide; eleventh rather longer than the three preceding combined and much thicker, obliquely acuminate. *Prothorax* relatively rather large, fully ⅓

wider than long, a little more than ½ as wide as the elytra, widest just before the middle, the sides rather strongly arcuate, moderately convergent and straight toward base; disk wholly impunctate, strongly convex, the median fovea somewhat large, deep and perforate. *Elytra* rather more than ¼ wider than long, the sides divergent, arcuate toward tip; humeral swelling evident; striæ and three basal foveæ distinct. *Abdomen* well developed, the first segment as wide as the elytra and ⅗ as long, 2½ times as wide as long, the carinæ long, parallel and distinct. *Legs* moderate, the hind tibiæ feebly arcuate. Length 1.5 mm.; width 0.68 mm.

Kansas.

Allied to *rubicunda*, but differing in the form of the abdominal carinæ, in the relatively smaller head, more slender and elongate antennæ, less inflated hind body and in the rather feebler sinus of the last dorsal segment. The male has the first ventral wholly unmodified, the last moderately large, feebly bitumorose in the middle near the base and very feebly impressed toward tip, which is broadly and briefly lobed; last dorsal rounded, finely, sparsely punctate, with an impunctate median line, the apex with a rather broad and moderately deep sinus having very broadly rounded lateral limits. In *rubicunda* the last ventral is much more narrowly and arcuately lobed at apex, and is merely flattened toward the middle of the disk.

R. ursina.—Strongly ventricose, polished, convex and impunctate throughout, rufo-testaceous, the abdomen infuscate; pubescence long, bristling, erect and abundant, pale in color as usual. *Head* nearly as wide as the prothorax, with distinct and normal foveæ, the eyes prominent and situated at rather less than their own length from the base. *Antennæ* rather slender, with a gradually formed and moderate club, ½ as long as the body; second joint cylindric, slightly longer than wide; three to eight equal in width and narrower; three to five elongate and almost equal, about ½ longer than wide; fifth just visibly longer than the fourth, the latter distinctly longer than the sixth, which is ⅖ longer than wide; seventh a little shorter but fully ⅓ longer than wide; eighth a little wider than long, the ninth similar in form but larger; eighth to eleventh very gradually and somewhat rapidly wider; eleventh obliquely acuminate, longer than the three preceding combined. *Prothorax* as in *kansana* but relatively smaller and somewhat less transverse, not more than ½ as wide as the elytra. *Elytra* short and transverse, the sides strongly divergent and almost evenly arcuate, the humeral swelling large but not very prominent; sutural stria deep, the discal rather feebly impressed; basal foveæ distinct, the sutural stria becoming sulciform toward base. *Abdomen* nearly as in *kansana* but with the dorsal carinæ a little shorter and notably more approximate; they are almost parallel and very nearly straight. Length 1.5 mm.; width 0.7 mm.

Western Missouri.

The last ventral of the male is not distinctly tumid in the middle near the base and has a rather large oval and decidedly deep concavity, rather well defined, slightly wider than long and extending from near the base to the apical margin, which is broadly lobed; last dorsal parabolic, finely and remotely punctulate, with a small and moderately deep rounded apical sinus limited by broadly rounded angles.

This species differs from both *rubicunda* and *kansana* in the much deeper concavity of the last ventral, and, from *gracilis*, which also possesses a deeply concave last ventral, it differs in its nearly parallel and not widely divergent abdominal carinæ, smaller and less transverse prothorax and smaller sinus of the last dorsal, this segment also being much less punctate.

The four species *rubicunda*, *kansana*, *gracilis* and *ursina* form a natural group, distinguished by the long bristling pubescence. The species are closely allied among themselves in general appearance, but appear to be definable by the characters given in the table. The material before me is not sufficiently extensive to disclose possible variations in the extent and direction of the abdominal carinæ, which exist to a visible degree without doubt.

R. insolita.—Moderately ventricose, the hind body oblong-elongate, strongly convex, highly polished, subimpunctate, piceous-black, the elytra rufous, the abdomen black; legs and antennæ pale; pubescence very short, stiff, recurved, only moderately dense, the elytra with a few remotely placed, short and erect tactile hairs visible under high power only. *Head* quite distinctly narrower than the prothorax, normally foveate, scarcely punctulate, the eyes prominent and well developed, at much less than their own length from the base. *Antennæ* slender, distinctly longer than the head and prothorax, the club gradually formed and not very stout; second joint much narrower than the first and not quite ½ longer than wide; three to eight still much narrower, equal in width; third ⅘, fourth and sixth barely ½, fifth 1, and seventh ⅔, longer than wide; eighth as long as wide; ninth obtrapezoidal, rather longer than wide; tenth nearly as long as wide, the eleventh obliquely pointed and as long as the three preceding combined. *Prothorax* scarcely ⅓ wider than long, widest at about the middle, the sides moderately strongly rounded, convergent and sinuate to the base, the apex barely ⅗ as wide as the base; disk strongly convex, finely, sparsely punctulate, the median fovea small but deep and perforate. *Elytra* but slightly shorter than wide, twice as wide as the prothorax, and ¾ longer, the sides moderately divergent and broadly arcuate; humeral swelling pronounced; striæ fine but strong. *Abdomen* as wide as the elytra, shorter when viewed vertically, the first segment ½ as long and nearly three times as wide as long, the carinæ fine, straight, about ⅖ as long as the segment, divergent and separated at base by slightly, though distinctly,

more than the strial interspace. *Legs* well developed, the hind tibiæ feebly arcuate. Length 1.35–1.55 mm.; width 0.65–0.7 mm.

Rhode Island (Boston Neck).

The male has the first ventral feebly flattened in the middle toward apex and the last large, broadly concave in about apical half or more, and broadly truncate at tip, the tergum gradually quite strongly though sparsely punctulate toward tip, with the last segment very broadly sinuato-truncate; the œdeagus has a long and remarkably slender, feebly arcuate and finely pointed process at each side. The completely fused meso-parapleuræ are separated from the metasternum by a broadly impressed, evenly arcuate suture, attaining the elytra at about apical third. The female seems to be a little smaller, with shorter elytra and antennæ, but with no difference in the eyes and but little in the abdominal carinæ.

This fine species, among the largest of the genus, was taken in considerable numbers; it is not comparable with any other described thus far.

R. sodalis.—Rather strongly convex and ventricose, polished and subimpunctate throughout, the elytra minutely and very feebly rugulose and the pronotum just visibly punctulate toward the sides anteriorly, rather pale rufotestaceous throughout, the elytra somewhat clearer and the abdomen obscure; pubescence pale, short, moderately dense, stiff, even and recurved. *Head* slightly, though distinctly, narrower than the prothorax, the foveæ normal; eyes large and prominent, at about ½ their own length from the base. *Antennæ* slender, ½ as long as the body, the club very gradual in formation and rather slender; second joint distinctly shorter and narrower than the first, cylindric, nearly ½ longer than wide; three to eight equal in width and still much narrower; third fully ⅘, fourth and sixth ⅔, fifth more than 1, seventh ½, longer than wide; eighth as long as wide; ninth and tenth obtrapezoidal, increasing in size, slightly wider than long; eleventh still thicker, obliquely pointed, as long as the three preceding. *Prothorax* only moderately transverse, a little more than ¼ wider than long, not very strongly rounded at the sides, the latter convergent and sinuate near the base; apex fully ⅗ as wide as the base; disk strongly convex, the median fovea rather small but deep and perforate. *Elytra* slightly shorter than wide, twice as wide as the prothorax and ¾ longer; sides distinctly divergent and broadly arcuate; humeral swelling pronounced; striæ and basal foveæ normal. *Abdomen* not quite as wide as apical third of the elytra, the basal segment ½ as long as the suture, the carinæ fine, short, strongly divergent and separated at base by but little more than the strial interspace. *Legs* normal, the hind tibiæ feebly arcuate. Length 1.4 mm.; width 0.63 mm.

Arkansas (Little Rock).

The male has the last ventral large, flattened, becoming gradually broadly and feebly concave toward tip, which is broadly, arcuately lobed and slightly deflexed; the last dorsal is sparsely and feebly punctulate and broadly sinuate, with rounded limiting angles at apex. The female is not represented in the material before me. This species is also isolated and unlike any previously known.

R. fusciventris.—Convex, only moderately ventricose, the hind body oblong-subelongate, polished throughout, rufo-testaceous, the head and prothorax rather more obscure; abdomen black; surface subimpunctate throughout, the pronotum not obviously punctulate at any part; pubescence short and decumbent, moderately dense. *Head* small, scarcely more than ¾ as wide as the prothorax, the foveæ normal; eyes prominent and very convex, moderate in size. *Antennæ* slender, ½ as long as the body, the club gradual as usual and but moderately stout; second joint a little narrower than the first, slightly longer than wide; three to eight equal in thickness and much narrower; third ¾, fourth, sixth and seventh ½ to ⅗, fifth fully 1, longer than wide; eighth not quite as long as wide; ninth and tenth obtrapezoidal, increasing, a little wider than long; eleventh but slightly oblique at tip and not quite as long as the preceding three combined. *Prothorax* relatively quite large and transverse, nearly ½ wider than long and much more than ½ as wide as the elytra, rather strongly rounded at the sides, widest just before the middle; disk convex; median fovea rather small but deep and perforate. *Elytra* not very transverse though obviously shorter than wide, the sides distinctly divergent, broadly arcuate behind; humeral swelling distinct; striæ and basal foveæ normal. *Abdomen* as wide as the elytra, much shorter from a vertical viewpoint, the first segment more than ½ as long, the carinæ fine, strongly divergent, about ⅖ as long as the segment and separated at base by slightly more than the strial interspace. *Legs* moderate in length and rather stout. Length 1.4 mm.; width 0.55 mm.

New York.

This species is somewhat allied to *peregrinator*, but may be recognized at once by the less ventricose hind body and subimpunctate pronotum. The male has the last ventral rather large, flattened toward the median line, the flattened surface ascending toward tip and lobed to fit the broad subcircular sinus in the tip of the last dorsal, the latter segment feebly punctured.

R. peregrinator.—Strongly ventricose and convex, polished and subimpunctate, except the pronotum, which is distinctly though not densely punctulate, less so broadly along the median line; body dark brown, blackish beneath, the elytra, legs and antennæ pale testaceous, the abdomen infuscate; pubescence very short, decumbent and rather abundant. *Head* much narrower than the prothorax, with the foveæ normal; eyes moderate in size, very convex

and prominent, situated at about their own length from the base. *Antennæ* slender, ½ as long as the body, the club very gradually formed and moderately stout; second joint much smaller than the first, ⅔ longer than wide; three to eight equal in thickness and still narrower; third, fifth and sixth almost equal in length and ⅘, the fourth ⅔ and seventh ⅓, longer than wide; eighth subquadrate but rather longer than wide; ninth feebly obtrapezoidal and nearly ⅓ longer than wide; tenth as long as wide; eleventh oval, obliquely acuminate and barely as long as the three preceding. *Prothorax* but feebly transverse, scarcely more than ¼ wider than long, widest just before the middle, where the sides are but moderately prominent and rounded; apex barely ⅗ as wide as the base and not quite ½ the maximum width; disk slightly convex, the foveæ normal, the median rather small but deep and perforate. *Elytra* well developed, a little shorter than wide, the suture a little longer than the humeral width; sides moderately divergent, broadly arcuate posteriorly; humeral swelling distinct; striæ and foveæ normal. *Abdomen*, from above, nearly as wide as the elytra and ⅔ as long, the first segment more than three times as wide as long and scarcely ½ as long as the elytra, the carinæ straight, strongly divergent, extending to about the middle of the segment and separated at base by obviously more than the strial interspace. *Legs* moderate, normal in structure. Length 1.6 mm.; width 0.75 mm.

Iowa (Iowa City and Keokuk); Nebraska; South Dakota.

This distinct species is rather abundant in the northwestern parts of the Mississippi Valley and is somewhat above the average in point of size. The male has the last ventral rather large, flat in the middle toward base, the surface ascending toward tip in a flattened depressed plane, the last dorsal distinctly punctulate, with the tip broadly and deeply sinuate between the more narrowly rounded limiting angles.

R. corporalis.—Strongly ventricose and convex, the hind body somewhat elongate; body black, the elytra rufous; legs and antennæ pale testaceous; integuments polished, subimpunctate, the pronotum quite distinctly though sparsely punctulate, except toward the sides and base and more narrowly along the median line; pubescence fine, short, decumbent and moderately dense. *Head* distinctly narrower than the prothorax, the foveæ deep, strongly developed and normal; eyes moderately large, strongly convex and prominent, situated at somewhat less than their own length from the base. *Antennæ* slender, more than ⅔ as long as the body, the club very gradual and rather slender; second joint much smaller than the first, longer than wide; three to eight equal in width and much narrower; third 1, fourth ⅔, fifth 1¼, sixth fully 1 and seventh ⅔, longer than wide; eighth quadrate; ninth feebly obtrapezoidal, a little longer than wide; tenth fully as long as wide along the median line, the apex broadly conical as usual; eleventh obliquely pointed and as long as the three preceding. *Prothorax* rather transverse, fully ⅔ wider than long, widest very near the middle, the sides evenly and rather broadly

parabolic from near the base and apex, the latter distinctly less than ½ the maximum width and ⅗ as wide as the base ; disk strongly convex, with distinct and normal foveæ, the median deep and perforate. *Elytra* large and well developed, a little shorter than wide, twice as wide as the prothorax, the suture fully ¼ longer than the humeral width ; sides distinctly divergent, broadly arcuate toward tip, the humeral swelling pronounced ; striæ and foveæ normal, the former very distinct. *Abdomen*, from above, as wide as the elytra and ¾ as long, the first segment less than ½ as long, three times as wide as long, the carinæ extending to the middle, straight, feebly divergent and separated by ⅓ the total width. *Legs* well developed and rather stout. Length 1.65 mm.; width 0.78 mm.

Michigan ; Canada (Ottawa).

A large and conspicuous species, readily distinguishable from *puncticollis*, which it resembles in form and coloration, by its larger size, very much feebler sculpture of the pronotum and by the male sexual modifications. The last ventral of male is large, and is broadly and distinctly concave toward the middle throughout, the concavity smooth; the last dorsal is well developed, sparsely and distinctly punctulate, the apex very broadly and strongly sinuate in circular arc with somewhat narrowly rounded lateral limits, the sides thence moderately oblique and almost straight to the base. In *puncticollis* the last ventral of the male is much smaller, and has a narrower and feeble, oval concavity along the middle, the last dorsal more narrowly and very feebly sinuato-truncate at tip.

R. borealis.—Similar in form to the preceding but much smaller, polished, black or piceous-black with pale rufous elytra, legs and antennæ, subimpunctate, the pronotum sparsely and feebly punctulate, becoming smooth toward base; pubescence short, strongly recurved and moderately dense. *Head* distinctly narrower than the prothorax, the three foveæ normal; eyes moderately large, convex, situated at rather less than their own length from the base. *Antennæ* but little longer than the head and prothorax, the club very gradually formed as usual; second joint cylindric, much smaller than the first, at least ⅖ longer than wide; three to eight equal in width, the former obconic, the remainder cylindric; third ⅘, fourth and sixth slightly more than ⅓, fifth ⅔ and seventh barely more than ¼, longer than wide; eighth nearly ⅓ wider than long; ninth obtrapezoidal, about as long as wide, the tenth slightly wider than long; eleventh very gradually and obliquely pointed, rather longer than the three preceding. *Prothorax* nearly ⅖ wider than long, widest scarcely before the middle, the sides moderately prominent and rounded; apex barely ½ of the maximum width and nearly ⅔ as wide as the base; surface strongly convex, the foveæ normal, the median deep and perforate. *Elytra* well developed though barely twice as wide as the prothorax, only slightly shorter than

wide, the suture fully ¼ longer than the humeral width; sides moderately divergent, becoming broadly arcuate; humeral swelling conspicuous; striæ and foveæ normal. *Abdomen*, from above, as wide as the elytra and ⅔ as long, the basal segment nearly ½ as long, not quite three times as wide as long, with the apex broadly arcuate; carinæ not quite attaining the middle, rather strongly divergent and separated by ⅓ the total width, by rather less at base. *Legs* rather slender. Length 1.25 mm.; width 0.6 mm.

Canada (Ottawa,—Mr. W. H. Harrington); Massachusetts (Lowell,—Mr. Blanchard).

Apparently an abundant and rather widely distributed species, closely allied to *puncticollis*, but distinguishable by the feeble sculpture of the pronotum, diverging and not parallel abdominal carinæ, shorter antennæ and slightly smaller size; the fifth joint of the antennæ in *puncticollis* is more than twice as long as wide, and the obtrapezoidal ninth and tenth are both longer than wide. The sexual characters are nearly as in *puncticollis*, the last ventral being feebly concave along the middle and the last dorsal feebly sinuato-truncate at tip, the truncature about ⅖ as wide as the base. The specimens from Lowell may possibly represent a variety, as the antennal joints are not proportioned exactly the same and the elytra are relatively a little shorter, but all the other characters are apparently similar; in these examples the eighth joint of the male antenna is about as long as wide and quite obliquely truncate at tip, the ninth and tenth both distinctly wider than long. The elytra in the female of this species are rather shorter, with more diverging sides and are frequently more obscure in coloration.

R. distans.—Moderately ventricose, convex and pale flavo-feruginous throughout, the elytra still somewhat paler; integuments shining, quite distinctly though sparsely punctulate throughout, the pronotum smooth along the median line and toward base, the head slightly punctulate toward base; pubescence very short, moderately dense and strongly recurved. *Head* only slightly, though obviously, narrower than the prothorax, with normal foveæ, the eyes moderately large, convex, situated at distinctly less than their own length from the base. *Antennæ* slightly longer than the head and prothorax, moderately slender, the three outer joints rather rapidly wider, the last scarcely ½ longer than wide and obliquely pointed; second smaller than the first, ovo-cylindric, distinctly longer than wide; three to eight narrower and equal in thickness, the former more obconic; third ⅘, fourth and seventh ⅔, fifth ½ and sixth nearly ½, longer than wide; eighth quadrate; ninth fully as long as wide; tenth distinctly wider than long. *Prothorax* with the rounded sides moderately prominent, about ⅖ wider than

long, widest rather distinctly before the middle ; apex more than ½ the maximum width and ¾ as wide as the base ; disk strongly convex, the foveæ normal. *Elytra* well developed, though scarcely twice as wide as the prothorax, only slightly shorter than wide, the suture nearly ⅓ longer than the humeral width ; sides moderately divergent, broadly arcuate posteriorly ; humeral swelling quite moderate ; striæ and basal foveæ normal. *Abdomen*, from above, as wide as the elytra and ¾ as long, the first segment distinctly less than ½ as long, nearly three times as wide as long, the carinæ ⅖ as long as the segment, straight, strongly divergent and enclosing ⅓ the entire width. *Legs* moderately long, rather slender. Length 1.2 mm.; width 0.6 mm.

Canada (Ottawa). Mr. W. H. Harrington.

A small species, allied somewhat to *demissa*, but distinguished not only by the sexual characters as indicated in the table, but by the larger eyes, less transverse and less prominently rounded sides of the prothorax and very much more elongate elytra, with less diverging sides.

R. procera.—Convex, elongate and only feebly ventricose, highly polished, dark red-brown and subimpunctate throughout, the pronotum not distinctly punctulate at any part, the sutural regions of the elytra feebly and subserially punctured ; pubescence rather short, coarse, moderately abundant and strongly recurved. *Head* much narrower than the prothorax, with normal foveæ, the eyes quite moderate in size, prominent and situated at about their own length from the base. *Antennæ* but slightly longer than the head and prothorax, the club very gradual in formation as usual; second joint almost as large as the first, ovo-cylindric, ⅖ longer than wide; three to eight equal in width and much narrower, the third more obconic as usual ; third and fifth ¾, fourth, sixth and seventh subequal and about ½, longer than wide ; eighth about ¼ wider than long ; ninth and tenth obtrapezoidal, nearly similar in form but increasing, both obviously wider than long ; eleventh rather longer than the three preceding, obliquely pointed in apical half. *Prothorax* about ⅓ wider than long, obviously more than ½ as wide as the elytra, widest and rounded at the sides before the middle but not very prominently ; apex fully ½ of the maximum width and ¾ as wide as the base ; surface very convex, the lateral foveæ situated at basal third. *Elytra* short, nearly ½ wider than long, ½ longer than the prothorax, the suture but slightly longer than the humeral width ; sides strongly divergent and broadly arcuate ; humeral swelling rather feeble ; striæ and foveæ normal, the former deep, the sutural receding more from the suture and more arcuate in apical half, the discal slightly everted toward tip. *Abdomen*, from above, about as wide as the elytra and fully as long, the basal segment ⅗ as long, 2½ times as wide as long, the carinæ very fine, straight, just visibly divergent, less than ⅓ as long as the segment and enclosing barely ⅓ of the entire width. *Legs* moderate in length, the femora rather stout. Length 1.35 mm.; width 0.55 mm.

Iowa ?

This is quite an isolated species, which I am unable to compare with any other, and which will be readily identifiable among those of the present group by its elongate form. The male has the last ventral concave at the middle, the last dorsal with an even and moderately broad sinus, limited by broadly rounded angles, the entire margin having a distinct beaded edge. The locality is open to some doubt, but will probably be found to be correct as surmised above.

R. arcifer.—Rather strongly ventricose, convex, and highly polished throughout; rufo-testaceous, the head less pale and the abdomen blackish, impunctate throughout, the pubescence moderately short and dense, coarse and strongly recurved. *Head* distinctly narrower than the prothorax, with the usual equilateral triangle of deep pubescent foveæ, the eyes very prominent and situated at obviously less than their own length from the base. *Antennæ* long and slender, $\frac{3}{5}$ as long as the body, the club gradually formed; second joint relatively small, much shorter and narrower than the first, $\frac{2}{5}$ longer than wide; three to seven equal in width and obviously narrower, much elongated; third 1, fourth just visibly more than 1, fifth nearly $1\frac{1}{2}$, sixth slightly more than 1, and seventh $\frac{1}{2}$, longer than wide; eighth slightly thicker and more asperate, properly forming a part of the club, quadrate; ninth obtrapezoidal, slightly elongate; tenth not quite as long as wide, slightly asymmetric, the inner angle at apex more acute; eleventh not as long as the three preceding, obliquely pointed, the inner side flattened toward base. *Prothorax* nearly $\frac{2}{5}$ wider than long, widest before the middle, the sides rounded but not particularly prominent; apex a little less than $\frac{1}{2}$ the maximum width and not $\frac{2}{3}$ as wide as the base; surface strongly convex, the lateral foveæ at basal $\frac{2}{5}$; median fovea normal, perforate. *Elytra* well developed, twice as wide as the prothorax, slightly shorter than wide, the suture $\frac{1}{5}$ longer than the humeral width; sides distinctly divergent and broadly and distinctly arcuate; humeral swelling distinct; striæ and foveæ normal. *Abdomen* shorter and quite distinctly narrower than the elytra, the first segment rather long and well developed, with the carinæ straight, short and parallel, scarcely $\frac{1}{4}$ as long as the segment and separated by a little more than $\frac{1}{4}$ of the total width. *Legs* rather long, the intermediate femora notably swollen toward the middle. Length 1.5 mm.; width 0.68 mm.

Kansas.

The intermediate tibiæ of the male are compressed and broadly arcuate, except toward apex, the outer edge bristling with long erect hairs; the last ventral is large and is evenly concave, with the apex sinuate and bilobed, the last dorsal short and broadly sinuate at tip, apparently in circular arc, with rather clearly defined subangular lateral limits. It is unnecessary to add that this is one of the most distinct forms of the genus in its aberrant

male antennæ and legs, and in its strongly marked abdominal sexual characters.

R. taphrocera.—Rather strongly ventricose, convex, shining, black, the elytra rufous; legs red-brown, the antennæ dark red-brown; head toward base, pronotum except along the middle and toward base, elytra and abdomen toward tip, finely, feebly and sparsely punctulate; pubescence fine, short, moderately dense and closely recurved. *Head* only very slightly narrower than the prothorax, somewhat wider than long, the vertexal foveæ widely separated, deep and equidistant from base and apex; eyes moderately prominent, situated at about ½ their length from the base. *Antennæ* slightly longer than the head and prothorax, the club gradually formed but large and stout; portion beyond the second joint arcuate in repose; second joint large, excavated beneath; third obtriangular, wider than long; fourth still wider, twice as wide as long; fifth moderately dilated, suboval, slightly transverse; sixth equally wide but shorter, parallel, ⅕ wider than long; seventh and eighth equal in width and very slightly narrower, the former slightly wider than long and longer than the sixth, the latter shorter, more pointed within, ⅔ wider than long; ninth a little wider, evenly obtrapezoidal, ⅗ wider than long; tenth evenly obtrapezoidal and about as long as wide; eleventh normal, obliquely pointed, stout, about as long as the four preceding; the sixth and seventh joints are irregular beneath, the latter with a deep irregular pit. *Prothorax* ⅖ wider than long, widest but not very prominently rounded before the middle; surface very convex, serially punctured along the basal margin for a short distance, the median fovea rather small but deep. *Elytra* well developed, slightly shorter than wide, the suture ⅕ longer than the humeral width; sides rather feebly divergent, broadly and distinctly arcuate throughout; humeral swelling very moderate; striæ and foveæ normal. *Abdomen* nearly as wide as the elytra and ¾ as long, the carinæ of the first segment fine, strongly divergent, straight, extending not quite to basal third and separated at base by ⅓ the entire width. *Legs* rather slender, the hind tibiæ broadly arcuate throughout, gradually clavate with circular cross-section toward tip. Length 1.2 mm.; width 0.6 mm.

California (Monterey Co.).

This species was briefly referred to by me (Bull. Cal. Acad. Sci., II, p. 195) as *deformata* Lec., and the antenna was figured on the accompanying plate under the same name; it is a smaller species than *deformata*, the latter differing besides in having the second antennal joint larger and unexcavated beneath, the sixth joint oblique and subtriangular, sixth and seventh slightly narrower, equal in size and transverse and the eighth still smaller but equally transverse, the elytra, also, broader at base with more developed humeri. The male of this species has the last ventral moderately large, flattened but not impressed, and with a rounded

lobe at apex, the last dorsal broadly rounded with the tip feebly sinuate. *Deformata* is a little more southern in its range.

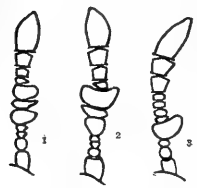


FIG. A.

1. Male antenna of *R. turgidicornis*. 2. Same of *R. falli*. 3. Same of *R. sagax*.

R. falli.—Strongly convex and ventricose, shining, black, the elytra bright rufous; legs piceous, the tibiæ slightly, the tarsi much, paler; antennæ blackish; integuments subimpunctate, the pronotum slightly sculptured along the basal margin; pubescence silvery, rather abundant, short, decumbent and closely recurved. *Head* slightly narrower and longer than the prothorax, the vertexal foveæ deep, situated distinctly nearer the base than the apex; eyes rather large, prominent, at scarcely ½ their length from the base. *Antennæ* extremely modified, about as long as the head and prothorax, the last joint very obliquely pointed; first joint large, convex beneath; second much smaller, slightly transverse; third and fourth small, wider than long; fifth large, as wide as the first, almost equilatero-triangular; sixth a little wider than the fifth and much shorter, strongly transverse; seventh extremely large and dilated, longer than the fifth and twice as wide, asymmetrically obtrapezoidal, convex above; eighth small, transverse, the club thence very gradually formed and nearly normal, the dilated joints profoundly complex beneath, the sixth with a narrow vertical ligula, the seventh broadly excavated, with a slender spine arising obliquely and inwardly from the basal margin, the excavation smooth and polished. *Prothorax* unusually short, ½ wider than long, widest near the middle, the sides evenly and not very prominently rounded; apex nearly ⅗ the maximum width and ¾ as wide as the base; foveæ normal. *Elytra* broad and ample, nearly ⅓ wider than long; suture quite distinctly longer than the humeral width; sides moderately divergent, arcuate toward tip; humeri large; striæ and foveæ normal. *Abdomen* nearly as wide as the elytra but much shorter; carinæ fine, straight, moderately divergent, fully ⅖ as long as the segment and separated at base by a little more than ⅓ the total width. *Legs* rather long and slender, the hind femora irregular, obtusely prominent beneath beyond the middle, the upper face broadly emarginate in a cylindrical surface thence to the base, the hind tibiæ long, slender, evenly arcuate throughout and but slightly thickened toward tip. Length 1.25 mm.; width 0.65 mm.

California (Sta. Monica, Los Angeles Co.). Mr. H. C. Fall.

In this species the sexual modification of the antennal funicle is carried to an extreme, and there are sexual modifications of the basal joint also, and of the hind femora, which render it one of the most isolated even of the widely differentiated California Reichenbachiæ. The second ventral segment is longer than the entire remainder of the abdomen, and the last is only moderately long, flattened slightly toward the middle and feebly, arcuately

lobed at tip, the last dorsal very short, broadly rounded and with a feeble apical sinuation.

R. turgidicornis.—Strongly convex and ventricose, shining, subimpunctate, the pronotum minutely, feebly and remotely punctulate; body black, the elytra pale rufous; legs piceous-black, paler distally; antennæ black, the first four joints paler; pubescence short, strongly and closely recurved and moderately dense. *Head* much narrower than the prothorax and about equally long, the vertexal foveæ moderate in size and about equidistant from base and apex; eyes prominent, moderately large, at much less than their own length from the base. *Antennæ* stout and very irregular, distinctly longer than the head and prothorax, the club normal and very gradually formed; basal joint not unusually large; second but little narrower, nearly globular, the next two still narrower, small and transverse; fifth large, dilated, much wider than long, gradually pointed within; sixth shorter but very nearly as wide; seventh as wide and long as the fifth, less pointed within; eighth abruptly very much smaller, transverse, pointed internally, the next two obtrapezoidal; under surface of the fifth joint convex and scarcely modified, the sixth with a narrow vertical ligula projecting from the basal margin, the seventh not excavated but with the surface gradually and acutely elevated toward the middle of the basal margin. *Prothorax* $\frac{2}{5}$ wider than long, widest near apical third, the sides there rather strongly but not prominently rounded, thence moderately convergent and feebly arcuate to the base; apex wide, $\frac{2}{3}$ the maximum width and $\frac{3}{4}$ as wide as the base; foveæ normal but only moderately developed. *Elytra* short, at least $\frac{1}{3}$ wider than long, more than twice as wide as the prothorax, the humeri widely exposed at base and rounded, with distinct plica; sides moderately divergent and broadly arcuate; striæ and foveæ normal. *Abdomen* a little narrower and much shorter than the elytra, the first segment less than $\frac{1}{2}$ as long and rather more than three times as wide as long; carinæ rather feeble, nearly straight, strongly divergent, not extending to basal third and separated at base by a little more than $\frac{1}{3}$ the total width. *Legs* moderate in length, slender, the femora unusually slender, the posterior not notably modified; hind tibiæ strongly arcuate throughout, feebly thickened toward tip. Length 1.25 mm.; width 0.68 mm.

California (Sta. Monica, Los Angeles Co.). Mr. H. C. Fall.

Allied in the structure of the front and in other features to the preceding species, but differing profoundly in the sexual modifications of the median joints of the antennal funicle and of the hind femora. The male modification of the ventral apex is virtually the same in both.

Sagax Lec., was also taken by Mr. Fall at Sta. Monica; a drawing of the male antenna is given for comparison. The under surface of the large fourth joint is flattened and coarsely asperate; the club is rather roughly though not densely sculptured and with unusually long and bristling pubescence.

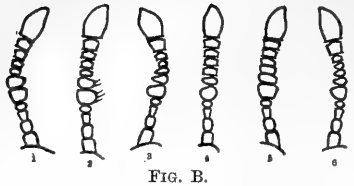


FIG. B.

1. Male antenna of *R. albionica;* 2. same of *R. binodifer;* 3. same of *R. articularis;* 4. same of *R. spatulifer;* 5. same of *R. fusticornis;* 6. same of *R. propinqua.*

R. binodifer.—Convex and rather strongly ventricose, dark brown with paler rufous elytra and legs, the antennæ infuscate; body subimpunctate throughout, the pubescence short, subdecumbent and moderately abundant. *Head* distinctly narrower than the prothorax, with normal foveæ, the eyes small but very convex, at fully their own length from the base; antennæ as shown in the accompanying figure, the under surface of the two dilated joints with small acute tubercles bearing more prominent setæ. *Prothorax* a little more than ½ as wide as the elytra, widest before the middle. rather transverse, the foveæ normal. *Elytra* about ⅓ wider than long, the sides broadly arcuate and moderately divergent; humeri well developed; striæ and foveæ normal. *Abdomen* nearly as wide as the elytra and fully ¾ as long, the carinæ feebly arcuate, strongly divergent, extending to basal ⅖ and separated by ⅓ the total width. Length 1.4 mm.; width 0.7 mm.

Vancouver Island.

The intermediate tibiæ of the male are slightly thickened and have a strong oblique spur projecting inwardly from near the tip, the hind tibiæ bent at the middle and thence strongly compressed, dilated and excavated to the apex.

R. articularis.—Body nearly similar but a little shorter and more ventricose, similarly subimpunctate, pubescent and polished, black, the elytra dull rufous, the legs paler; antennæ blackish, paler toward base. *Head* relatively larger, almost as wide as the prothorax, the eyes small but very prominent, at fully their own length from the base; antennæ distinctly longer than the head and prothorax, as shown in the figure, the under surface of joints five and six asperate and sparsely clothed with dilated squamiform hairs. *Prothorax* distinctly smaller and less transverse than in *binodifer*, rather less than ½ as wide as the elytra, widest before the middle, the foveæ normal. *Elytra* and abdomen nearly as in *binodifer*, but with the strongly divergent carinæ straight and extending almost to the middle of the disk, separated at base by ⅓ of the total width. Length 1.4 mm.; width 0.73 mm.

Southern Colorado.

Allied closely to *binodifer*, but distinguished by the characters stated; it inhabits the high mountainous regions of the State.

R. fusticornis.—Rather strongly ventricose and convex, polished, subimpunctate throughout, dark brown in color, the abdomen black; elytra bright red, the legs dark red-brown; antennæ blackish toward tip; pubescence very short and subdecumbent, not very abundant. *Head* almost as wide as the prothorax, nearly as in the preceding species, the antennæ as in the accom-

panying figure. *Prothorax* scarcely more than ⅓ wider than long and not quite ½ as wide as the elytra, widest well before the middle, the foveæ normal. *Elytra* fully ⅓ wider than long, the humeri broadly exposed and well developed; sides moderately divergent and broadly arcuate. *Abdomen* nearly as wide as the elytra and distinctly shorter, the carinæ fully ½ as long as the first segment, strongly divergent, straight and separated at apex by slightly more, at base by a little less, than ⅓ the entire width. Length 1.25 mm.; width 0.7 mm.

California (northern coast regions).

Closely allied to the preceding species and to *albionica*, but distinguished by the thick and nearly cylindrical antennæ from the fifth joint; the under surface of the enlarged outer joints is flattened and roughly scabrous as far as the club.

R. spatulifer.—Body only slightly ventricose, convex, highly polished, impunctate throughout, piceous-black, the elytra not paler or only feebly rufescent; antennæ and legs blackish, the latter paler distally; pubescence short and decumbent, not very abundant. *Head* as wide as the prothorax, normally foveate, the eyes small but prominent, at fully their own length from the base; antennæ longer than the head and prothorax, as in the figure, the under surface of joints five and six alone modified and more coarsely setulose. *Prothorax* nearly ⅔ wider than long, ½ as wide as the elytra, widest before the middle, normally foveate, the lateral foveæ deep. *Elytra* fully ⅓ wider than long, only moderately developed at the humeri, the sides strongly divergent and broadly arcuate, the usual striæ and foveæ distinct. *Abdomen* nearly as wide and almost as long as the elytra, the first segment unusually elongate, less than 2½ times as wide as long, the carinæ straight, ⅖ as long as the segment, only moderately divergent, separated at base by fully ⅓ the entire width and at tip by much more. Length 1.2 mm.; width 0.6 mm.

Canada (Ottawa). Mr. W. H. Harrington.

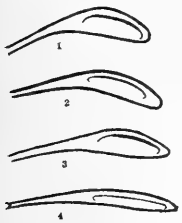


FIG. C.

1. Male hind tibia of *R. articularis;* 2. same of *R. albionica;* 3. same of *R. fusticornis;* 4. same of *R. propinqua.*

This species may be readily distinguished from the three preceding, and *albionica*, by its smaller size, blackish elytra with narrower humeri and more divergent sides, and more elongate first segment of the abdomen.

These four allies of *albionica* form with that species a well-marked group, distinguished by the spatulate and excavated hind tibiæ of the male; it includes also *propinqua*, in which the tibial dilatation becomes much less distinct as shown in the figure. The sexual characters at the abdominal apex are virtually similar throughout, the last ventral being flattened slightly and lobed at apex,

and the last dorsal feebly sinuate at tip. In my opinion they should be regarded as closely allied but true species and not mere geographic subspecies. The representatives of *albionica* before me are from Idaho (Cœur d'Alène) and Washington State, those of *propinqua* from Michigan and Massachusetts (Lowell).

NISAXIS Csy.

The species of this genus are smaller as a rule than in Reichenbachia, and can readily be distinguished by the complete obliteration of the vertexal foveæ, and the median of the three basal foveæ of the elytra; the abdominal carinæ are as widely separated as in Decarthron, but are shorter and more feebly developed. The four components in my cabinet belong to two distinct groups and may be separated as follows:—

Male with the third dorsal segment broadly flattened, the median parts toward apex feebly tumid and bearing long erect setæ.

Elytra of the male less abbreviated, the abdominal carinæ scarcely ⅓ as long as the segment; pubescence abundant and conspicuous.

tomentosa Aubé

Elytra decidedly shorter than wide and more arcuate at the sides; abdominal carinæ generally a little longer; body smaller, with the pubescence less abundant.....subsp. **cincinnata** Csy.

Male with the second dorsal profoundly excavated in nearly median half, the excavation very irregular and with complex modifications.

Head large, subequal in width to the prothorax. Maritime regions of Texas.

maritima Csy.

Head much narrower than the prothorax. Missouri valley regions.

parviceps n. sp.

The last species of the table may be thus described from the male:—

N. parviceps.—Elongate, subparallel and only moderately convex, pale and uniform rufo-testaceous and polished throughout; elytra coarsely, sparsely and obsoletely variolato-punctulate, the remainder impunctate; pubescence moderate in length, coarse, recurved and rather sparse. *Head* scarcely ⅘ as wide as the prothorax, the front near the feeble antennal prominences very slightly impressed and subpunctate; eyes rather large but only slightly prominent, at less than their own length from the base. *Antennæ* barely as long as the head and prothorax, the club gradually formed and rather stout; second joint but little smaller than the first; three to seven equal in thickness and narrower, the third obconic and distinctly longer than wide; eighth slightly transverse; ninth distinctly and tenth moderately, transverse. *Prothorax* relatively large, ½ wider than long, widest and prominently though evenly rounded at the sides before the middle; apex scarcely ½ the maximum width

and ¾ as wide as the base; surface strongly convex, the foveæ all nude, the lateral small and feeble, the median still smaller but distinct. *Elytra* short, ⅔ wider than long, ½ wider than the prothorax, the suture ½ longer than the latter and ⅔ longer than the first dorsal; sides broadly arcuate; sutural stria arcuate, the discal extending but little behind the middle. *Abdomen* not quite as long or wide as the elytra, the first segment less than twice as wide as long, feebly convex, the carinæ subparallel, separated by ½ the total width and extending to the middle or nearly so. *Legs* slender, moderately long. Length 1.28 mm.; width 0.52 mm.

Nebraska.

The first dorsal of the male is deflexed in the middle of the apical margin, the deflexed lobe transversely excavated and bearing at apex a small nude slender and erect tubercle, the surface of the tip above the excavation with two small feeble setose tumors. The second segment is transversely and deeply excavated, the hind margin reflexed, lamellate and setose in the middle. The third has two small distant median tubercles, each of which bears a stiff erect seta. Remainder of the dorsum unmodified. The last ventral is very short as usual and has a short acute reflexed apical lobe. The modifications of the tergum are quite similar to those of *maritima*, differing principally in degree.

Tomentosa and *cincinnata* are very closely allied but appear to me to be at least subspecifically distinct; they have nearly identical male sexual characters, but so also do *maritima* and *parviceps*, and yet these last are mutually widely separated in very numerous characters, such as the larger size, more elongate form, smaller head and very much shorter and more transverse elytra of the latter.

ANCHYLARTHRON Bndl.

The form described below from the male is closely allied to *cornutum* in the sexual modifications of the head and antennæ, but differs profoundly in general habitus, the hind body being much shorter and more dilated and the elytra very much more abbreviated; the pubescence, also, is decidedly longer.

A. curtipenne n. sp.—Strongly ventricose and convex, polished and subimpunctate throughout; body, legs and antennæ dark rufo-testaceous, the elytra scarcely paler; pubescence conspicuous, rather long, pale in color, moderately abundant and recurved. *Head* distinctly narrower but only slightly longer than the prothorax, subquadrate, the eyes at the middle of the sides, rather small, moderately prominent and very coarsely faceted; basal parts of the vertex elevated obliquely forward in two rounded prominences, separated by less

than ½ the total width, the upper surface anterior to this large and nearly flat to the frontal declivity, with two small tufts of erect setæ at the middle, the surface very feebly swollen along the median line at the middle and very broadly and feebly impressed near each antennal prominence, the latter feeble. *Antennæ* nearly as in *cornutum*, but relatively more elongate, much longer than the prothorax and elytra combined, the sixth joint longer than either of those adjacent. *Prothorax* scarcely ½ wider than long, widest and rather prominently rounded before the middle; apex more than ½ the maximum width and fully ¾ as wide as the base; surface strongly convex, smooth, sculptured along the base, the lateral foveæ small, the median subobsolete, all nude. *Elytra* short; nearly ¾ wider than long, fully twice as wide as the prothorax; sides strongly divergent and distinctly arcuate from base to apex, the humeral swelling moderate; disk without striæ or foveæ, except the sutural line, which is straight, deep and entire. *Abdomen* about as wide as the elytra and a little longer, the basal segment broadly rounded at apex and not quite three times as wide as long; carinæ short, subparallel and very remotely separated. *Legs* slender. Length 1.6 mm.; width 0.75 mm.

Iowa.

In the male of *cornutum* the body is narrower, much less ventricose, flavo-testaceous in color, with the antennæ but slightly longer than the prothorax and elytra, and the latter scarcely more than ⅓ wider than long; the subbasal lobes of the head are flatter and more broadly rounded, and the pubescence shorter and stiffer.

The following species is evidently congeneric with *curtipenne* and *cornutum*, though much smaller, and is possibly the form alluded to by Dr. Brendel (Bull. Univ. Iowa, II, p. 4).

A. caviceps n. sp.—Ventricose, convex, highly polished and impunctate throughout; body, legs and antennæ rather pale rufo-testaceous, the elytra darker, piceo-rufous; pubescence moderately long and coarse, rather sparse and strongly recurved. *Head* a little narrower than the prothorax and distinctly longer, fully as long as wide, the eyes somewhat small, convex, and situated at rather more than their own length from the base. *Antennæ* distinctly longer than the head and prothorax, moderately stout, the club very gradual in formation, the last joint relatively larger and longer than in Reichenbachia, and as long as the preceding four combined; second joint distinctly smaller than the first, cylindric and slightly elongate; third narrower, as long as the second, strongly obconic; fourth as long and broad as the first, elongate-oval, impressed internally near the middle and base, without trace of dividing suture; five to seven smaller, subequal and subquadrate; eighth and ninth wider, obtrapezoidal, increasing in size, nearly similar in form and about twice as wide as long. *Prothorax* nearly ½ wider than long, widest and somewhat prominently rounded at about the middle; apex more than ½ the maximum width and fully ¾ as wide as the base; disk strongly convex, smooth but strongly sculptured along the basal margin; lateral foveæ small, the median still smaller, all nude. *Elytra* fully ⅓ wider than long, twice as wide as the prothorax, the

sides strongly divergent and broadly arcuate from the base, the humeral swelling moderate; disk feebly, longitudinally impressed toward base within the humeri, but without basal foveæ or discal stria, the sutural stria deep and entire. *Abdomen* as wide as the elytra and only slightly shorter, the basal segment broadly arcuate at apex, 2½ times as wide as long, with the carinæ scarcely more than ¼ as long, feebly arcuate, parallel and separated by fully ½ the total width. *Legs* slender, the femora only feebly dilated; hind tibiæ broadly arcuate, feebly swollen and pubescent within toward tip. Length 1.35 mm.; width 0.65 mm.

Florida (Lake Worth).

The head in the males of this genus, as well as Pselaptus, is as singularly modified as in Batrisus. In the present species the occipital region is feebly convex, smooth and gradually ascending to a transverse, broadly bilobed truncature at the middle of the length, this being the posterior limit of a very deep excavation extending entirely across the head between the eyes, and, posteriorly, far under the occipital surface, the bottom swollen in the middle, the tumor bearing two suberect pointed and setose tubercles extending upward to about the level of the posterior margin of the excavation, the two broadly rounded lobes of the latter with inflexed yellow setæ disposed along the edge. The antennal tubercles are rather large and are lamellarly prominent within, the tip of the prominence setose, the two separated by a longitudinal depression carrying the bottom of the transverse excavation forward to the rapidly sloping front. The clypeal margin is rounded and minutely reflexed. The ventral apex is not greatly modified, the sixth segment being broadly truncate in a straight line having subangulate and slightly prominent lateral limits, this apical line being also very slightly reflexed in plane.

The generic name Anchylarthron does not seem to be preoccupied, and cannot therefore be changed; it is moreover more appropriate than " Verticinotus."

NOTE.—In the male of *Pselaptus belfragei* Lec., the vertex is broadly concave in the middle from the line through the middle of the eyes to the frontal margin, the concavity being about ½ as wide as the head, with rounded and indefinitely limited margins and having at the central point of the bottom a small and transverse, very feebly elevated and somewhat setose swelling. The antennal cavities at the sides of the front are prolonged inward dorsally behind the prominences in a very remarkable manner, separated dorsally by about a seventh of the entire width of the head and surrounded by a minutely but strongly elevated bead-like margin, the concave channel separating them longitudinally being a continuation of the bottom of the large concavity of the

vertex. The front between the large inferior parts of the antennal cavities is narrowed and tumid along the middle, descending and expanding to the clypeal margin, which is broadly arcuate. The basal joint of the antennæ is as long as the next two combined, and the eyes are large, very prominent and very coarsely faceted. The under surface of the head has three narrow but very strongly elevated longitudinal carinæ, one median and one immediately beneath each eye. The legs are very slender, the femora thicker than the tibiæ but not dilated. This very minute bryaxid occurs from central Texas to Yuma, in California, but is not common.

BYTHININI.

BYTHINUS Leach.

The name Machærodes, proposed by Brendel for the few American representatives of this essentially European genus, cannot hold good in the opinion of the writer, and the change of the name *bythinoides* to *tychoides*, made by the author referred to in his recent monograph, is not generally considered allowable by zoölogical authors, such names as *Bythinus bythinoides* being considered acceptable under the adopted rules of nomenclature, and therefore demanded by the rules of priority. The three species of Bythinus in my cabinet inhabit the eastern parts of the United States exclusively, and may be distinguished as follows:—

Basal parts of the head strongly carinate along the median line.
carinatus Bndl.

Basal parts not carinate; body much smaller.
Pubescence coarse, rather long and sparse (*tychoides* Bndl.)
bythinoides Bndl.
Pubescence shorter, finer and about twice as dense.....**carolinæ** n. sp.

In the first species the head of the male is tumid and carinate along the median line for some distance further toward tip than in the female, and, between the anterior limit of the elevation and the acutely angulate frontal margin, there is a perfectly smooth and highly polished depression, containing a trapezium of four elevated setigerous punctures. I have not noticed analogous sexual differences in the second section of the table.

B. carolinæ.—Convex and rather strongly ventricose, polished, dark rufo-testaceous in color, the head somewhat, and the abdomen quite noticeably, darker; legs, antennæ and palpi still paler; pubescence quite abundant and conspicuous, pale in color and strongly recurved. *Head* fully as wide as long, much narrower than the prothorax, the eyes moderately small and subbasal; surface throughout with large sparse and concave annular elevations with minute granuliform pubiferous punctules scattered sparsely over the inter-

spaces; general form as in *bythinoides*, the antennæ and palpi also nearly as in that species. *Prothorax* scarcely more than ⅓ wider than long, widest near anterior third, the sides moderately convergent and nearly straight thence to the base; surface convex, with large sparse circular and almost completely effaced areolæ and minute, scattered granuliform punctules, the transverse posteriorly arcuate subbasal furrow distinct. *Elytra* very nearly as long as wide, the sides feebly divergent, evenly and strongly arcuate from base to apex, the humeri distinctly swollen; sutural stria strong; surface with minute and subasperate punctures. *Abdomen* distinctly narrower and much shorter than the elytra, the dorsal segments short, subequal in length but diminishing rapidly in width. *Legs* slender. Length 1.1 mm.; width 0.53 mm.

North Carolina (Asheville).

The second palpal joint is studded with large tubercles, and the last joint is densely and very regularly clothed with fine, perfectly erect hairs throughout. The single specimen before me is a male, the last ventral segment being moderate in length, not impressed but parabolically rounded at tip.

Pselaptrichus of Brendel, is extremely closely allied to Bythinus and should perhaps more properly be regarded as a subgenus, the elongation of the basal segment of the abdomen being but slight.

TYCHUS Leach.

Of the two species described below, the first is allied to *minor* and the second rather remotely to *puberulus*.

T. pocahontas n. sp.—Rather slender, strongly convex, pale rufo-testaceous throughout, the elytra slightly clearer red and the legs and apical part of the antennæ more flavate; pubescence rather abundant, long, coarse, pale and recurved; integuments highly polished and impunctate throughout. *Head* slightly narrower than the prothorax and rather longer than wide, the double apical tubercle about ⅔ the maximum width; eyes well developed, convex, subbasal and very prominent; surface strongly, evenly convex in little more than basal half, then declivous to the transverse depression which is situated at about apical third; longitudinal sulcus of the frontal tubercle rather fine and deep; small nude punctiform foveæ remotely separated at the middle of the length, each immediately behind a large feeble tubercle having a minute acute apex; antennæ ½ as long as the body, nearly as in *minor*, the ninth and tenth joints less transverse and only slightly wider than long. *Prothorax* very nearly as long as wide, widest and subangularly rounded before the middle, the sides nearly straight and feebly convergent posteriorly; apex narrow, ⅔ of the maximum width and scarcely more than ½ as wide as the base; surface convex and even, with a series of small punctures along the basal margin. *Elytra* slightly shorter than wide, fully twice as wide as the prothorax, convex, the sides moderately divergent, more arcuate behind; humeral swelling narrow

but strong; discal stria distinct in basal half, the sutural strong. *Abdomen* slightly shorter and narrower than the elytra, the first segment deeply impressed along the basal margin from side to side, the sulcus interrupted by two cariniform bridges, separated by a little more than ⅓ of the total width. *Legs* rather long and slender. Length 1.4 mm.; width 0.55 mm.

Virginia (Norfolk).

This species is narrower than *minor*, with slightly longer, denser and more conspicuous pubescence and with the head narrower, more elongate and less rapidly narrowed to the frontal tubercle. In *minor* the transverse depression behind the tubercle is near apical fourth, and, between the minute nude foveæ and each antennal tubercle, there is an extremely minute spicule, situated slightly nearer the tubercle than the fovea and arising from the general surface without trace of a tuberculiform swelling. The description and comparisons are drawn from the female.

T. hexagonus n. sp.—Moderately ventricose, strongly convex, polished and impunctate, dark piceous when mature but frequently paler; elytra, legs and antennæ always pale rufo-testaceous; pubescence long, bristling and suberect, rather abundant and conspicuous. *Head* small, very much narrower and rather shorter than the prothorax, somewhat longer than wide, the base rounded in circular arc behind the eyes, which are moderately developed and prominent; surface convex, the subfrontal transverse impression situated just behind apical fourth; frontal tubercles distinctly less than ½ the maximum width, separated by a fine sulcus which angularly expands anteriorly; punctiform foveæ remotely separated, situated slightly behind the middle and exceedingly minute, the spicules apparently subobsolete; antennæ not quite ½ as long as the body, the basal joint long and cylindric, twice as long as the second and almost as long as the next three combined, the second cylindric and obviously elongate; three outer joints gradually larger; tenth nearly ½ wider than long. *Prothorax* hexagonal, about as long as wide, widest and angularly rounded at the middle, the sides thence straight to apex and base, strongly convergent toward the former; apex narrow, ⅖ of the maximum width and ½ as wide as the base; surface smooth and convex, with a coarse elongate furrow at each side and a small fovea at the middle, all basal; basal margin also with a single series of small punctures. *Elytra* slightly shorter than wide, fully twice as wide as the prothorax; suture much longer than the humeral width; sides rather strongly divergent and broadly arcuate; humeral prominences pronounced; surface convex, the discal stria coarse and deep, extending slightly behind the middle, the sutural deep and broadly arcuate. *Abdomen* slightly narrower and distinctly shorter than the elytra; first segment slightly longer, as usual, transversely rectilinear at apex, impressed along the basal margin, the impression clothed with very short, subsquamiform, recurved setæ. *Legs* moderate in length, the femora somewhat inflated, the two anterior pairs shorter and much less stout than the posterior. Length 1.4 mm.; width 0.6 mm.

California (Ojai). Mr. H. C. Fall.

Although to be placed near *puberulus* for the present, this species bears but little resemblance, differing completely in the form of the prothorax. The anterior trochanters of the male type before me are acutely spiculate posteriorly near the base, but there are no pronounced sexual characters at the ventral apex, the last segment being truncate at tip and having a very small median sinus limited by rather pronounced and somewhat prominent obtuse angles.

CTENISTINI.

PILOPIUS n. gen.

Ctenistes Lec. nec Reich.; *Sognorus* Csy. nec Reitter.

The American species formerly placed in Ctenistes by LeConte, and later in Sognorus by the writer (Col. Not. V, p. 501), must in reality form a new genus distinct from either. Sognorus was founded by Reitter upon three species of very small size, *Ctenistes oberthüri* and *calcaratus* of Europe and Syria and *simonis* of West Africa, the latter of which I now have before me. It differs from Ctenistes, not only in the minute size of the body and certain small divergencies in antennal and abdominal structure, but also in the rudimentary and not well developed appendage of the second palpal joint. Pilopius differs from Sognorus in having the second palpal joint extremely bent and clavate, with a well-developed lateral appendage and the third transversely sublunate, the second and third ventrals not much longer than the fourth and the first four visible dorsals equal in length, also in the much larger size of the body and in having the male antennæ very different in structure, the funicular joints being longer and the club 3-jointed. From the genus Ctenisodes, recently published by Raffray (Ann. Soc. Fr., LXV, p. 274), it differs in having no distinct trace of an angulation or spiniform appendage at the apex of the fourth palpal joint.

In Sognorus the second palpal joint is much less bent and more gradually enlarged distally, the third forming a very acute scalene triangle, and the second and third ventrals, or first and second apparent dorsals, are much longer than the remainder; the antennæ of the male have the joints three to seven very small and moniliform, and the last four very much developed as in Ctenistes and Ctenisis. Sognorus seems to be merely a subgenus of Ctenis-

tes, but Pilopius differs too radically in abdominal structure to be given a subordinate status.

The genus Pilopius is widely distributed over the continent of North America, occurring in every part, except the true Pacific coast faunal province, and is rich in species, but as there are but few and slight structural divergencies, the latter are difficult to define. The sexual characters are strongly marked in the antennæ and eyes and in the relative size of the elytra and abdomen, but are nearly uniform throughout, and the ventral characters of the male are feeble and practically undiversified. The stiff erect setæ bristling along the lower edge of the anterior femora and trochanters, are equally developed in both sexes in much the same manner as the distortion of the anterior tibiæ of Tmesiphorus; these setæ exist also in the latter genus, but in Cedius are replaced by three long slender spines.

There seems to be but little doubt that the species of Ctinistini, though much larger in size as a rule, are lower in the scale of organization than the first tribes of the Raffrayan arrangement, such as the Euplectini, this being quite as obvious as in the case of the large and cumbrous Asidinæ of the Tenebrionidæ, when compared with the more highly organized, or perhaps geologically more recent and corporeally smaller, Thinobatini and other related tribes.

In the following table of species which seem to warrant definition, all the characters relate to the male alone, except in the case of *impressipennis*, of which the only known example is a female.

Small species, always distinctly under 2 mm. in length.

Vestiture rather sparse; last antennal joint as long as the three preceding combined or nearly so.

Tenth antennal joint not at all longer than wide; body stout, the elytra nearly as long as wide; prothorax rather large and transverse; species northern in habitat.

Antennæ only moderately stout toward tip, the sixth joint as long as the fifth or somewhat longer.....**lacustris** n. sp.

Antennæ very stout toward tip, the sixth joint a little shorter than either of those adjoining.....**saginatus** n. sp.

Tenth antennal joint more or less distinctly elongate.

Median depression of the pronotum extending to or beyond the middle of the disk; elytra long, with strongly diverging sides, much longer than the head and prothorax combined.....**georgianus** n. sp.

Median depression never extending as far as the middle of the pronotal disk.

Body stout, generally dark in color, sometimes with paler elytra and always with the abdomen black or blackish.

Prothorax feebly transverse, never at all more than ½ as wide as the elytra ; species northern in habitat.

Fifth antennal joint small, only slightly longer than wide, shorter than the fourth ; hind tibiæ swollen in apical third and scarcely at all bent.....**piceus** Lec.

Fifth joint more developed, a little longer than the fourth ; hind tibiæ swollen and gradually bent in scarcely more than apical fourth ; elytra less abbreviated.....**iowensis** n. sp.

Prothorax larger and more transverse, much more than ½ as wide as the elytra ; foveæ of the vertex less widely separated.

Antennæ rather stout, distinctly incrassate toward tip, the tenth joint only very little longer than wide....**granicollis** n. sp.

Antennæ slender, very feebly incrassate toward tip ; the tenth joint decidedly elongate.....**floridanus** n. sp.

Body narrower, pale in color throughout, the abdomen never blackish.

Elytra nearly as long as wide, rather longer than the head and prothorax combined ; eyes large, separated by but little more than twice their own width.....**zimmermanni** Lec.

Elytra shorter and transverse, obviously shorter than the head and prothorax ; eyes much smaller ; body small in size and still more slender.

The elytra evenly convex toward the flanks..**cinderella** n. sp.

The elytra obliquely impressed on the upper surface at the middle of the length between the discal groove and upper limit of the flanks.....**impressipennis** n. sp.

Vestiture quite dense ; last antennal joint much shorter than the three preceding combined ; eyes separated by decidedly more than twice their own width ; elytra about as long as the head and prothorax. Middle Atlantic States.....**consobrinus** Lec.

Larger species, 2 mm. or more in length. Sonoran faunal province.

Antennal funicle very slender and filiform.

Eyes relatively small, separated by nearly four times their own width. **pulvereus** Lec.

Eyes very large, separated by but little more than twice their own width. **ocularis** Csy.

Antennal funicle very stout ; elytra larger, more rapidly and rectilinearly narrowed from near the apex to the base.....**abruptus** Csy.

There are two or three other species in my cabinet, represented by females only, which cannot be properly described at present.

P. lacustris.—Stout and rather convex, dark rufo-testaceous, the elytra, legs and antennæ paler; abdomen blackish; integuments polished, scarcely punctulate, the pubescence moderate in length, rather sparse, appressed as usual and subsquamiform, especially at the elytral apices and in the dense masses filling the pronotal impressions and transverse impression at the base of the first

dorsal segment. *Head* a little wider than long, quite distinctly narrower than the prothorax; eyes large, very coarsely faceted and separated by a little less than three times their own width; foveæ forming a small equilateral triangle; constriction at the base of the frontal tubercle more than ½ as wide as the latter. *Antennæ* nearly as long as the head, prothorax and elytra, moderately stout, feebly incrassate toward tip, the fifth joint elongate, a little longer than the fourth but shorter than the sixth; tenth much shorter than the ninth, the eighth quadrate. *Prothorax* nearly ½ wider than long, about ½ as wide as the elytra; sides parallel to apical third or fourth, then abruptly convergent and sinuate; apex broad, truncate, almost ¾ as wide as the base; median fovea very deep and large, extending beyond the middle. *Elytra* large and well developed, almost as long as wide, the sides strongly divergent and nearly straight, becoming arcuate near the tip; humeri broadly rounded and slightly prominent; two basal foveæ of each pubescent as usual, the discal groove deep and strong, entire, the sutural distinct, close to the suture. *Abdomen* about as wide as the elytra and much shorter, the segments equal and the lateral border wide, feebly inclined and discontinuous in external outline as usual. *Legs* long and slender, the tarsi very short but slender. Length 1.7–1.8 mm; width 0.72–0.8 mm.

Michigan; Indiana; Northern Illinois; Iowa (Iowa City).

This is the common species of the upper Mississippi Valley and vicinity of the Great Lakes. It is usually confounded with *piceus*, but may be distinguished by its more elongate and pale rufous elytra. In the female the elytra are a trifle shorter, and much less than twice as wide as the prothorax, the eyes smaller, separated by fully four times their own width, and the antennæ shorter and more strongly and rapidly incrassate toward tip as usual; they are about ½ as long as the body.

P. saginatus.—Stout and moderately convex, shining and pale rufo-testaceous throughout the body, legs and antennæ, except the abdomen which is blackish-piceous, subimpunctate, the pubescence nearly as in *lacustris*. *Head* distinctly wider than long and but just visibly narrower than the prothorax, the eyes large and very prominent, separated by three times their own width; foveæ small, deep and not very conspicuous, especially the apical, forming a small equilateral triangle; post-tubercular constriction ¾ as wide as the tubercle; frontal longitudinal groove distinct and long. *Antennæ* long and stout, as long as the body excepting the abdomen, becoming gradually very stout toward tip; fifth joint moderately elongate, as long as the fourth, slightly shorter than the sixth and very much shorter than the third; tenth distinctly shorter than the ninth, scarcely as long as wide. *Prothorax* ½ wider than long, rather wider and subprominently rounded at apical third than at base, a little more than ½ as wide as the elytra; apex broad and transverse; median fovea long, extending to the middle but only moderately deep. *Elytra* slightly shorter than wide, the sides moderately divergent and nearly straight from the obtusely prominent humeral swelling, arcuate at apex; striæ strong and deep, the

sutural straight and approximate. *Abdomen* as wide as the elytra and much shorter, nearly as in *lacustris*. Length 1.75–1.8 mm.; width 0.75 mm.

Canada (Ottawa—Mr. W. H. Harrington); Rhode Island (Boston Neck).

Allied rather closely to the preceding but distinguished from it by the stouter and more incrassate antennæ, slightly shorter and more convex elytra, especially in the female, with the humeral swelling very much more pronounced and the sides consequently much less divergent. As in *lacustris* the female differs in its shorter and more incrassate antennæ, smaller eyes, larger and more transverse prothorax, nearly $\frac{2}{3}$ as wide as the elytra, in its much shorter elytra with more diverging sides, somewhat less prominent humeri, and, as apparently usual in the genus, shorter discal stria and relatively larger abdomen, this being fully as long as the elytra from a perpendicular viewpoint. The last antennal joint of the female is fully as long as the four preceding combined.

As usual, the ventral segments of the male diminish but slightly in length from base to apex, in marked contrast to the Bryaxini, and the last is but little longer than the penultimate, with a small rounded sinus at tip enclosing a minute horizontal pygidium.

P. georgianus.—Rather stout and convex, shining, subimpunctate, the body, legs and antennæ throughout rufo-testaceous, the abdomen blackish; vestiture rather sparse, appressed, rather longer and less squamiform than usual, pale luteous-white and conspicuous. *Head* not distinctly narrower than the prothorax, slightly wider than long, the eyes very large and prominent, separated by scarcely three times their own width; frontal longitudinal furrow long and distinct, the foveæ normal, the apical the smallest of the three. *Antennæ* long and rather slender, fully as long as the head, prothorax and elytra combined, the funicle only slightly incrassate distally, the last joint fully as long as the three preceding, slightly swollen and obliquely pointed toward tip and almost twice as wide as the tenth; fifth joint much elongated, rather longer than the fourth, distinctly longer than the sixth and only a little shorter than the third; tenth distinctly elongate and as long as the ninth. *Prothorax* relatively rather small, ½ wider than long, parallel, narrowed near the apex, the latter broad and transverse; median fovea extending rather beyond the middle. *Elytra* large and well developed, almost fully as long as wide, much longer than the head and prothorax and rather more than twice as wide as the latter, the sides somewhat strongly divergent and nearly straight from the moderately developed humeral swelling, broadly arcuate in apical half, the apex somewhat narrower than the ante-apical width; striæ normal. *Abdomen* barely as wide as the elytra and much shorter. Length 1.75 mm.; width 0.73 mm.

Georgia.

The unusually small head and prothorax, large elytra and pale coloration distinguish this species from *piceus*, and, from the two preceding species, it may be known immediately by the antennal structure. A single male.

P. piceus of LeConte, is represented in my cabinet only from Pennsylvania, and is apparently confined to the northern maritime provinces of the Atlantic coast fauna. It is, when mature, of a dark rufo-piceous tint with the usual black abdomen of this section of the genus, and is identifiable by its short and decidedly transverse elytra, even in the male, and by the small fifth antennal joint of that sex, this being notably shorter than either of those which adjoin it; the antennæ are rather shorter than in any of the three preceding species. The prothorax is but little wider than long and is narrowed anteriorly from near the middle, differing in this respect from those most closely allied, and the vertexal foveæ are more widely separated than usual.

P. iowensis.—Nearly similar in form and coloration to *granicollis*, the antennæ less pale and the pronotum smooth, highly polished and devoid of granuliform punctures; pubescence sparse. *Head* only slightly wider than long, about as wide as the prothorax, the eyes large and convex. *Antennæ* not quite as long as the head, prothorax and elytra, only moderately and very gradually incrassate toward tip, the tenth joint distinctly elongate and equal to the ninth. *Prothorax* not more than $\frac{2}{5}$ wider than long and $\frac{1}{2}$ as wide as the elytra, parallel, narrowed only very near the apex, which is broad and transversely truncate; surface convex, the median fovea large, broadly impressed and scarcely extending through basal $\frac{2}{5}$ of the length. *Elytra* ample, slightly shorter than wide; humeral swelling only moderately pronounced, the sides thence quite moderately divergent and broadly, evenly arcuate to the apex; surface rather convex, highly polished and smooth, the striæ normal, the discal subentire becoming stongly and inwardly arcuate toward tip. *Abdomen* about as wide as the elytra and distinctly shorter, polished and sculptureless. Length 1.7 mm.; width 0.72 mm.

Iowa (Keokuk).

Differs from *granicollis* in its shorter antennæ, smaller, less transverse and smooth prothorax, in the form of the discal stria of the elytra and smoother and more polished integuments; from *piceus*, it may be distinguished by the characters of the table.

P. granicollis.—Moderately stout and convex, piceo-rufous, the abdomen blackish, impunctate except the pronotum, which is sparsely granulose; pubescence as in the preceding species. *Head* well developed, much wider

than long and nearly as wide as the prothorax; eyes large. *Antennæ* fully as long as the body excepting the abdomen, pale rufous throughout, only moderately incrassate toward tip, the tenth joint but little longer than wide and somewhat shorter than the ninth. *Prothorax* well developed, fully ½ wider than long, distinctly more than ½ as wide as the elytra, narrowed only near the apex; median fovea not extending quite to the middle. *Elytra* only slightly shorter than wide, the sides rather strongly divergent from the broadly and moderately swollen humeri, becoming arcuate toward tip; striæ coarse, the discal expanding and disappearing before the apex. *Abdomen* a little narrower and much shorter than the elytra. Length 1.7–1.8 mm.; width 0.7–0.8 mm.

New York (Willets Point, Long Island).

The female is much larger and stouter than the male described above, with the antennæ ⅗ as long as the body, the eyes smaller, the foveæ more widely separated, the prothorax relatively a little smaller and with more obsolete sculpture, the elytra shorter, transverse, with more rapidly diverging and straighter sides and the abdomen very broad with arcuate sides, wider than the elytra and fully as long. It may be distinguished from *piceus* by the larger head, larger, granulose and more transverse prothorax and less abbreviated elytra.

P. floridanus.—Rather stout, the upper surface only moderately convex, subimpunctate and rather shining throughout; body, legs and antennæ dark rufo-testaceous, the abdomen black; vestiture appressed, moderate in length, coarse, pale, somewhat abundant and distinct. *Head* about as wide as the prothorax, slightly wider than long, the eyes large and very prominent, separated by about 2½ times their own width; foveæ normal. *Antennæ* long and rather slender, only just visibly incrassate toward tip, a little longer than the head, prothorax and elytra combined; eleventh joint fully three times as long as wide; tenth elongate and equal to the ninth. *Prothorax* nearly ½ wider than long, parallel, abruptly narrowed only very near the apex, the latter very broadly and transversely truncate; surface minutely, feebly and sparsely asperato-punctulate; foveæ normal. *Elytra* well developed, as long as the head and prothorax and obviously less than twice as wide as the latter, nearly as long as wide; humeral swelling scarcely at all prominent, the sides strongly divergent almost from the base and nearly straight, becoming broadly arcuate in apical half; striæ moderate, the discal not attaining the apex and only feebly arcuate. *Abdomen* as wide as the elytra but much shorter. Length 1.75 mm.; width 0.7 mm.

Florida.

This species is rather closely allied to *granicollis*, but differs in the much less thickened apical parts of the antennæ, smoother pronotum and more broadly squamiform vestiture of the ventral segments. I have not seen the female.

In the male of *P. zimmermanni* Lec., the body is very decidedly narrower, as well as smaller, than in any of those which precede, and is pale in color throughout including the abdomen; the vestiture is sparse but rather long, and is appressed as usual, the hairs stout but scarcely squamiform. The antennæ are quite slender, but the eleventh joint becomes twice as wide as the second; the ninth and tenth joints are elongate, subequal and decidedly longer than any of the preceding. The prothorax is barely as wide as the head, somewhat transverse and rather more than $\frac{1}{2}$ as wide as the elytra. In my previous table of this genus (Col. Not. V, p. 501), the antennal characters should refer to the female and not to the male; in the latter sex the last joint is barely as long as the preceding three combined as usual. The specimens in my cabinet are from Louisiana.

P. cinderella.—Rather slender and moderately convex, polished and impunctate throughout; body, legs and antennæ pale rufo-testaceous in color, the abdomen barely distinguishably less clear; pubescence rather abundant, appressed as usual, only moderate in length but subsquamiform and distinct. *Head* and prothorax relatively rather large, equal in width, the former slightly wider than long, the eyes only moderately large but convex and prominent, separated by a little more than three times their own width; foveæ small, equal, forming a small equilateral triangle; antennal tubercles moderate in width, the longitudinal sulcus subobsolete. *Antennæ* slender; joints three to seven elongate, the remainder missing in the type. *Prothorax* nearly $\frac{3}{5}$ wider than long, only slightly more than $\frac{1}{2}$ as wide as the elytra, parallel, narrowed slightly near the apex, the latter very broad and transversely truncate; median fovea large, extending through basal $\frac{2}{5}$ of the length. *Elytra* conspicuously short, fully $\frac{1}{4}$ wider than long, the sides rather strongly divergent and feebly arcuate from the moderate and obtuse humeral swelling; surface moderately convex, the striæ normal, the discal rather feeble, becoming obsolete at some distance from the apex. *Abdomen* as wide as the elytra and very nearly as long, the sides parallel and rounded. *Legs* slender, the hind tibiæ slightly swollen near the tip but not distinctly bent. Length 1.28 mm.; width 0.52 mm.

Texas (Brownsville). Mr. H. F. Wickham.

This is the smallest species of the genus known to me from the United States, and occurs in the subtropical extreme southern limit of the State of Texas. It can be readily determined by the characters given in the table. A single male.

P. impressipennis.—Slender, the elytra and abdomen quite depressed; entire body, legs and antennæ very pale rufo-testaceous and perfectly uniform in color, polished and subimpunctate; pubescence moderate in length and

coarseness and rather sparse but pale in color and distinct. *Head* slightly narrower than the prothorax, about as long as wide, triangular, the eyes relatively rather small. *Antennæ* normal, rapidly incrassate at tip, about ½ as long as the body. *Prothorax* more than ½ wider than long, fully ⅔ as wide as the elytra, parallel, slightly narrowed at apex; surface convex, smooth and polished, the median fovea extending only slightly beyond basal third. *Elytra* nearly ¼ wider than long, the sides distinctly divergent and only very feebly arcuate from the rather pronounced humeral swelling; disk depressed, obliquely impressed at the middle toward the flanks; striæ normal, the discal distinctly abbreviated before the tip. *Abdomen* somewhat wider than the elytra and quite distinctly longer, the legs slender. Length 1.35 mm.; width 0.55 mm.

Texas (locality unrecorded).

The single example of this very distinct form before me is a female, and it is the only species represented by that sex alone which I can venture to define. The singular oblique impressions of the elytra are without much doubt normal, as they are bilaterally symmetric.

P. consobrinus of LeConte, is well distinguished from any of those treated of above by its denser vestiture, relatively shorter last antennal joint and other characters. The sexual differences in the antennæ, eyes and elytra are of the same nature as in the others, but the elytra differ more than usual, being very short and transverse in the female, while in the male they are nearly as long as wide. My specimens are from New Jersey and Virginia (Norfolk).

In *pulvereus* Lec., the eyes in the male are much smaller than in the same sex of any other species known to me, and it may be readily recognized by this character as well as by its large size and habitat. *Ocularis* and *abruptus* have already been described at sufficient length (Col. Not. V, p. 502).

Tyrini.

CEDIUS Lec.

In this well-marked genus the body is rather stout and very convex, the antennæ enlarged distally, the eighth joint obliquely produced and pointed within at tip, partially enclosing the ninth, the remainder gradually enlarged but not obviously modified, the eleventh affixed somewhat obliquely to the tenth. The head is nearly as in Pilopius, with moderately large, subbasal and more finely faceted eyes and three foveæ, the posterior much more

widely separated, the antennal tubercles large, separated by a broad longitudinal depression which is much more abruptly limited at the sides; in *spinosus* the tubercles become more flattened. The integuments are nearly smooth, the pronotum traversed near the base by a fine continuous furrow, with slight enlargements at the sides and in the middle but not pubescent. The discal furrow of the elytra vanishes behind the middle, and the basal segment of the abdomen has two distinct sublateral carinæ in about basal half and a short tumid projection at the middle of the base. The ventral segments diminish rather gradually in length as in Pilopius, but the last ventral of the male is large, convex and polished, with the tip produced slightly in a rounded lobe, the last dorsal short and very tumid. There seem to be three species which may be defined as follows from the males:—

Head transversely excavated at apex between the large antennal cavities, the narrowed front deflexed, with the tip narrowly rounded and free; clypeus tumid and setose at the middle; body large and stout.

Antennæ much less stout, distinctly enlarged toward tip; elytra transverse, at least ⅓ wider than long, rather strongly, though not densely, punctate, and wider than the abdomen, the side margin of the latter concave inwardly toward base.....**ziegleri** Lec.

Antennæ stouter and longer, only very feebly enlarged toward tip; elytra larger and less transverse, scarcely ¼ wider than long, very finely and rather sparsely punctulate throughout, the vestiture a little shorter; abdomen as wide as the elytra, with the broad and feebly inclined lateral margin perfectly flat throughout; anterior tibiæ thicker; body larger and much stouter, nearly similar in the crural spines and feeble sexual characters. Length 2.5 mm.; width 1.0 mm. District of Columbia.

robustus n. sp.

Head not transversely excavated at apex, the narrowed front between the antennal cavities vertical and continuous to the upper surface of the clypeus, which is not at all tumid in the middle; body much smaller and narrower.

spinosus Lec.

The tarsi in Cedius are much longer than in either Tmesiphorus or Pilopius. The genus seems to be confined to the eastern parts of the United States.

The figure of *C. spinosus* given by Dr. Brendel in the "Monograph," is not at all correct, the true form being much narrower, with more elongate elytra and with the usual two carinæ of the abdomen as distinct as in the others.

TYRUS Aubé.

In this genus the peculiar internal prominence of the trochanters and the carina or spine of the anterior femur, are not sexual characters, but are equally pronounced in the female, which, it will be observed, is the case also in all the allies of Ctenistes and Chennium, so that crural modification in this part of the family becomes of generic import. As in most of these genera, also, the species are closely allied among themselves and require careful study.

The primary sexual characters are rather feeble, the male having the last ventral moderate in size, with the apex produced slightly in a rounded lobe and the last dorsal large, broadly truncate and medially feebly sinuate at tip; the female has the last ventral shorter, with the apex narrowly and deeply inciso-sinuate in the middle, and the last dorsal much smaller, more tumid along the middle and frequently more coarsely punctured, these sexual differences in the last dorsal being parallel to those of certain Batrisi. No well-marked sexual differences can be observed in any other part of the body or appendages.

The material in my cabinet indicates five North American species, which may be defined as follows :—

Carina of the anterior femur long, equaling ¼ of the entire length. Utah. **carinifer** n. sp.

Carina short, never more than ⅙ as long as the femur and sometimes a little shorter.

Elytra large, about as long as the abdomen, very widely exposed at the humeri, the sides strongly arcuate and only moderately divergent posteriorly; head small; body pale testaceous with the abdomen black. Lake Tahoe, California. (*Pytna cort.* Csy.) ..... **corticinus** Csy.

Elytra more abbreviated and transverse, with less broadly rounded humeri and more divergent and less arcuate sides, always much shorter than the abdomen in both sexes. Northeastern States.

Antennæ moderately elongate in both sexes, the penultimate joints of the funicle not transverse; abdominal carina well developed.

Head in the male slightly narrower than the prothorax and as long as wide; prothorax usually noticeably elongate (*compar* Lec.). **humeralis** Aubé

Head in the male much narrower than the prothorax and shorter than wide; body smaller and less stout, the prothorax slightly wider than long..... **semiruber** n. sp.

Antennæ shorter and stout, the three outer joints of the funicle transverse in the female; prothorax a little wider than long; abdominal carina generally extremely short and inconspicuous..... **consimilis** n. sp.

T. elongatus of Brendel, does not belong to the genus and is therefore not included in the table. The American species of Tyrus all differ greatly from the European in having the anterior femora carinate beneath; *mucronatus* has, instead of the carina, an acutely pointed spine; it is therefore possible that Pytna may be regarded as a valid subgenus, in view of the importance of crural modifications in this part of the Pselaphidæ.

T. carinifer.—Stout and convex, the body, legs and antennæ very pale rufo-testaceous throughout, the abdomen black with palish side margins; integuments shining, subimpunctate anteriorly, the elytra and abdomen finely punctate; pubescence moderately abundant, rather short and strongly recurved as usual. *Head* scarcely as long as wide, only slightly narrower but much shorter than the prothorax, the eyes moderate in size, at more than their own length from the base, the latter rounded; surface flattened above, the foveæ normal. *Antennæ* about ½ as long as the body, moderately stout, the club gradually formed and not very stout; joints three to five distinctly, six and seven barely perceptibly, longer than wide, the eighth quadrate; ninth slightly elongate, the tenth almost as wide as long; eleventh obliquely pointed at tip. *Prothorax* very slightly longer than wide, widest and obtusely rounded at the sides before the middle, the sides thence convergent and nearly straight to the apex, parallel and feebly sinuate to the base; apex nearly ⅔ of the maximum width and about ¾ as wide as the base; disk very convex, with a deep rounded and pubescent fovea at each side near the base, the two connected by a fine, transverse and posteriorly arcuate groove, which become slightly coarser but not at all foveate at the middle, the surface thence to the base punctulate. *Elytra* ⅗ wider than long, ⅖ longer than the prothorax and 2⅖ times as wide; humeri rounded, the sides thence rather strongly divergent and very feebly arcuate to the apex; discal impression very large toward base, disappearing near apical third. *Abdomen* rather wider and a little longer than the elytra, arcuately narrowed and serrate at the sides as usual, the border wide and flat; basal carina well developed, extending to apical third of the basal segment. Length 2.1 mm.; width 0.95 mm.

Utah (southwestern). Mr. C. J. Weidt.

The single male before me represents a very distinct form near *corticinus*, but with a much larger head, narrower and more elongate prothorax, more diverging sides and more punctate surface of the elytra and relatively larger abdomen. The intermediate tibiæ are slightly arcuate and somewhat thickened, the corresponding trochanters with the usual long oblique process, the anterior with a short conical process, and the anterior femora with a long carina on the under edge, extending from basal fourth to the middle.

T. semiruber.—Moderately stout and convex, highly polished, dark red-brown, the elytra pale rufous, the abdomen black and the legs and antennæ pale testaceous; integuments subimpunctate, the punctules of the elytra and abdomen extremely minute and rather sparse; pubescence moderately short, rather fine, sparse, strongly recurved and not very conspicuous. *Head* small, distinctly narrower and shorter than the prothorax, shorter than wide, the eyes rather small, at more than their own length from the base, the latter circularly rounded; foveæ normal. *Antennæ* scarcely ½ as long as the body, unusually slender, the club gradual and relatively strong; joints smooth, polished and subimpunctate throughout, except the last three, which are sparsely rugose; three to five distinctly elongate, the sixth slightly and the eighth just visibly, longer than wide; seventh quadrate; ninth very distinctly elongate, the tenth rather longer than wide; eleventh obliquely pointed as usual. *Prothorax* not quite as long as wide, widest and subprominently rounded near apical third, the sides feebly convergent and somewhat sinuate thence to the base; apex about ½ the maximum width and ⅗ as wide as the base; disk and transverse groove nearly as in the preceding species, not distinctly punctured near the base. *Elytra* fully ½ wider than long, ⅔ longer than the prothorax and twice as wide; humeri moderately prominent, the sides distinctly divergent and broadly, distinctly arcuate thence to the apex; discal groove very broad toward base, fine posteriorly, ending at apical fifth. *Abdomen* rather wider and much longer than the prothorax, the sides parallel and arcuate; border wide and flat; basal carina well developed in basal ⅗. Length 1.7 mm.; width 0.78 mm.

Lake Superior.

The single male type in my cabinet has the intermediate trochanters obliquely prolonged in a shorter, more pointed and less curved process than in the preceding, the tibiæ arcuate and thickened, the anterior trochanters prominent within at tip and the femur with a strong but short inferior carina just behind the middle. The body is narrower, the antennæ shorter and more slender, the prothorax shorter and broader, the elytra less transverse and with longer discal stria, and the integuments less punctured and less densely pubescent than in *humeralis*.

T. consimilis.—Stout and convex, shining and subimpunctate; body, legs and antennæ red-brown, the elytra paler, bright rufous, the abdomen black; pubescence rather long, abundant, recurved and conspicuous. *Head* wider than long, nearly as wide as the prothorax. *Antennæ* ⅔ as long as the body, stout, the club rather large and paler in color. *Prothorax* slightly transverse, widest and slightly rounded near apical third, the apex wide, ⅗ the maximum width and nearly ¾ as wide as the base; disk nearly as in the preceding species. *Elytra* very transverse, ⅔ wider than long, ⅔ longer than the prothorax and a little more than twice as wide; sides moderately divergent, broadly and distinctly arcuate; discal impression very broad toward base as usual, vanishing at apical fourth. *Abdomen* rather wider and distinctly longer

than the elytra, the sides strongly arcuate; border very wide; basal carina very short, extending through basal ⅖ or less. Length 1.8 mm.; width 0.83 mm.

Kentucky; Indiana.

The specimens before me agree very well together, but are females; in comparison with the same sex of *humeralis*, this species differs in its longer and more shaggy pubescence, evidently shorter antennæ, smaller and relatively much shorter prothorax, more abbreviated abdominal carina, and in some other features; the modifications of the legs and trochanters are of the same general kind as in the other species, but the process of the middle trochanters is shorter and broader than in *humeralis*, and the corresponding tibiæ are quite different, being strongly, evenly arcuate throughout in the latter, while in *consimilis* they are nearly straight toward base, becoming gradually distinctly arcuate thence to the tip.

The specimens of *humeralis* in my cabinet are from Canada (Ottawa—Mr. W. H. Harrington) and the Hudson River valley, the latter taken by Mr. H. H. Smith.

CUCUJIDÆ.

Colydiinæ.

ADITOMA n. gen.

This genus is allied to Bitoma, but differs in the cylindrical and scarcely at all depressed form of the body, with very different sculpture, larger metasternum, convex and not flattened abdomen, with the third suture strong, and the fourth segment flat and deflexed, the fifth concave, and in the radically different antennal club. The single species is remarkable in having a large bifid thoracic process, nearly covering and concealing the head.

A. bifida n. sp.—Elongate, parallel, cylindric, dark rufo-piceous in color and highly polished. *Head* subtriangular with truncate apex, quite distinctly narrower than the prothorax, depressed above, more deeply toward base, where there is a short longitudinal medial groove in the more excavate portion; vertex before the eyes slightly tumid, coarsely punctured and minutely setulose, the apical margin of the front polished and sculptureless; remainder minutely sculptured and opaque; supra-antennal ridges strong. *Antennæ* 11-jointed, but little longer than the width of the head, thick, cylindric, the joints transverse with very thick exposed pedicels; two basal joints thicker, the club small, rounded, the tenth joint obtrapezoidal and slightly asymmetric, at apex nearly twice as wide as the ninth, polished and sparsely setose like the preceding joints; eleventh much narrower than tenth and barely as long, fused within

its apex, rounded at tip, paler and spongy in texture and with short but coarse close-set hairs in addition to the sparse erect bristles. *Labrum* very short, strongly transverse; mandibles small; eyes large, rounded, entire and basal, the antennal grooves altogether obsolete; mentum rather large, transversely subquadrate; ligula triangular, corneous; palpi rufous, similar, the labial a little smaller, the fourth joint elongate-oval, as wide as the preceding, with the obliquely truncate apex hollowed and spongy. *Prothorax* slightly elongate, very convex with a coarse deep median groove which is dilated anteriorly in a large and deep excavation and slightly dilated also at the base, the polished surface enclosing the groove prolonged anteriorly over the head in two porrect processes, finely, sparsely punctate, each puncture with a minute seta, the setæ more evident at the apices of the processes; flanks above strongly declivous to a deep groove adjoining the acute lateral margin, which groove is dilated in a rounded excavation just behind the middle; lateral margins nearly straight, feebly convergent from apex to base, the apical angles dentiform and everted; basal angles acute and slightly prominent. *Scutellum* small, subquadrate. *Elytra* about twice as long as wide and twice as long as the prothorax, not wider than the apex of the latter but a little wider than the base, the sides straight and parallel; apex semicircularly obtuse; surface evenly cylindrical, impressed at the sides near the apex, with nine coarse even and feebly impressed series of coarse perforate punctures, the sutural stria enlarged and deeper toward tip, becoming confluent with the subapical depression at the side, the coarse punctures nude but alternating with minute punctures, each of which bears a minute hair. *Prosternum* long before the coxæ, the latter moderately and almost equally separated throughout; anterior cavities open behind. *Legs* very short and stout; tarsi short with the basal joint small. Length 2.9 mm.; width 0.75 mm.

Florida.

No indication of sex can be observed in the single specimen before me, which was communicated by Mr. H. F. Wickham.

BITOMA Herbst.

Ditoma Ill.; *Synchytodes* Cr.

The following species is allied to *ornata*:—

B. suffusa n. sp.—Elongate, strongly depressed, opaque, dark rufopiceous, the elytra suffusedly pale rufous but darker near the suture and lateral margin; pubescence short, sparse, setiform, forming even recumbent series along the ridges. *Head* rather small, ⅔ as wide as the prothorax, subquadrate, the eyes large, convex and prominent, occupying basal half; surface flat and densely sculptured; antennæ about as long as the width across the eyes, the funicle slender, the club stout, compressed and very abrupt, with the two joints subequal. *Prothorax* scarcely ⅕ wider than long, the sides feebly convergent and feebly, evenly arcuate from apex to base; apex truncate, the angles somewhat anteriorly prominent; basal angles obtuse; margins minutely serrulate; base feebly arcuate; disk but feebly elevated, with a fine entire

raised line at some distance from the side margin, near which line externally there is a short longitudinal groove; inner raised line of *ornata* extremely feeble and not distinct much beyond the middle; middle parts toward base with two feeble longitudinal depressions; sculpture dense and indistinct. *Scutellum* small, transversely subquadrate. *Elytra* fully ¾ longer than wide, 3 times as long as the prothorax and nearly ¼ wider; sides straight and parallel, the apex semicircular; surface of each with four fine entire ridges, separated by double series of rather coarse close-set punctures, the sutural elevation bifurcate toward base. Under surface dark red-brown, with short, coarse and rather sparse reclined hairs, the legs short and paler in color. Length 2.3–2.8 mm.; width 0.65–0.85 mm.

Arizona (Yuma).

Rather abundant in the lower valley of the Colorado River. It is allied closely to *ornata*, but differs in its narrower form, suffused coloration of the elytra, less distinct ridges of the pronotum and in its much larger eyes.

The name Bitoma is used on the authority of Dr. Sharp, though according to Seidlitz (Faun. Balt. ii, p. 234), it was applied by Herbst to the Fabrician Lyctus; if so, Ditoma Ill., will be the proper designation of the present genus.

EUCICONES Sharp.

The species at present in our lists under the name *Cicones lineaticollis* Horn, differs generically from *marginalis* in having the upper surface feebly costulate and devoid of erect bristles, and in having a distinctly biarticulate antennal club. The genus has been named Acolobicus by Dr. Sharp, and the Mexican species, *obscurus* Shp., seems to be extremely closely related to *lineaticollis*.

Cicones marginalis is also regarded as generically different from Cicones, and must be known henceforth as Eucicones.

The material in my cabinet appears to indicate two species, which may be separated on the following general characters:—

Body more than twice as long as wide, subparallel, the elytra relatively more broadly reflexed at the sides, with the humeri quite broadly rounded. **marginalis** Melsh.

Body not more than twice as long as wide and much more dilated behind, the elytra more narrowly reflexed at the sides, with the humeri much less rounded; clavate bristles finer..... **latus** n. sp.

The upper surface of the body in Eucicones is always variegated with small irregular paler spots. The genus extends far into Mexico, from which region the generic type has been recently described by Dr. Sharp.

E. latus.—Broad and convex, oblong-oval in form, gradually broader to apical third of the elytra, blackish and subopaque, the reflexed lateral margins paler by diaphaneity; elytra with small anastomosing paler spots; erect bristles moderate in thickness and but feebly clavate. *Head* wider than long, scarcely more than $\frac{2}{5}$ as wide as the prothorax, widest at base, the eyes rather large, minutely setose; surface scabrous; antennæ short. *Prothorax* fully twice as wide as long, widest near basal third or fourth, the sides strongly arcuate, more convergent anteriorly, the apex deeply emarginate and with distinct limiting angles, $\frac{3}{5}$ as wide as the base, the latter transverse, broadly arcuate, broadly sinuate near the sides; surface broadly explanato-reflexed toward the sides, densely tuberculato-scabrous throughout. Scutellum small. *Elytra* less than $\frac{1}{3}$ longer than wide, at base as wide as the prothorax, at apical third much wider, broadly parabolic at apex; sides nearly straight in basal $\frac{2}{3}$; humeri obtuse but distinct and subangulate; lateral margins narrowly explanato-reflexed; surface convex, with series of moderately coarse punctures separated in the series by single short longitudinal raised lines, each of which bears a small slender hair at its posterior end, the erect bristles borne from small subasperate punctures extending in a single regular series along the middle of each interval. Under surface scabrous and dull, with inconspicuous vestiture, the epipleuræ wide and concave, the abdomen flat with gradually diminishing segments to the fourth, the fifth as long as the first; sutures fine and perfectly straight, the legs short. Length 3.4 mm.; width 1.75 mm.

Indiana?

A single specimen was included without locality label in the Levette cabinet, and was probably taken in the region suggested. This species is notably broader than *marginalis*, and is more rapidly broader behind.

The clavate bristles in Eucicones are peculiar in structure; they are deeply strigose, and the median parts of the apex are prolonged and obtusely truncate.

SOSYLUS Erichs.

S. extensus n. sp.—Elongate, parallel, cylindric, dark rufo-piceous, the elytra slightly paler; surface feebly alutaceous in lustre, glabrous. *Head* slightly wider than long, not quite as wide as the prothorax; eyes large, convex and prominent, at scarcely $\frac{1}{3}$ their length from the prothorax; surface moderately convex, finely, not very densely punctate; antennæ about as long as the width across the eyes, the first joint swollen and subglobular, the second elongate, slender and inserted at the side of the first, the club very stout and abrupt, strongly compressed with the basal joint shorter than the second and rather more than twice as wide as long. *Prothorax* distinctly longer than wide, the sides straight and parallel in rather more than apical third, then feebly convergent and straight to the base, which is nearly $\frac{4}{5}$ as wide as the apex, the latter transverse, becoming feebly arcuate toward the sides; basal angles not rounded, the base feebly emarginate; disk finely, evenly and not

densely punctate. *Elytra* rather more than 3 times as long as wide, fully 2½ times as long as the prothorax and equal in width to the apical parts of the latter; sides straight and parallel; humeri slightly prominent anteriorly; apex near the suture narrowly arcuato-truncate, with slightly prominent lateral limits; surface feebly elevated near the suture, each elytron also having four fine and very feeble longitudinal ridges, separated by three shallow flat and impunctate grooves, which are separated from each other by shallow flat intervals equal in width to the grooves; flanks also with shallow flat striæ, the third interval from the side margin with some elongate scratch-like punctures toward base. Under surface with moderately close punctures, those of the abdomen very elongate and linear toward base. Length 4.65 mm.; width 0.8 mm.

Central Texas (Colorado River).

This form is very different in sculpture from our other species, but resembles certain Central American species in that feature. The fine flat grooves of the elytra give these an appearance of having been drawn like a wire; the ridges become quite strong on the apical declivity as usual.

Extensus seems to be closely allied to *affinis* Shp., from Central America, and also to *trilineatus* Reitt., from Colombia. The latter differs in having the prothorax narrowed behind from the middle and not from near apical third.

CERYLON Latr.

The following table includes all the American species of this genus known to me at present:—

Upper surface without distinct setæ; size smaller, always much under 3 mm.
Clypeus evenly sinuate at apex.
Prothorax not wider anteriorly, finely or moderately punctate.
Prothorax about as long as wide.
Scutellum short, broadly rounded behind.
Clypeus notably smaller, more deeply sinuate; body stouter, the pronotum more strongly punctate and more convex with the sides slightly arcuate.....**sylvaticum** n. sp.
Clypeus large, very feebly sinuate at apex; prothorax with straight sides, rounding anteriorly (*angustulum* Lec.)...**castaneum** Say
Scutellum longer, broadly angulate behind; prothorax narrower, still more finely and remotely punctate and subsinuate at the sides behind the middle; elytral striæ fine, feeble and very finely punctate; clypeus feebly sinuate at tip.....**unicolor** Zieg.
Prothorax distinctly shorter than wide; body stouter and more convex. **simplex** Lec.
Prothorax wider anteriorly, quite coarsely and deeply, though not densely, punctate throughout.....**sticticum** n. sp.

Clypeus with a deep median notch, which is rounded at the bottom; prothorax widest near the apex.....**clypeale** n. sp.
Upper surface with obvious erect setæ; size larger, 3 mm. in length.
californicum Csy.

Unicolor appears to undoubtedly differ from *castaneum* in the characters given above; it is rather more elongate than *castaneum* and the form of the scutellum is perfectly constant, as far as I have been able to observe; these species both occur in the Atlantic States and westward, at least as far as Illinois. The Californian *simplex* is quite different in its much shorter and more convex, though equally finely and sparsely punctate prothorax, and the body is larger and stouter than in *castaneum* or *unicolor* with more oval outline; in the scutellum and general sculpture it closely resembles *castaneum* and *sylvaticum*; it seems to be confined to the coast regions from Sta. Cruz northward. Under suitable amplification and direction of sight extremely minute erect setæ can be observed arising from the punctures in nearly all of the species, but *californicum* is the only one in which they become very obvious, and this species differs besides from the others in its much larger size. The three following species are hitherto undescribed.

C. sylvaticum.—Elongate, suboval, moderately depressed, polished, dark rufo-castaneous, more blackish beneath, the legs and antennal club paler and rufous. *Head* slightly more than ½ as wide as the prothorax, wider than long, evenly convex, finely, sparsely punctate, the eyes minutely and sparsely setulose; antennæ moderate in length, the club paler. *Prothorax* quadrate, widest at the middle, the sides parallel and feebly arcuate throughout, rounded anteriorly; apex evenly emarginate in circular arc and almost ⅘ as wide as the base, the latter transverse, with the median lobe distinct though broadly rounded; basal angles right and not sharply defined, being minutely rounded; surface transversely and feebly convex, more distinctly so toward the apex, transversely and quite distinctly impressed at the basal margin at each side and also feebly impressed just behind the eyes at the apical margin; punctures small and remote but rather strong, bearing minute erect setæ remotely interspersed with other erect setæ which are coarser and longer, the setæ observable under a power of about 80. Scutellum transversely oval, very broadly rounded behind. *Elytra* about ⅔ longer than wide, not quite twice as long as the prothorax and rather more than ¼ wider, widest before the middle; sides broadly arcuate; apex broadly parabolic; striæ well impressed, finely punctured, the intervals somewhat convex, the first depressed as usual toward tip, the first stria closely approaching the suture posteriorly. Under surface finely but strongly and rather sparsely punctured. Length 2.0 mm.; width 0.78 mm.

Idaho (Cœur d'Alène); California (Lake Tahoe).

Closely allied to the eastern *castaneum*, but differing in its slightly larger size, just visibly stouter and more convex form and more marked punctuation; it also differs in the slightly arcuate and not rectilinear sides of the prothorax and in the form of the terminal pygidium. The species can be distinguished at once from *simplex* by its more elongate and more deeply striate elytra.

C. sticticum.—Oblong, parallel, strongly depressed, shining, castaneo-rufous, the legs and antennal club paler rufous; under surface slightly darker and more piceous. *Head* perceptibly more than ½ as wide as the prothorax, finely, sparsely punctate; antennæ moderate in length, the joints 7–9 of the funicle rather rapidly increasing in thickness, the latter perceptibly wider than long; club strong, oval, moderately compressed, the basal joint occupying more than ½ the length, the apical spongy portion apparently with an imperfect median annulus of hairs. *Prothorax* not quite as long as wide, distinctly widest at about apical fourth, the sides thence very feebly convergent and just visibly arcuate to very near the basal angles, where there is a feeble sinuation, strongly rounded at apex, the basal angles just visibly everted, not rounded; apex barely more than ¾ as wide as the base, feebly emarginate in circular arc; base very feebly arcuate, the median lobe scarcely differentiated; disk depressed, convex toward the apical angles, rather sparsely, somewhat coarsely and strongly punctate, feebly impressed and more densely punctate at each side at the basal margin; setæ inconspicuous, even under a power of 80. Scutellum longer than in *castaneum* and more subangularly rounded behind, transverse and flat. *Elytra* but slightly more than ½ longer than wide, fully ¾ longer than the prothorax but not evidently wider, widest before the middle, the sides very feebly arcuate; apex semicircularly rounded; humeral angles acute and minutely everted; striæ rather fine but strong, evidently punctured, the first approaching the suture posteriorly, the sutural interval strongly depressed toward tip. Under surface evidently and rather closely punctured, the legs stout. Length 2.5 mm.; width 0.85 mm.

Iowa (Iowa City).

The points of difference between this species and those of the *castaneum* group are numerous and well marked; the prothorax, for example, being as wide as the elytra and of a different form, with much larger and deeper punctures, and the last three joints of the antennal funicle are gradually wider, while in *castaneum* the joints 3–8 are equal in width, 9 being larger and obtrapezoidal; the annuli of hairs toward the apex of the club are also much more marked than in *castaneum*.

C. clypeale.—Oblong-elongate, parallel, strongly depressed, polished, glabrous, dark rufous in color, the legs but slightly paler and the under surface somewhat darker; setæ entirely inconspicuous. *Head* ⅗ as wide as the prothorax, rather strongly convex, very minutely and quite sparsely punctate;

eyes moderately large, very convex, prominent and finely faceted as usual; antennæ moderate in length, stout, the three outer joints of the funicle gradually thicker, the club stout, oval, of the usual structure and paler in color. *Prothorax* scarcely as long as wide, widest before apical third, the sides broadly rounding to the obtuse apical angles, very feebly arcuate posteriorly, the basal angles minutely and just perceptibly everted, not blunt; apex broadly emarginate in circular arc, about $\frac{4}{5}$ as wide as the base, the latter transverse and feebly bisinuate; surface sparsely and rather finely but strongly punctate, very feebly impressed at the sinuous parts of the basal margin. Scutellum very short and transverse, very broadly rounded behind as in *castaneum*. *Elytra* $\frac{2}{3}$ longer than wide, more than $\frac{3}{4}$ longer than the prothorax, and not obviously wider, widest before the middle, where the sides are distinctly arcuate, quite distinctly narrowed posteriorly, the apex subcircular in curvature; humeri acute, minutely everted; striæ fine but distinct, very finely, remotely punctato-crenulate; intervals nearly flat, the sutural narrower and depressed toward tip. Under surface rather sparsely and not very strongly punctured, the legs short and very stout, the tibiæ elongato-triangular. Length 2.35–2.45 mm.; width 0.75–0.8 mm.

Kansas.

This distinct species may be identified at once by its deeply and narrowly notched clypeus. In general form it closely resembles *sticticum*, but may be known by its more elongate elytra and finer pronotal punctures; the shape of the prothorax is also different, being widest at a point less apical, with the sides more arcuate posteriorly and the apex broader. It is represented in my cabinet by two specimens.

NOTES.—According to Dr. Sharp it is probable that *Synchita granulata* Say, and allied species will have to be referred to the genus Endeitoma.

The species placed in Machlotes in our lists must be referred to Prolyctus Zimm.

CUPESIDÆ.

CUPES Fabr.

The four species of this remarkable genus which are known to me may be differentiated among themselves quite readily as follows:—

Supra-antennal tumid surface rounded and convex; antennæ shorter; tempora more developed behind the eyes, which are usually smaller.

Body black, the head pale and ochreous-yellow in color; punctures of the elytral series very large, deep and quadrate.....**capitatus** Fabr.

Body ochreous, the elytra variegated with confused patches of dark piceous-brown; punctures of the elytral series much smaller .....**lobiceps** Lec.

Supra-antennal tumidity obliquely angulate, the antennæ more elongate; tempora short, the eyes very large; body ochreous in color, the elytra variegated with sublongitudinal patches of a darker brown.

Elytral series composed of large approximate quadrate punctures.
concolor Westw.

Elytral series composed of narrow, elongate punctures; antennæ less elongate.....**oculatus** n. sp.

The affinities of Cupes are very obscure, but certain structures, as for example the reception of the acute prosternal process in a deep pit of the mesosternum, proclaim its marked serricorn relationship.

C. oculatus.—Form nearly as in *concolor* but less elongate, pale yellowish-brown with indefinite sublineate spots of dark brown on the elytra; integuments throughout densely scaly. *Head* scarcely wider than the prothorax; sides above near the eyes longitudinally tumid, the elevation divided transversely at the anterior limit of the very large convex eyes; median line fine, coarse anteriorly; tempora very short. *Prothorax* fully ¾ wider than long, rectangular at apical fourth, the sides thence deeply sinuate and strongly convergent to the apex, parallel and nearly straight in basal ¾, becoming feebly convergent and arcuate toward base; disk elevated along the middle, with a fine median line, broadly reflexed at the sides, also deeply concave at each side of the middle. Scutellum well developed, rounded. *Elytra* 2¾ to nearly 3 times as long as wide, parallel and straight at the sides, gradually narrowed at apex, distinctly wider than the head; ridges feeble, the second and third alone distinct. Under surface densely scaly. Length 8.5–9.7 mm.; width 2.0–2.2 mm.

Indiana.

Differs strikingly from *concolor* in sculpture and in its less elongate and rather more depressed elytra, with subobsolete first costa.

The eyes in Cupes are very convex and composed of extremely minute lenses; the outer surface of the eye is perfectly smooth and unbroken, the lenses shining through from the inner surface of the external shell. I do not remember having observed this peculiar structure in any other type of the Coleoptera, but it is probably not altogether confined to the present genus.

LUCANIDÆ.

PLATYCERUS Geoff. (auct.).

SYSTENOCERUS Weise.

The first species described below is allied in coloration, general sculpture and structure of the antennal club to *oregonensis*, but is much smaller; the second is more closely related to *depressus*.

P. chalybeus n. sp.—Subparallel, strongly convex, glabrous, black, the legs and abdomen piceous, the elytra with a dark steel-blue lustre; integuments but slightly alutaceous. *Head* scarcely ⅔ as wide as the prothorax, transverse, sparsely but distinctly punctured, the eyes moderate; front broadly concave; mandibles small, arcuate, setose internally, with a large quadrate tooth within at base, the apex almost equally trilobed, the upper lobe most acute. *Antennæ* moderate, the club 4-jointed, twice as long as the funicle; joints two to five of the latter gradually and slightly increasing in width, the latter ⅗ as wide as the first joint of the club, which is three times as wide as long and scarcely ½ as long and ¾ as wide as the second; last three joints much more densely pubescent, subequal in width, nearly as in *oregonensis*. *Prothorax* ⅔ wider than long, widest and subangularly rounded at the sides at basal third, the sides thence convergent and sinuate to the basal angles, which are right, only slightly blunt, prominent and slightly everted; sides less convergent and nearly straight in apical ⅔; apex broadly and bisinuately emarginate, the apical angles slightly prominent anteriorly; disk feebly impressed along the middle, sparsely, somewhat unevenly and not very strongly punctate. Scutellum punctured slightly at base. *Elytra* ½ longer than wide, nearly three times as long as the prothorax and perceptibly wider; intra-humeral impression small but distinct; punctures disposed nearly as in *oregonensis*. *Legs* moderate in length, rather slender, the hind tarsi but little shorter than the tibiæ. Length ♂ 8.3–9.5, ♀ 10.3 mm.; width ♂ 2.8–3.5, ♀ 4.1 mm.

California.

This species greatly resembles *oregonensis*, but differs in its much smaller size, smaller head, prothorax and mandibles of the male, rather stronger and sparser punctures, and especially in the prominent basal angles of the prothorax, these being broadly obtuse and obliterated in *oregonensis*. The description is from the larger of the two males before me, the female having the head relatively smaller, the prothorax narrower but less transverse and more narrowed toward tip, the body stouter and the hind tarsi scarcely ⅔ as long as the tibiæ.

P. marginalis n. sp.—Oblong, parallel, moderately convex, glabrous, the punctures of the head with very short hairs, the mandibles setose within and the side-margins of the prothorax bristling with rather numerous erect setæ; body and legs black, the tarsi and antennæ dark piceo-rufous; integuments moderately shining, the elytra feebly alutaceous. *Head* moderately large, ⅔ as wide as the prothorax, strongly transverse, strongly and closely punctured, the mandibles short and stout, with the apex within broadly truncate, the truncature nearly straight, only feebly oblique and beset with about five small denticles, of which the superior is slightly larger and more acute, the inner basal tooth well developed and feebly bifid at tip. *Antennæ* moderate, the club unusually developed, fully twice as long as the stem, broad, composed of four joints, the first only slightly shorter in a transverse sense than the others

and more than twice as wide as the last joint of the funicle. *Prothorax* nearly ⅕ wider than long, widest and obtusely angulate at the sides at basal ⅖, the sides thence very feebly convergent and nearly straight, becoming arcuate near the prominent but rounded apical angles anteriorly, and much more convergent, becoming sinuate near the base posteriorly, the basal angles obtuse but prominent and not blunt; surface transversely convex, broadly concave near the reflexed side-margins especially anteriorly, the punctures moderately coarse and numerous but distinctly separated, becoming sparse or partially absent along the median line and near the side-margins. Scutellum wholly impunctate. Elytra short, scarcely ⅖ longer than wide, not obviously wider than the prothorax and about 2¾ times as long, the apex semicircularly rounded; humeri right and slightly denticulate, the intra-humeral impression feeble; striæ moderately coarse, rather feebly impressed, closely and strongly punctured, subobliterated toward the humeri, stronger behind but wholly wanting behind the rather pronounced subapical swelling; intervals closely and strongly punctured, nearly flat, the punctures sparse and more serial toward the suture. *Legs* rather slender, the hind tarsi distinctly shorter than the tibiæ. Length 10.9 mm.; width 4.1 mm.

Washington State.

The male type represents a species allied to *depressus*, but smaller, shorter in form, with finer, more superficial and smoother elytral sculpture, more concave and fimbriate margins of the prothorax and blacker coloration.

Passalinæ.

Some years ago I received small sets of species in this subfamily from two sources. The larger number were taken by Mr. Erich Wittkugel in the vicinity of San Pedro Sula, Honduras, on the Atlantic slope, and the remainder by Mr. Baron, in the Mexican state of Guerrero, on the Pacific side. Only one of the fifteen species examined proves to be common to the two regions, indicating in some degree the mutual distinctness of the Atlantic and Pacific faunas even in this very constricted portion of the continent.

The arrangement of the genera proposed by Mr. Bates in the "Biologia," which is based primarily upon the relative size of the prothorax and elytra, even should it prove not entirely natural, is at least far more convenient than that of Kaup, the classification of the latter being marred in addition by a most original and unaccountable assumption, that each and every genus would be found ultimately to be composed of five species. In some genera, possessing a number of species, this premise even led Dr. Kaup

into flagrant errors of synonymy, due to his desire not to announce in any case more than the assumed five components.

The species composing the material before me are as follows:—

Proculus mniszechi Kaup.—Honduras.

Proculus magister sp. n.—Honduras.

Proculejoides crassulus sp. n.—Honduras.

Platyverres intermedius Kaup.—Guerrero. The single example is rather small, not quite 42 mm. in length, 48 mm. being the length recorded by Kaup. It is somewhat singular that the pronounced habital divergence of *intermedius* from the other species placed in Verres, should not have been alluded to by the author, and the necessity for a distinct genus is sufficiently evident. It is probable that Dr. Kaup had in view only the cephalic structure, which greatly resembles that of Verres, and the short lobes of the antennal club, in associating it with *Verres corticola.*

Rimor munitus sp. n.—Guerrero.

Paxillus parvus sp. n.—Honduras.

Neleus tlascala Perch.—Honduras.

Ninus interstitialis Esch.—Guerrero and Honduras. The male has the elytra very slightly shorter and the prothorax a little longer, but not wider, than the female. There is no distinguishing feature apparent in the representatives of the two localities.

Rhodocanthopus inops Truq.—Guerrero.

Ptichopus angulatus Perch.—Honduras.

Passalus striatopunctatus Perch.—Honduras. Differs from *distinctus* and *cornutus* in having the metasternum strongly punctured near the hind angles, with the depressed lateral line wider and more pubescent, in the large and prominent single external spine of the middle tibiæ, and especially, in the structure of the antennal club, the first joint being fully three times as wide as long and of a different form. Some of these differences are possibly subgeneric in weight.

Soranus imbellis sp. n.—Guerrero.

Verres corticola Truq.—Guerrero.

Verres vernicatus sp. n.—Honduras.

Verres cavilabris sp. n.—Honduras.

The new species of the list are described below in the same succession.

Proculus magister.—Elongate-oval, strongly convex, polished, the pubescent areas and general structure almost exactly as in *mniszechi. Head* with three feeble tubercles, two of which are near the anterior margin, and a large oblique tumidity above each eye, the neck densely punctured at the sides of the upper surface; labrum a little larger than in *mniszechi*, rather more deeply sinuate at apex and less densely punctured, the mandibles shorter and stouter, more unequally bilobed at apex and much more convex externally toward base, the upper tooth less basal, more oblique and much less developed;

mentum very nearly ½ as wide as the entire head, the lobes very strongly and obliquely cariniform. *Prothorax* as in *mniszechi*, but with the apical angles a little less rounded. *Elytra* suboval, more vertical at the sides than in *mniszechi* and flattened above, finely and feebly striate, becoming deeply so internally; striæ finely punctured toward the sides and apex, but impunctate, or with the faintest trace of punctures, toward the suture. Under surface as in *mniszechi*, except that the intermediate tibiæ generally have but two external spinules, the posterior one. Length of body ♂ 73.0; width of head 21.5; length of prothorax 20.0, width 27.5; length of elytra 37.5, width 26.3 mm. Length of body ♀ 66.0; width of head 20.0; length of prothorax 18.0, width 24.5; length of elytra 33.0, width 25.8 mm. Honduras.

Larger and more elongate than *mniszechi* and with notable divergence in the structure of the mandibles, mentum and elytral striæ. The minute tubercles near the frontal margin are more widely separated than in *mniszechi*, and, in that species, the mentum is smaller, being but slightly more than ⅓ as wide as the head and the elytra more evenly convex, with the striæ not much deeper toward the suture and having the strial punctures equally distinct throughout. In *magister* the male is larger than the female, with larger head and prothorax and notably more elongate elytra, while in *mniszechi* the two sexes are much more similar in shape, the head and prothorax of the male being simply a little larger. The mandibles and antennæ are not affected sexually. I have before me both sexes of the two species here compared.

Proculejoides crassulus.—Stout and very convex, highly polished throughout and deep black, the pubiferous punctures of the inflexed sides of the prothorax fine and only moderately dense, wanting internally toward apex; metasternum and elytra completely glabrous; tibiæ sparsely pubescent externally. *Head* slightly more than ⅗ as wide as the prothorax, the ambient posterior impression feeble; horn narrow, small and cariniform, with a small angulate and slightly prominent elevation at each side, the tip horizontal and but just visibly protuberant over the frontal impression, the latter limited by very broadly swollen, extremely widely diverging and indefinitely limited ridges; clypeal margin straight and transverse, with a minute and very feeble median sinus and ending at lateral fourth in an acute tubercle, the margin thence angularly receding to the eyes; supra-ocular ridge large, cariniform above, longitudinally excavated at its posterior end; labrum sparsely punctured toward tip, the latter almost rectilinear; mandibles broadly angulate on the upper edge, the apex tridentate, with the two upper teeth much more advanced; scar of the mentum feebly defined; antennal club trilobed, the lobes slender, the first joint 4 times as wide as long, the second nearly similar, the third evenly arcuate externally, 3 times as wide as long. *Prothorax* slightly more than ¼ wider than long, the apical angles obtuse but only slightly rounded, the apex transverse; mar-

ginal groove fine and wholly impunctate, extending inward at apex about $\frac{2}{5}$ the distance to the middle ; post-median impression feeble and impunctate ; disk convex and wholly impunctate, the median groove strong. Scutellum polished and wholly impunctate. *Elytra* distinctly less than $\frac{1}{2}$ longer than wide, about $\frac{4}{5}$ longer than the prothorax, slightly dilated behind the middle, the base transverse, feebly protuberant at the middle, the humeral angles strongly defined, not at all rounded and but little more than right ; disk coarsely and deeply striate throughout, the sulci strongly and equally punctate throughout the width ; intervals convex. *Metasternum* short, without an elevated median plane, having a patch of coarse punctures at lateral fourth near the hind margin and a small oblique posterior impression at each side of the median line ; epipleuræ extremely fine and wholly glabrous. *Legs* rather short, the middle tibiæ with one very strong, the posterior also with a single feebler, external spine. Length 24.0 mm. ; width 9.0 mm. ; length of the prothorax 6.5, of the elytra 12.3 mm. Honduras.

The genus Proculejoides is allied closely to Proculejus, differing in its glabrous elytra and metasternum; it should probably include also *Proculejus championi* of Bates, which differs from the present species in its larger size and in having the frontal carinæ tuberculose far behind the apical margin.

Rimor munitus.—Parallel, rather strongly convex, deep black and highly polished throughout, the basal wall of the elytra slightly pubescent at the humeri ; metasternum and hypomera finely punctate and pubescent, the former in a large lateral area from the middle coxæ to the sides of the apex, the latter glabrous anteriorly; tibiæ all rather conspicuously pubescent externally. *Head* impunctate, $\frac{2}{3}$ as wide as the prothorax, the posterior ambient excavation deep and impunctate, with a feeble elevation at each side near the base of the horn, the latter large, elongate, convex, simple and finely punctulate, with a minute longitudinal elevation at each side of the base, the apex pointed and prolonged horizontally far over the front, the tip feebly reflexed, and, from a vertical viewpoint, almost exactly over the apical margin of the clypeus, the diverging elevations from the anterior part of its base very feeble and rounded, flexing laterally to the supra-orbital ridge and forming the anterior limit of the posterior ambient impression; clypeal margin transverse, broadly sinuate in the middle and separated from the front—which is nearly flat and gradually declivous from the base of the horn—by a transverse marginal sulcus, ending immediately behind the ridge of the mandibles in a pronounced angular protuberance, the sides of the clypeus proper marked also by a slightly prominent angle at the sides of the labrum; supra-orbital ridge large and prominent, evenly convex and gradually disappearing behind, becoming narrow and acutely cariniform anteriorly; canthus of the eyes rather wide; labrum moderately sinuate at tip, the surface excavated and gradually beveled in a broadly triangular region bordering the sinus; mandibles well developed, the upper ridge angulate beyond the middle, the apex truncate and equally tridentate, the inferior tooth well developed; mentum with the median part

of the base elevated, glabrous and impunctate, its flanking scars deep but only slightly punctate; two basal lobes of the antennal club long and subequal, about 5 times as long as the joint, the last joint about 3½ times as wide as long, the lobe widest beyond the middle. *Prothorax* about ½ wider than long, the apex transverse and feebly bisinuate, the apical angles rather broadly rounded; marginal groove fine and impunctate, extending inward at apex without the least dilatation about ⅖ the distance to the middle; disk transversely convex, wholly impunctate, the post-median lateral depression well marked though smooth; median groove deep, terminating at some distance from the apical margin. Scutellum sparsely punctate toward base, the median line impressed except toward tip. *Elytra* about ⅗ longer than wide and nearly 2½ times as long as the prothorax, equal to the latter in width and with the sides parallel and nearly straight, the apex circularly rounded; base broadly and very feebly sinuato-truncate; disk rather deep and vertical at the sides, gradually less convex and horizontal above, the striæ distinct and equally pronounced throughout, only a little more widely separated above than on the flanks, the punctures distinct on the flanks but very indistinct toward the suture, the intervals broadly and equally convex throughout. *Metasternum* well developed, the depressed side-pieces becoming broader behind, the surface polished, without coarse punctures near the hind angles. Middle tibiæ with three external spines, gradually more pronounced distally, the hind tibiæ with a single spine. Length 38.0 mm.; width 13.0 mm.; length of prothorax 9.0, of the elytra 21.0 mm. Guerrero.

This species is closely allied to *sagittarius*, but differs in its larger size and relatively shorter and more transverse prothorax; the elytra are only twice as long as the prothorax in *sagittarius*, according to the measurements given by Dr. Kaup.

Paxillus parvus.—Elongate, rather narrow, depressed, the upper surface flat, deep black and highly polished throughout, glabrous, the fine punctures of the posterior parts of the hypomera and humeral part of the basal wall of the elytra bearing very short erect hairs, the latter very dense, but not extending behind the humeri at the sides. *Head* nearly ⅘ as wide as the prothorax, with scattered deep punctures at the sides behind the eyes and coarse shallow punctures near the clypeal margin, elsewhere impunctate; posterior ambient excavation rather deep, its posterior wall broadly cuspiform in the middle and sharply defined; cephalic process consisting of a feeble transverse elevation in the middle, trilobed by two feeble sulci, the lateral lobes small, the median evenly convex without trace of horn, the diverging ridges from its apex acutely cariniform and evenly arcuate, terminating each in a strong and prominent tuberculiform process at the clypeal margin, the latter transverse, straight and unmodified between the processes, the enclosed space being scarcely ⅓ the total width of the head; frontal margin at each side between the process and the prominently angular anterior part of the ocular canthus evenly sinuate; antennal club pentaphyllous, the lobes long and slender, the middle the longest, and nearly 5 times the length of the joint. *Prothorax* nearly ⅖

wider than long, the flanks with coarse irregularly scattered punctures throughout, the post-median depression feeble; marginal groove fine, with large shallow opaque and anastomosing punctures; apex transverse, feebly sinuate near each angle, the latter acute and anteriorly prominent, the marginal groove very fine, extending $\frac{2}{5}$ the distance to the middle; median groove fine but deep, very nearly attaining the apical margin. Scutellum impunctate, the median line feebly impressed. *Elytra* nearly $\frac{4}{5}$ longer than wide, about $2\frac{1}{2}$ times as long as the prothorax, and, at base, equally wide, just visibly wider behind the middle; base transversely rectilinear throughout; striæ of the flat upper parts rather fine but well impressed and very feebly punctate, the second and third somewhat sinuous, the intervals relatively wide and feebly convex, those of the vertical flanks very coarse, deep, approximate and sulciform, with the punctures coarse. *Metasternum* with a strongly delimited median plate, strongly punctured about the circumference on the sloping sides and very densely near the middle coxæ, the episterna very narrow, linear, concave, opaque and glabrous. Middle and hind tibiæ each with a single small external spine near apical third. Length 16.8–18.8 mm.; width 5.6–6.0 mm.; length of the prothorax (in the smaller example) 4.0, of the elytra 9.7 mm. Honduras.

Differs from the Brazilian *leachi* in its very much smaller size and transverse and not visibly emarginate median parts of the clypeal apex.

Soranus imbellis.—Rather elongate and strongly convex, glabrous, black and highly polished throughout above. *Head* small, scarcely $\frac{3}{5}$ as wide as the prothorax, impunctate, the posterior ambient impression shallow posteriorly where it is indefinitely limited, becoming larger and deep anteriorly along the supra-orbital ridges, enclosing also a small deep rounded depression at each side of the base of the central process, the latter transverse, rather small and feebly elevated, almost equally trilobed by very feeble longitudinal depressions, the lateral lobes rectangular at apex, the median produced at tip in a minute and nearly erect, acutely pointed process, from the base of which extend two very widely diverging, low, obtuse and straight ridges flexed outward at apex, joining the supra-orbital ridge and minutely tuberculate at the point of flexure; front between the ridges very feebly concave to the straight and transverse marginal sulcus, the latter terminating at each side in a small acute tubercle directed obliquely upward and outward at the base of the mandibular ridge; clypeal edge transverse and virtually straight, angular and slightly prominent at each side of the labral base; supra-orbital elevation rather short, cariniform anteriorly. *Prothorax* rather small, fully $\frac{1}{2}$ wider than long, transversely subarcuate at apex, the angles moderately rounded; marginal groove very fine, impunctate, flexed inward fully $\frac{1}{2}$ the distance to the middle at apex, receding gradually from the edge and becoming gradually more feeble; post-median depression small but deep, coarsely punctate, the flanks with a few coarse scattered punctures in its neighborhood; median groove strongly impressed, entire. Scutellum impunctate, not impressed. *Elytra* nearly $\frac{4}{5}$ longer than wide, $2\frac{3}{4}$ times as long as the prothorax and slightly wider, especially behind the middle; striæ rather fine, closer on the flanks, finely but distinctly

punctured throughout, the intervals moderately convex. *Metasternum* well developed, punctured and pubescent near the middle coxæ, but elsewhere completely impunctate and glabrous, the epipleuræ very fine, linear and deeply concave. Middle tibiæ with very short, stiff, external pubescence and a single rather distinct spine, the hind tibiæ spineless. Length 19.0 mm.; width 6.4 mm.; length of the prothorax 4.2, width 5.7; length of the elytra 11.5 mm. Guerrero.

Differs from *haagi* and *recticornis* in its impunctate scutellum, and from *wagneri* in its straight and not arcuate frontal ridges; *tropicus*, *ellipticus*, *championi* and *yucatanus* are much larger species and *intergeneus* of Bates, which is doubtfully referred to the genus, has the metasternum somewhat punctate at each side of the apex. The type of the description is probably the female, the male being nearly similar but with the prothorax a little more transverse and about as wide as the elytra. Four specimens.

Verres vernicatus.—Parallel, moderately convex, polished and glabrous throughout above except some sparse short hairs distributed over the vertical wall of the elytral base; pro- and mesosterna opaque and minutely granulato-reticulate, except toward the lateral edges where the former is conspicuously pubescent as usual, the latter strongly and coarsely punctured at the sides of the peduncle. *Head* nearly $\frac{4}{5}$ as wide as the prothorax, the posterior ambient impression deep, its posterior margin behind well defined and broadly cuspid, broad and shallow anteriorly; central process transverse, forming an anteriorly acute middle lobe and two obtusely rounded lateral lobes, not separated by longitudinal impressions, the frontal ridges diverging extremely widely from a short distance before the base of the process, gradually and arcuately becoming transverse and joining the supra-orbital elevation; they are subacute, though feeble, and are feebly tuberculate at lateral third of the entire width of the head; clypeus thence moderately declivous, smooth and almost plane to the apex, which is subrectilinear, with a small median sinus and limited at each side of the labrum by a moderately prominent angular projection; from this projection proceeds a pronounced short longitudinal elevation to the frontal ridge; supra-antennal elevation large and angularly prominent anteriorly; labrum rather deeply sinuate in the middle at apex, the surface adjoining the sinus deeply impressed and concave for a short distance. *Prothorax* fully $\frac{1}{2}$ wider than long, the apex slightly advanced in median $\frac{2}{3}$ and subrectilinearly truncate, thence obliquely subsinuate to the rounded apical angles; marginal groove punctate, inflexed at apex less than half way to the middle, becoming deeper though only slightly wider, with acutely limited margins and strongly and transversely rugose bottom; post-median depression rather small, smooth; disk impunctate throughout though with minute scattered punctules, the median groove coarse and deep. Scutellum deeply and closely punctured, with a smooth median line. *Elytra* but little more than $\frac{1}{2}$ longer than wide, not quite $2\frac{1}{2}$ times as long as the prothorax, just visibly wider behind the middle, the striæ moderately impressed and finely

punctured, the intervals feebly convex. *Metasternum* finely punctured and pubescent toward the coxæ and along the depressed epipleuræ, which become wider behind. Tibiæ distinctly pubescent, the middle and posterior without trace of external spinules. Length 34.0–35.0 mm.; length of prothorax in the larger 8.5, width 11.5 mm.; length of elytra 19.7, width 12.0 mm. Honduras.

Closely allied to *corticola* but shorter, with the elytra, especially, less elongate and distinguished besides by the smaller, deeper and narrower apical concavity of the labrum, cariniform lateral limits of the plane of the clypeus, which are wanting in *corticola*, in the smaller cephalic process with smaller median protuberance and less angulate lateral lobes, in the deeper, longer and strongly rugose apical part of the lateral thoracic groove, and in many other features. The small clypeal projections in the Guerrero examples of *corticola* before me, are much feebler and more widely separated than in the figure of Kaup, this distance being fully ½ the entire width of the head; in the present species it is even greater still.

Verres cavilabris.—Parallel, rather stout and broadly convex, the elytra deplanate above and rather abruptly but deeply vertical at the sides; upper surface highly polished and glabrous throughout, except the short sparse pubescence on the vertical wall of the elytral base. *Head* ¾ as wide as the prothorax, the upper surface somewhat as in the preceding species, except that the posterior margin of the posterior ambient depression, which is broad, feeble and indefinite throughout, seems to be indefinitely limited, the supra-orbital ridges acutely carinate anteriorly and globularly dilated internally behind, the central process much longer, with a long slender median projection, and the lateral lobes more angulate, also in the form of the frontal ridge; the latter is at a slight distance in front of the deep horizontal excavation extending under the horn, and is transversely and feebly arcuate, ending, at lateral third of the entire width of the head, in an abrupt and strongly marked tubercle and not extending further toward the sides; the clypeus between this ridge and the tip is rapidly declivous, the apical margin broadly emarginate, with a broad and still more pronounced sinus at the middle, exposing a transversely truncate pale coriaceous piece between the upper surface of the labrum and under surface of the clypeus; the emargination nearly equals ½ of the entire width of the head in extent, and is limited at each side by a prominent angular projection, not connected at all with the tubercle forming the extremity of the transverse frontal ridge; labrum about as long as wide, rather deeply sinuate at tip, the surface deeply and abruptly concave in a parabolic area extending to basal fourth and including the apical sinus anteriorly; mandibles unusually developed. *Prothorax* about ⅔ wider than long, the apex much advanced toward the middle and transverse at tip, very oblique and subsinuate laterally to the broadly rounded angles; lateral groove obsoletely and re-

motely punctate, inflexed and greatly dilated at tip for scarcely $\frac{2}{5}$ the distance to the middle, the excavation moderately deep, punctured and rather abruptly defined at its arcuate posterior and interior limit, but shallow, indefinite and smooth anteriorly to the apical edge; post-median depression strong, transverse and smooth; disk impunctate, evenly, transversely convex, the median groove fine and feeble. Scutellum punctate, with an impunctate median line. *Elytra* parallel, not swollen behind, $\frac{1}{2}$ longer than wide, $2\frac{1}{3}$ times as long as the prothorax, finely striate, more coarsely on the vertical flanks, where also the punctures become more distinct and the intervals distinctly narrower and more convex. Pro- and mesosterna opaque, the metasternum polished but punctulate and pubescent broadly at the sides throughout, with numerous coarse punctures along the hind margin. Tibiæ densely pubescent externally, without trace of external spines. Length* 39.5 mm.; length of prothorax 9.5, width 12.5; length of elytra 21.0, width 13.0 mm. Honduras.

This remarkable species is evidently somewhat related to *hageni* Kaup, but differs in its stouter form and in having the end tubercles of the transversely arcuate frontal ridge perfectly and abruptly isolated laterally, and not connected with the supra-orbital ridge by a transverse elevation. From *cavicollis* of Bates, to which it is very closely allied, it appears to differ in its still larger labral excavation, shorter transverse frontal ridge and shorter and more transverse joints of the antennal club. Mr. Bates states with regard to *cavicollis* " metasterno punctulato-pubescenti, medio solum glabro;" in the present species the pubescent and punctured surface is confined to the sides, broadly anteriorly but not extending inward beyond the depressed side-piece posteriorly.

NOTE.—For several years past I have had two series of examples separated under the name *cornutus* Fabr., the series differing from each other quite conspicuously in size and in the structure of the cephalic process. From all that I have been able to gather, the smaller form occurs more especially on the eastern slopes of the Appalachian system, while the larger occurs generally to the westward, although there is without doubt a mixture of the two in the intervening regions. The eastern form, which may be regarded as the true *cornutus*, has the cephalic process somewhat variable but small, thickened at base and cylindrically pointed at its porrect apex, while the western form not only has the body larger and slightly more elongate, but the horn much larger, with the porrect portion flattened and the transverse section near base more angulate at the sides. Although there are absolutely no other differential features of note, it seems necessary to consider these larger western forms, with more developed corneous process, as at least a well-marked subspecies, which may be known as **distinctus** Weber.

*The measurements of length include the mandibles in all the above descriptions.

The sexual differences in Passalus are extremely slight. For example, in the typical *cornutus*, the male is a little larger than the female with the prothorax wider and longer, about equaling the elytra in width, and the head is more than ½ as wide as the elytra, with the horn moderately developed, while the female has the prothorax noticeably narrower than the elytra, the latter being more than twice as wide as the head, and the corneous process is very small and narrow. The abdominal characters are precisely similar in the two sexes, the marginal groove of the fifth segment being asexual in nature as in Zopherus and some other types, and there are scarcely discernible differences in the antennæ, except that the first joint of the club is notably narrower than the second in the female, but nearly equal in the male. In *distinctus* the sexual differences are still less marked, there being no appreciable variation in the corneous cephalic process; in general form of body the male is but slightly larger, though notably broader than the female.

CEPHALOIDÆ.

CEPHALOON Newm.

The body in this very isolated type is elongate and convex, with rather loose connective tissues as in Cistelidæ, and, as in that family, the claws are strongly pectinate; they are, however, more largely developed than in Cistelidæ, minutely pubescent and provided with a long, finely pubescent appendage; there is a bisetose onychium between them. The head is elongate, gradually and obliquely narrowed behind the eyes, which are large, finely faceted, deeply emarginate, anterior in position and minutely setulose. The mentum is moderate in size, flat or concave, somewhat elongate-oval in form, truncate at apex and has its plane much inclined to that of the narrow support; the maxillæ are very large, prominently exposed at the sides of the mentum, the lobe well developed, gradually acuminate and densely ciliate along its inner edge. Ligula broad, with very large rounded paraglossæ; labial palpi small, with the third joint triangular, compressed, squarely truncate in arc at apex. Maxillary palpi long and much developed, the last joint dilated, very obliquely truncate and excavated at tip. Antennæ inserted at the sides of the head before the eyes under the acute side margins of the front, slender, 11-jointed, the last three joints broader or not, differing in form and vestiture from the preceding joints and forming a feeble club. Clypeus large and rather long, the suture fine but distinct. Labrum long and greatly developed, the apex broadly and feebly bilobed or sinuato-truncate. Mandibles long and arcuate but not

extending much beyond the labrum. Prothorax generally campanulate, with everted basal angles, always distinctly narrower than the elytra. Anterior and intermediate coxæ very large and greatly exposed, approximate, the anterior cavities large, confluent and very broadly open behind; posterior coxæ contiguous, extending to the sides of the body. Metasternum large, the episterna broad, becoming narrower behind. Abdomen composed of five free segments, the fifth emarginate at tip in both sexes, more narrowly in the female; sutures straight. Legs long and very slender; tibial spurs well developed, simple; tarsi slender, cylindrical, the penultimate joint unmodified.

The characters of the family as given by LeConte and Horn (Class. Col. N. A., 2 ed., p. 405), are unaccountably erroneous and misleading, it being stated, for example, that the eyes are small, the frontal suture not distinct, the prothorax at base as wide as the elytra, that the side-pieces of the metasternum are narrow, and, finally, that the abdomen is composed of six free ventral segments, with the sixth short and deeply emarginate in the male.

The family should follow the Cistelidæ in our lists, and is out of place in its present position near the Œdemeridæ. The species inhabiting the United States are at least five in number, and may be readily differentiated as follows:—

Prothorax larger and more campanulate, fully as long as the head or longer and much broader at base, the everted basal angles more developed; antennæ shorter, the last three joints slightly dilated in the female, the ninth and tenth not notably elongate; neck feebly but abruptly constricted.

Antennæ short, not as long as the head and prothorax, the three outer joints distinctly wider, the eighth distinctly shorter and much narrower than the ninth..... **lepturides** Newm.

Antennæ longer than the head and prothorax, the eighth joint at least as long as the ninth and generally longer.

Eyes separated by nearly their own width; body generally uniformly testaceous throughout, the antennæ with the three basal joints pale, the remainder blackish, becoming gradually paler at tip; eighth joint fully as long as the ninth..... **tenuicorne** Lec.

Eyes separated by ⅓ to ⅔ of their own width, as viewed vertically; body variable in color.

Front between the antennæ broad, as wide as the neck or wider.

versicolor n. sp.

Front narrower than the neck; elytra more rapidly and obliquely narrowed from the base and more acutely rounded at tip.

ornatum n. sp.

Prothorax small, shorter and only slightly wider than the head, scarcely ⅔ as wide as the elytra; antennæ more elongate, the last three joints not broader but less conical and very much elongated, at least in the male; neck not abruptly constricted.....**ungulare** Lec.

Of *ungulare* I have seen only the male, the characters assigned to the first four species of the table are however taken throughout from the female.

C. versicolor.—Elongate, convex, alutaceous in lustre, minutely, closely punctured and uniformly clothed with fine, short, pale and decumbent pubescence throughout; body varying from blackish throughout, with the legs, front parts of the head and basal and apical parts of the antennæ paler, to pale testaceous throughout, the apex of the femora, especially the posterior, generally suffusedly darker and the tip of the tibiæ blackish; pronotum in intermediate forms blackish, with the flanks, tip and median basal parts paler, or pale testaceous throughout, with two discal blackish spots; elytral suture and basal parts of the flanks frequently blackish. *Head* elongate, slightly more than ½ as wide as the base of the prothorax, the post-ocular portion feebly impressed along the middle, conical with the sides feebly sinuate; neck abruptly but moderately constricted; eyes large, separated by ½ of their own width. *Antennæ* about as long as the head and prothorax, the three outer joints very feebly swollen, paler and more finely pubescent, the ninth and tenth subequal, ½ longer than wide and distinctly shorter than the eighth; eleventh elongate-oval, about as long as the two preceding combined. *Prothorax* slightly elongate, strongly campanulate, the apex rounded and about ⅔ as wide as the base, the latter transverse with the sublateral sinuations feeble; sides rounded, strongly convergent from near the middle; basal angles acute and strongly everted; disk evenly convex, the median line sometimes feebly impressed anteriorly. Scutellum well developed, campanulate, not quite as long as its basal width. *Elytra* 3 times as long as wide, ⅓ wider than the prothorax and more than 3 times as long; sides subparallel, gradually rounded and convergent in apical fourth or more; apex of each evenly and rather narrowly rounded; disk longitudinally and feebly impressed within the rounded humeri, each with feeble traces of three fine, longitudinal, elevated lines. *Legs* long and very slender; hind tarsi as long as the tibiæ. Length 10.0–12.5 mm.; width 2.2–3.2 mm.

Colorado?

Four specimens are before me from the Levette cabinet, without indication of locality but probably taken in or near the region suggested. The description is drawn from the female, the sinus of the fifth ventral being small, deep and rounded. In the male the body is smaller and narrower, with the elytra narrowed gradually from the humeri, the antennæ rather longer than the head and prothorax, with the last three joints scarcely as thick, the ninth a little longer than the tenth but each much shorter than

the eighth, and the eleventh shorter than the two preceding, the head more rapidly conical behind the eyes, which are larger and separated by less than $\frac{1}{3}$ of their own width, and the fifth ventral with a large, deep and subangular sinus at tip. The sheath of the intromittent organ has two elongate and slender apical appendages, and the posterior margin of the third segment has a small bifurcate process at the middle.

C. ornatum.—Elongate, convex and subrhomboidal, alutaceous, finely punctate and pubescent as usual, the head black with the portions before the eyes and a small spot behind the latter, pale testaceous; prothorax blackish above and beneath, the flanks testaceous, the pale area extending obliquely inward posteriorly to the median line near the base; basal parts blackish with a large semi-isolated pale spot near each angle, a small spur of blackish from the under surface also showing from above at the middle of the side margin; elytra pale ochreous, the suture feebly blackish toward base; under surface blackish, the mes-epimera and median parts of the abdomen pale; legs pale and colored as in *versicolor*. *Head* elongate, the post-ocular portion conical, feebly impressed toward the median line except toward base, and with the sides perfectly straight; neck abruptly constricted, the base feebly and evenly sinuate in arc to fit the anterior margin of the prothorax; eyes large but only feebly convex, separated by $\frac{2}{3}$ of their own width; antennæ pale at base, missing in the type. *Prothorax* distinctly longer than wide, campanulate, the sides arcuately subprominent behind the middle; apex narrow and rounded; base transverse, with the sinuations broad and feeble, the angles only moderate in size, very acute and strongly everted. Scutellum much wider at base than long, the sides sinuate; apex strongly rounded. *Elytra* barely 3 times as long as wide, between $\frac{1}{3}$ and $\frac{1}{4}$ wider than the prothorax and about 3 times as long; humeri longitudinally swollen, rounded, the sides thence gradually convergent and very broadly sinuate to near apical third, then broadly arcuate and more convergent to the apices, which are narrowly and individually rounded; disk of each with feeble traces of three fine elevated lines, feebly, longitudinally impressed within the humeri. *Legs* long and slender, the hind tarsi fully as long as the tibiæ. Length 10.5 mm.; width 2.75 mm.

Idaho (Cœur d'Alène).

The single representative of this species is a female, the notch in the apex of the fifth ventral being small, deep and rounded; it is very distinct in coloration, the peculiar pattern of pronotal ornamentation not being suggested by any of the variations of *versicolor*, and, in that form, the eyes are much more approximate, with the sides behind them broadly and just visibly sinuate.

OTHNIIDÆ.

ABABA n. gen.

Body narrow and subcylindric, with erect bristling pubescence. Head not narrower than the prothorax, prolonged behind the eyes but not at all narrowed at base, the eyes entire, rather small, moderately convex and prominent and finely faceted, transversely truncate behind; front short and obliquely narrowed before the eyes, the supra-antennal edge slightly prominent laterally but not at all dorsally, the apex broadly emarginate in trapezoid. Labrum very small, short and transverse. Mandibles short, thick, arcuate, decussate, with at least one large oblique internal tooth behind the apex, the latter acute. Mentum very small, the ligula small, the labial palpi moderately developed, with the terminal joint broad, triangular, compressed and with the apical truncature arcuate. Maxillæ wholly exposed at the sides of the mentum, the lobes small, feebly setulose at tip, the palpi cylindric, with the joints closely joined, the fourth feebly oblique, elongate, conical, at base as wide as the third and $\frac{3}{4}$ longer, the apex narrowly obtuse. Antennæ 11-jointed, short, attached at the sides of the front immediately before the eyes; last three joints broader, forming a loose club. Prothorax parallel, the side-margins but feebly defined by a simple edge, which is without a continuous elevated line but marked by a series of punctures with asperate interspaces appearing as minute serrulations from a dorsal point of view; side-pieces of the under surface not at all differentiated; prosternum moderately long before the coxæ, which are small in size but rather prominent, contiguous and with their cavities narrowly closed behind. Elytra cylindric, irregularly punctate, entire, the epipleuræ vertical, defined by a fine line near the margin, wider and oblique in plane at base. Mesosternum narrowly separating the middle coxæ and intervening at the sides between the cavities and the side-pieces, the episternum in isosceles triangle with the apex behind, the epimeron a long scalene triangle separating the episternum from the sides of the closed elytra throughout. Metasternum moderately long, the episternum narrow, disappearing under the elytra behind; hind coxæ apparently slightly separated, transverse, extending to the sides of the body. Abdomen consisting of five free segments, with transverse apices and without

exposed connective membrane, the first as long as the next two, the last four gradually diminishing in length. Legs short and very stout; femora much swollen throughout but especially the anterior; tibiæ short and stout, obliquely truncate at tip, apparently without terminal spurs; tarsi short and stout, 5–5–4-jointed, the last joint as long as the remainder in all, the anterior pair very broadly dilated and densely clothed with stiff yellowish hairs beneath; claws rather stout, well developed, arcuate, simple and divaricate.

The single species assignable to this genus, the relationship of which seemed rather difficult to determine at first, is small and quite insignificant in appearance, and was forwarded to me by Mr. H. F. Wickham as one of his captures in the delta region of the lower Rio Grande.

A. crinita n. sp.—Parallel, subcylindric, feebly depressed above, shining, dark rufo-testaceous and somewhat sparsely clothed throughout with moderately long, stiff, erect hairs; legs and elytra brighter rufous. *Head* subdeflexed, fully as long as wide, cylindrically and evenly convex above, strongly punctate, the punctures slightly elongate, well separated but closer and subrugose near the sides of the front; eyes at nearly twice their length from the prothorax; antennæ as long as the prothorax, sparsely bristling, the first joint globularly enlarged to some extent. *Prothorax* as long as wide, very feebly narrowed and with slightly arcuate sides from apex to base; apex transverse, feebly arcuate toward the angles, which are not prominent; basal angles obtuse; surface subcylindrically convex, even, the basal margin depressed beneath the general surface; punctures deep, strong, moderately coarse, distinctly separated, becoming slightly elongate toward the sides, the marginal serrulation exceedingly fine, feeble and obtuse. Scutellum flat, moderately small, transversely oval. *Elytra* parallel, with the sides straight, semicircularly rounded at tip, $\frac{1}{5}$ longer than wide, $2\frac{1}{3}$ times as long as the prothorax and fully $\frac{1}{4}$ wider; base truncate, the humeri feebly tumid, slightly more than right but forming a distinct angle; surface feebly flattened toward the suture, coarsely, deeply and irregularly punctate, the punctures becoming gradually smaller behind, well separated throughout. Length 2.15 mm.; width 0.63 mm.

Texas (Brownsville).

No note concerning the habits of this interesting species has been received as yet, but it is probably predaceous like Othnius.

CURCULIONIDÆ.

Balaninini.

BALANINUS Germ.

The species having short beaks in both sexes are numerous within the borders of the United States, and have been only superficially elaborated thus far; the table given below is therefore confined to them alone. In the table published by Mr. Blanchard (Bull. Bk. Ent. Soc., 1884, p. 106) this particular group is represented by two species, *obtusus* and *uniformis*; *confusor* was subsequently defined by Dr. Hamilton. Nine other species are now added. The species having the beak of the female longer than the body are far less numerous, and will probably not be materially increased by future collecting.

In determining the systematic position of the tribe Balaninini, more weight should be given to ungual structure than to that of the meso-parapleuræ, for, as I have elsewhere pointed out, the oblique truncature of the humeri although the most constant and characteristic peculiarity of the Barini, is not confined by any means to that tribe but may appear in a more or less marked form in several other sections of the Curculionidæ, but, aside from this, in point of fact the obliquity of humeral truncature in the Balaninini is barely discernible, and is not at all comparable with the conformation of these parts in the Barini. In the latter tribe one of the most significant general characters is the simplicity of the tarsal claws; in the Anthonomini on the other hand, the toothed modifications are one of the most characteristic features, simplicity being the notable exception. In Balaninus the claws are conspicuously toothed internally, and this, in conjunction with the general habitus of the body, would seem to determine its closer relationship with the Anthonomini.

The following table includes only those species in which the beak of the female is distinctly shorter than the body, and is connected with the preceding section, containing those with the beak of the female longer than the body, by *nasicus*, the latter bearing a striking superficial resemblance to *confusor*, which is placed at the head of the table :—

Beak of the female as long as the elytra or longer, but never quite as long as the body, that of the male much shorter.

Femoral teeth moderate in size, their distal slope oblique, the reëntrant angle rounded.

Femora stout and more strongly inflated ; prothorax more arcuate at the sides and usually distinctly narrowed at base, with the sublateral vittæ of paler scales more evident ; elytral vestiture variegated, with a transverse pale band near apical third generally more evident as in *nasicus*. **confusor** Ham.

Femora less stout and less strongly inflated, the prothorax never narrowed at base, with the sublateral pale vittæ less evident except occasionally toward base.

The femora more properly swollen beneath, with a small erect denticle at the summit of the swelling ; tibiæ thick ; body very short and thick, with widely exposed humeri ; basal joint of the antennal club shorter, evenly obconic.....**humeralis** n. sp.

The femora normally toothed beneath, with the tibiæ less thick ; body narrower and more elongate-oval, with less prominent humeri ; basal joint of antennal club longer, generally subpedunculate toward base.

Vestiture less dense, the scales somewhat separated, not entirely concealing the blackish surface of the elytra.....**uniformis** Lec.

Vestiture dense, concealing the surface of the elytra ; first joint of the antennal club less evidently prolonged or pedunculate at base.

Scales of the strial punctures short and broad ; body very small. **nanulus** n. sp.

Scales of the strial punctures long and narrow.

Beak in the male very short, ½ as long as the body, the antennæ shorter and thicker, the scape attached beyond the middle.....**occidentis** n. sp.

Beak in the male nearly as long as the elytra, the antennæ longer and more slender, the scape attached distinctly behind the middle ; body shorter and thicker...**undulatus** n. sp.

Femoral teeth large and very conspicuous, their distal slope almost perpendicular, the reëntrant angle right and sharply defined.

Prothorax widest at the middle, more or less distinctly and arcuately narrowed thence to the base ; vestiture of the elytra distinctly variegated in wavy transverse lines of pale luteous and dark brown..**strictus** n. sp.

Prothorax not narrower at base; elytral vestiture much less variegated, the humeri decidedly more prominent; legs long, the femoral teeth extremely large .....**longipes** n. sp.

Beak in the female short, not as long as the elytra, the sexual differences becoming almost inappreciable except probably in *sulcatulus*; femoral teeth as in *uniformis*.

Body narrow, elongate-oval and much smaller in size, the elytral striæ coarse, about ½ as wide as the intervals; beak more slender. **sulcatulus** n. sp.

Body stout, the elytral intervals very broad when compared with the striæ.
Last ventral segment of the female unimpressed and clothed with long dense vestiture to the apex.
Elytral vestiture strongly variegated or irregularly tesselate; beak of the female subcarinate above for a considerable distance from the base. Massachusetts.....**obtusus** Blanch.
Elytral vestiture feebly variegated or nearly uniform, the beak of the female feebly carinate only at the extreme base. New Mexico.
brevirostris n. sp.
Last ventral of the female impressed at the middle, the vestiture becoming shorter, as well as hair-like, toward tip; elytral vestiture strongly variegated.....**monticola** n. sp.

These short-beaked species probably feed upon nuts having thin and exposed shells, such as acorns, and this circumstance, if true, will account for their greater variety and numbers, the oaks being numerous in species and having widely varying characteristics, which must exert more or less influence in evolving what we designate species among the depredating insects. The new species are described below in order.

B. humeralis.—Very stout and thick, subrhomboidal; integuments dark piceo-rufous in color, the prothorax piceous-black; vestiture moderately dense, nearly uniform, pale ochreous in color, the scales on the pronotum slender and directed transversely. *Head* scarcely more than $\frac{2}{5}$ as wide as the prothorax, the eyes separated by nearly $\frac{3}{4}$ of their own width, the intermediate surface with a small rounded puncture; beak equal in length to the elytra, moderately slender, evenly and distinctly arcuate throughout the length, punctate and feebly carinate above toward base, the antennæ inserted just behind the middle; first four funicular joints decreasing rather rapidly in length, the club elongate-fusiform, very densely pubescent. *Prothorax* relatively rather small, short, fully $\frac{1}{2}$ wider than long, the sides subparallel and very feebly arcuate to near the apex, then rapidly rounded and sinuate to the distinctly tubulate and truncate apex; base broadly lobed at the middle; surface moderately convex, densely and somewhat coarsely punctured. *Elytra* short, not longer than wide, twice as long as the prothorax and fully $\frac{2}{5}$ wider, the sides rapidly convergent and very feebly arcuate from the rather widely exposed and prominent humeri, the apex parabolic; striæ moderately coarse, deep, strongly and somewhat distantly punctate, the intervals wide and feebly convex, strongly and closely punctato-rugose. *Legs* rather stout. Length (exclusive of the beak) 6.5 mm.; width 3.5 mm.

Florida.

This distinct and isolated species is described from the male, the abdomen being strongly impressed toward the middle of the two basal segments; the fifth segment is narrowly and feebly sinuate at tip, with the surface feebly impressed, subtumid at each

side near the apex. The facies of the body is quite different from that of any other species, owing to the short rhomboidal form, prominent humeri and distinctly tubulate apex of the prothorax. A single specimen, probably from the extreme southern part of the State.

B. nanulus.—Rather short and stout, subrhomboidal, piceous-black, the legs rufescent; beak and antennæ pale rufous; integument densely clothed with an almost uniform mixture of white and brown scales, the latter longer and more slender; white scales of the strial punctures generally shorter and broader. *Head* nearly ½ as wide as the prothorax, the eyes separated by but little more than ½ their own width, the interval feebly sulcatulate; beak slender, almost evenly arcuate, about as long as the elytra; antennæ slender, inserted at about the middle, the first four joints of the funicle uniformly and rather rapidly decreasing in length, the club elongate, fusiform and very densely pubescent. *Prothorax* relatively small, fully ½ wider than long, the sides parallel and nearly straight in basal ⅗, then moderately convergent and subrectilinear to the truncate apex; disk densely punctured, the slender scales close-set and arranged transversely, meeting along a fine and rather prominent median line. *Elytra* but slightly longer than wide, more than twice as long as the prothorax and fully ⅖ wider, the humeri moderately exposed and subprominent; sides feebly convergent to near apical third, then much more rapidly and more arcuate to the tip; striæ moderately coarse and deep, rather coarsely punctate, the intervals nearly flat and subrugose. *Legs* rather short, the femora quite feebly inflated. Length 4.8 mm.; width 2.3 mm.

New Mexico (Las Vegas).

The single representative is a male, having the abdomen distinctly impressed in the middle toward base, the fifth only slightly flattened, with the vestiture becoming finer, more hair-like and suberect toward the middle and tip, and with the apex transversely truncate, the pygidium clothed densely with long erect brown and white hairs, the former the longer. This species seems to be quite isolated and not closely related to any other.

B. occidentis.—Elongate-suboval, strongly convex, dark in color, with dark rufous beak and antennæ and very densely clothed throughout with ochreous-yellow scales, only very slightly and unevenly variegated with somewhat darker brownish, the scales all long and very narrow, arranged transversely and hair-like on the pronotum, where they generally become whitish sublaterally toward base, paler, very broad, extremely dense and more closely decumbent beneath. *Head* ½ as wide as the prothorax, the eyes separated by but little more than ½ of their own width, the intervening surface scarcely impressed; beak moderately slender, shorter than the elytra, nearly straight, becoming arcuate distally, the antennæ inserted slightly beyond the middle, the funicle unusually stout and setose, with the first four joints decreas-

ing rather rapidly in length, the club fusiform and densely pubescent, with the first joint narrowed and glabrous at base. *Prothorax* moderate in size, densely punctate, $\frac{2}{5}$ wider than long, the sides moderately convergent and broadly, almost evenly arcuate from base to apex, rather straighter and more convergent near the latter; apex transversely truncate. *Elytra* about $\frac{1}{4}$ longer than wide, distinctly more than twice as long as the prothorax and fully $\frac{2}{5}$ wider, the outline narrowly and almost evenly ogival from base to apex, the humeri only moderately exposed and subprominent; striæ somewhat fine, punctured, the intervals broad and nearly flat, subrugose and concealed by the vestiture. *Legs* moderate in length and in degree of femoral dilatation. Length 5.9–6.6 mm.; width 2.8–3.1 mm.

California (Sta. Cruz, Sonoma and Siskiyou Cos.).

This species is somewhat allied to the eastern *uniformis*, but differs in its smaller size, shorter form, very dense covering of slender ochreous scales, shorter and less slender male antennal funicle, with the scape in the female fully as long as the next three joints combined, narrower and more acuminate fifth ventral of the male, and in its entire habitus. The description is drawn from the male, that sex having the abdomen distinctly impressed medially at the base and the fifth segment very feebly impressed and less pubescent toward the middle, with the apex concealed by the long dense fulvous vestiture, the pygidium bristling with long dense hairs as usual. The female is larger, nearly identical in form but with a slightly larger prothorax, the beak $\frac{3}{4}$ as long as the body, the antennæ inserted between basal third and fourth, with the funicle longer and more slender and the club smaller and shorter, and the fifth ventral parabolic and feebly impressed, being also less pubescent at the middle. The vestiture along the elytral suture is more prominent, dense and suberect except toward base.

B. undulatus.—Stout, only moderately convex above, elongate-suboval, dark in color; beak and antennæ rufous, the former piceous toward base; vestiture dense, the scales long and slender, pale ochreous in color, variegated on the elytra with well-defined but broken wavy bands of darker brown. *Head* distinctly less than $\frac{1}{2}$ as wide as the prothorax, the eyes separated by $\frac{2}{3}$ of their own width; beak moderately slender, almost evenly and rather strongly arcuate, not quite as long as the elytra, the antennæ inserted distinctly behind the middle; funicle slender, with the first four joints decreasing rapidly in length, the club elongate-fusiform, densely pubescent, equal in length to the first funicular joint, with the apices of the joints distinctly exposed at the edges. *Prothorax* well developed, $\frac{2}{5}$ wider than long, the sides very feebly convergent and slightly arcuate to apical third, then more rounded, convergent and subsinuate to the apex, which is feebly and angu-

larly sinuate and but little more than ½ as wide as the base; surface densely punctate. *Elytra* but little longer than wide, only slightly more than twice as long as the prothorax and about ⅔ wider, subogival in form, the humeri moderately prominent and exposed; striæ rather coarse, strongly punctured, the intervals nearly flat, moderately broad, rugose. Entire under surface very densely clothed with broader, more decumbent whitish scales. *Legs* moderate in length and femoral dilatation. Length 6.5 mm.; width 3.4 mm.

Arizona.

The type is a male, having the usual large feeble indentation at the base of the abdomen, the fifth segment toward tip and the pygidium bristling with long dense pale hairs, the former prominent at each side near the tip, with the apex concealed but probably truncate. This species may be distinguished from *occidentis* by the more elongate beak, with more posteriorly inserted antennæ and larger prothorax of the male.

B. strictus.—Narrow and elongate-subrhomboidal, rather convex, dark in color, the legs, beak and antennæ rufous; vestiture dense, the scales long and very slender, pale brown in color, paler toward the flanks of the prothorax, in large irregularly subtransverse elytral areas and on the under surface, where they become broader and more decumbent as usual. *Head* rather more than ½ as wide as the prothorax, the eyes separated by ⅗ of their own width, with the interval not distinctly impressed; beak slender, feebly arcuate, rather more so toward tip, ⅔ to ¾ as long as the body, the antennæ inserted a little behind basal third, the scape rather longer than the first three joints of the funicle, which decrease rapidly in length as usual, the club elongate, fusiform and densely pubescent. *Prothorax* relatively small, nearly ½ wider than long, widest at the middle, where the sides are rounded, thence very feebly convergent and slightly arcuate to the base, and much more rapidly convergent and feebly sinuate to the apex, the latter transversely truncate and ⅗ as wide as the base; surface densely punctate. *Elytra* ¼ longer than wide, 2⅖ times as long as the prothorax and very nearly ½ wider, elongate-ogival in form, the humeri moderately exposed and rather prominent; striæ deep and punctured, the intervals flat, rugose and moderately wide. *Legs* moderate in length and femoral dilatation, the femoral tooth very large and conspicuous. Length 5.8–6.7 mm.; width 2.5–3.0 mm.

New Mexico (Las Vegas).

The types before me are females and I have not seen the male; the species can be distinguished at once from any of those allied to *uniformis* by the very large femoral tooth, as described in the table, as well as by the peculiar form of the prothorax. The female has a small and very feeble median indentation at the middle of the fifth ventral.

Two specimens labeled "New Jersey," both males, are placed

with this species for the present; they are evidently shorter and stouter in general form, with the beak about as long as the elytra, but agree in the peculiar ornamentation of the elytra, form of the prothorax and dentition of the femora.

B. longipes.—Moderately stout, thick and elongate-subrhomboidal, rufo-testaceous in color, the beak and antennæ still paler rufous; vestiture extremely dense, consisting of long, slender and pale brownish-ochreous scales, feebly interspersed with slightly paler spots on the elytra and also paler toward the sides of the prothorax, more whitish, broader and dense on the under surface. *Head* nearly ½ as wide as the prothorax, the eyes separated by nearly ¾ of their own width, the interval broadly and feebly concave; beak ⅘ as long as the body, very slender, rather arcuate, more strongly beyond the middle; antennæ inserted somewhat behind basal third, slender, the funicle long, with the first four joints decreasing in length, the club fusiform, densely pubescent and as long as the two preceding joints combined. *Prothorax* well developed, ⅔ wider than long, the sides rather more rounded just before the middle, thence very feebly divergent and slightly arcuate to the base and more strongly convergent and just visibly sinuate to the apex, which is truncate, becoming feebly sinuate at the middle; disk densely punctate. *Elytra* scarcely ¼ longer than wide, nearly 2½ times as long as the prothorax and a little less than ½ wider; humeri rather widely exposed and prominent, the sides thence rather strongly convergent and nearly straight, rapidly subparabolic at tip, with the posterior discal swelling somewhat noticeable; striæ moderate, rather closely punctate, the intervals wide; sutural vestiture rather prominent posteriorly. *Legs* unusually long, the femora moderately dilated, with the tooth very large, its vertical distal edge much longer than the femoral width in continuation of it. Length 6.5–7.0 mm.; width 3.2–3.6 mm.

Colorado (Manitou).

The description is from a female example, the fifth ventral in that sex having a small median concavity which is much less densely clothed. The male is a little smaller but does not differ greatly in form, having the beak distinctly shorter than the elytra, with the antennæ inserted at the middle, the club a little larger and more elongate, the abdomen broadly and feebly impressed at base, and the truncate fifth segment toward the sides and the entire pygidium bristling with long erect hairs.

This species very closely resembles the Californian *occidentis*, but differs in the more prominent femoral teeth, longer legs and beak, more rhomboidal and less oval form, more prominent humeri and several other features.

B. sulcatulus.—Narrowly elongate-oval and strongly convex, dark piceous in color, the legs rufescent, the beak and antennæ rufous; vestiture white, variegated with indefinite subtransverse patches on the elytra, in which

the scales become slightly less slender and very dense ; scales of the pronotum linear and sparse, becoming wider and denser toward the sides, broad and dense on the under surface. *Head* fully ½ as wide as the prothorax, the eyes separated by slightly more than ½ of their own width, the intermediate surface not foveate ; beak slender, straight, becoming gradually feebly arcuate distally, very nearly as long as the elytra and nearly ⅗ as long as the body, the antennæ inserted at basal third, the scape short, not as long as the first three joints of the funicle, the latter decreasing rapidly in length. *Prothorax* moderately developed, scarcely ⅔ wider than long, the sides subparallel, evenly and rather strongly arcuate, becoming more rapidly convergent and then sinuate anteriorly, the apex subtubulate and transversely rectilinear ; surface rather coarsely, densely punctate. *Elytra* more elongate than usual in this section of the genus, ⅓ longer than wide, ⅔ wider than the prothorax, evenly elongate-ogival in form, acute behind, the subapical prominences almost obsolete ; suture slightly prominent toward tip ; humeri narrowly exposed and rounded ; striæ coarse, deep and punctate, ½ as wide as the intervals, the latter flat and rugose. *Legs* rather short, the femora only feebly inflated. Length 5.2 mm. ; width 2.4 mm.

New Mexico (Las Vegas).

This small species is allied structurally to *uniformis* by the insertion of the antennæ, but is placed in the present subsection because of the very short beak ; it is however quite isolated and distinct. The fifth ventral of the female, which is the only sex known to me, is broadly parabolic, and is scarcely visibly impressed and not differently clothed toward the middle. In the female of *uniformis* the abdomen is clothed with narrower scales toward tip and the fifth segment is deeply indented, the size, also, being much larger ; in addition to this the beak is as long as the elytra, and the elytral intervals four or five times as wide as the striæ.

B. brevirostris.—Stout, strongly convex and subrhomboidal, blackish in color, the legs rufescent; beak and antennæ rufous; vestiture consisting of long slender scales, dense and concealing the integuments, pale luteous-brown in color, with but feeble vestiges of variegation on the elytra. *Head* not quite ½ as wide as the prothorax, the eyes separated by fully ¾ of their own width, the interval flat, densely punctured but not medially foveate; beak very short, scarcely more than ½ as long as the body, somewhat stout, straight, becoming feebly arcuate toward tip, distinctly punctured toward base, the antennæ inserted near basal ⅖, the funicle rather slender, with the three basal joints decreasing rather rapidly in length, the club well developed. *Prothorax* relatively rather large, ⅔ wider than long, the sides broadly and almost evenly arcuate and feebly convergent from the base almost to the apex, where they become feebly sinuate; apex feebly, subangularly emarginate; surface densely punctate, the punctures largely coalescent sublongitudinally. *Elytra* slightly longer than

wide, subtriangular with feebly arcuate sides, the subapical swellings distinct; humeri rounded, very moderately exposed and scarcely prominent; striæ moderately fine, punctured. *Legs* rather short, the femoral enlargement moderately strong, the teeth rather well developed but with the distal slope oblique. Length 6.3–6.5 mm.; width 3.2 mm.

New Mexico (Las Vegas).

The type described above is a female, in order to better compare the species with those closely related. The male is a little shorter, with the prothorax relatively smaller, and the humeri more exposed and prominent; the beak is scarcely shorter than in the female, $\frac{1}{2}$ as long as the body, more strongly and evenly arcuate, more punctured and carinate above toward base and with the antennæ inserted at apical $\frac{2}{5}$; the abdomen is broadly impressed at base toward the middle, and the fifth segment is sinuato-truncate at tip.

This species is evidently allied to *obtusus*, but differs in its smaller size, less obese form, relatively larger prothorax of the female, narrower and less broadly oval dense scutellar cluster of squamules, less variegated vestiture and in numerous other characters.

B. monticola.—Elongate-suboval, strongly convex, black, the legs feebly rufescent; beak and antennæ rufo-piceous; vestiture dense, consisting of rather broad whitish scales, variegated with browner patches on the elytra, a transverse band of whitish near apical third more conspicuous, the scales narrower and brownish on the pronotum, where they are arranged transversely as usual, broader and paler beneath. *Head* $\frac{1}{2}$ as wide as the prothorax, the eyes separated by $\frac{3}{4}$ of their own width, without distinct intermediate puncture, the beak scarcely more than $\frac{1}{2}$ as long as the elytra, moderately stout, arcuate distally, the antennæ inserted slightly behind the middle, the scape nearly as long as the first four joints of the funicle, the latter decreasing in length; club moderate in size, rather stout. *Prothorax* well developed, scarcely $\frac{2}{5}$ wider than long, the sides subparallel and broadly arcuate to near apical third, then more rapidly rounded and convergent, becoming sinuate near the apex, the latter subtubulate, truncate, feebly sinuate at the middle; surface densely punctate. *Elytra* not $\frac{1}{4}$ longer than wide, rather more than $\frac{2}{5}$ wider than the prothorax, subogival in form, the subapical prominences moderate; humeri moderately exposed and rounded. *Legs* and femoral dilatation moderate. Length 6.5 mm.; width 3.2 mm.

Colorado (Colorado Springs). Mr. Wickham.

The only specimen known to me is a female, the fifth ventral being triangular in form and with a pronounced medial indentation toward tip. This species is allied somewhat to *obtusus* and

brevirostris, but differs from the former more especially in its much less obese form, and from the latter in its much more variegated vestiture; from both it differs in its rather more subtubulate apex of the prothorax and in the indentation of the fifth ventral segment of the female.

TYCHIINI.

TYCHIUS Schönh.

The minute species constituting subgenus IV, as previously defined by me, are becoming known in considerable number; they inhabit the dry and barren regions of the southwestern United States. The three following are to be added to those previously defined (Col. Not. IV, p. 420):

T. sulcatulus n. sp.—Oblong-oval, moderately convex above, black, the legs feebly picescent, the beak feebly rufo-piceous toward tip; body densely clothed with a crust of large, rounded and concave scales, which are wanting in certain areas on the elytra, especially on intervals two to four, where they are replaced by narrower and rather brownish scales, a small transverse median spot of large scales behind the middle, involving the second interval, excepted; scales sometimes becoming brownish also at each side of the middle line of the pronotum, more broadly toward base, the elytral intervals also with distant scales which are suberect. *Head* and beak densely incrusted with whitish scales, glabrous but still somewhat rugose toward tip, rather strongly tapering throughout, the antennæ inserted at or beyond the middle. *Prothorax* twice as wide as the head, $\frac{1}{3}$ to $\frac{2}{5}$ wider than long, the sides moderately convergent and arcuate from base to apex, feebly sinuate behind the latter, which is truncate and fully $\frac{3}{5}$ as wide as the base; punctures concealed, dense. *Elytra* rather short, about $\frac{1}{3}$ longer than wide, $2\frac{1}{2}$ times as long as the prothorax and $\frac{1}{2}$ wider, the sides parallel and nearly straight, broadly rounded behind; humeri distinctly exposed and rounded; striæ very coarse, deep and sulciform, strongly punctured, the intervals feebly rugose, alternately narrow and much wider. *Legs* short and stout, densely squamose, the scales of the femora large and rounded. Length 1.5–1.7 mm.; width 0.65–0.75 mm.

Texas (Brownsville—Pt. Isabel). Mr. Wickham.

A small maritime species, remarkable in having the elytral striæ coarse and deep and alternating in distance asunder. The sexual differences do not seem to be very marked in the large series in my cabinet. It may be placed near *simplex*.

T. inermis n. sp.—Oval, strongly convex, piceous-black, the integuments densely clothed with long slender decumbent scales, whitish in color but variegated with large confused areas of darker brown, whitish toward the sides and along the median line of the pronotum, larger, broadly oval and

nearly white beneath, without trace of erect scales or setæ. *Head* and basal parts of the beak densely squamose; beak stout toward base, the portion beyond the antennæ rapidly narrower, polished and glabrous, as long as the head and prothorax, a little shorter and stouter in the male, the antennæ inserted at the middle in the female and at apical $\frac{2}{5}$ in the male, the first funicular joint longer than the next two combined, especially in the male, and much stouter. *Prothorax* more than $\frac{2}{5}$ wider than long, $2\frac{1}{2}$ times as wide as the head, the sides strongly convergent, strongly and almost evenly arcuate from base to apex, minutely sinuate just behind the latter; punctures not wholly concealed, circular, moderate in size, nearly in mutual contact but not crowded. *Elytra* neatly $2\frac{1}{2}$ times as long as the prothorax and about $\frac{2}{5}$ wider, $\frac{2}{5}$ longer than wide, the sides parallel and feebly arcuate; apex broadly obtuse; humeri slightly exposed and oblique; striæ rather fine, strongly punctate, the intervals feebly convex, slightly rugose, with the scales disposed closely and irregularly. *Legs* rather short and stout. Length 1.7–2.0 mm.; width 0.8–0.9 mm.

Texas (Brownsville). Mr. Wickham.

This species is to be placed near *mica*, but is slightly larger and more elongate, with narrower squamules, and differs besides in the larger first funicular joint of the male. It is represented before me by a large series.

T. transversus n. sp.—Oblong, strongly convex, blackish, the legs and beak rufous; body clothed throughout with a very dense crust of large, broadly rounded, non-strigose and overlapping scales, which conceal the integuments, the scales whitish and of various shades of brown, the white scales more evident toward the sides and mid-basal regions of the pronotum, in a large sutural spot before the middle of the elytra and in an almost entire straight transverse band near apical third, the elytral striæ evident merely as fine lines separating the single or partially double lines of scales, the intervals bearing single series of widely separated and very long, erect bristles, which are strigose and uniformly tapering from base to their acute apices. *Head* and beak clothed with the dense indument of scales, with erect sparse spinules irregularly disposed; beak short, very rapidly tapering, not longer than the prothorax, the antennæ inserted at the middle, the portion beyond the antennæ glabrous and shining. *Prothorax* nearly as long as wide, the sides parallel and nearly straight to near apical fourth, then rounded and converging for a short distance to the broadly tubulate apex, the latter broad, truncate, $\frac{2}{3}$ as wide as the base; sculpture entirely concealed, the bristles sparse, much shorter than those of the elytra. *Elytra* rather short, scarcely $\frac{1}{3}$ longer than wide, more than twice as long as the prothorax and $\frac{3}{5}$ wider; sides parallel and nearly straight; apex broadly and obtusely subangulate from above; humeri quite widely exposed at base and rather narrowly rounded; surface entirely concealed. *Legs* short, densely squamose. Length 1.3 mm.; width 0.6 mm.

Arizona (Tucson).

This species is allied to *setosus*, but differs in its much longer erect bristles, denser and more uniform crust of scales, pattern of ornamentation, and many other less prominent characters. Three specimens.

SIBINIA Germ.

The following species seems to be congeneric with *fulva*, but is very much smaller and more narrowly oval, and has the scutellum concealed, as in the European *primita*, which it considerably resembles in outline.

S. ochreosa n. sp.—Oval, strongly convex, dark rufo-piceous in color, the beak and legs pale; integuments densely clothed above with moderately elongate, closely decumbent, uniformly bright ochreous-yellow scales, the scales denser and more prominent by superposition along the median parts of the elytral intervals, but without isolated suberect squamules, the scales of the under surface whitish and much broader, forming a dense crust. *Head* and basal parts of the beak densely squamulose as usual, the beak distinctly shorter than the head and prothorax in both sexes, differing but little sexually, rapidly tapering, polished and glabrous beyond the antennæ, the latter inserted at the middle in the female and just beyond that point in the male, short and stout in both, the scape relatively shorter and the club smaller in the female. *Prothorax* about 2½ times as wide as the head, ½ to ⅗ wider than long, the sides strongly convergent and almost evenly arcuate from base to the feeble apical sinuation; apex rather less than ⅗ as wide as the base; punctures concealed, moderate in size and depth and polygonally crowded. *Elytra* rather short, oval, less than 2½ times as long as the prothorax and not more than ⅖ wider; sides parallel, distinctly and evenly arcuate, the apex broadly obtuse, the apices individually rounded; humeri obliquely rounded and not exposed at base; striæ moderate in width, shallow, with deep and somewhat widely separated punctures, each of which bears a long slender and decumbent hair-like squamule. *Legs* short and stout, rather densely squamulose. Length 1.4–1.6 mm.; width 0.65–0.75 mm.

Texas (Brownsville). Mr. Wickham.

Resembles *Tychius sibinioides*, but with the beak shorter and the scales of the upper surface shorter and denser, without semierect squamules along the intervals.

ZYGOPINI.

The generic characters of this tribe were only superficially outlined by LeConte in the "Rhynchophora of America North of Mexico," and Zygops had not been discovered within our territories at that time. Psomus, allied to Acoptus, has also been added recently. Another statement of the genera occurring

in the United States would therefore seem to be desirable. It is quite evident that none of our genera, except Zygops, can be held to be identical with the tropical groups defined by Schönherr; I have therefore regarded them as different in the following table and have assigned new names to the Piazurus and Copturus of LeConte:—

Pygidium large, vertical and exposed, the axial line of the abdomen nearly straight; mesosternum vertical, the side-pieces not obliquely truncating the elytral humeri; eyes very approximate on the front; antennal club well developed, very densely pubescent, with the basal joint moderate in size; four anterior femora minutely, the posterior strongly, toothed beneath; species moderately large in size.....**Zygops**

Pygidium completely concealed by the elytra.

Abdomen rapidly ascending toward tip.

Mesosternum excavated for the reception of the tip of the beak, the mes-epimeron obliquely truncating the elytral humeri; eyes narrowly separated; antennal club rather well developed, feebly pubescent, strongly annulate, the basal joint constituting ½ of the entire length; femora minutely and subequally toothed beneath; body small in size....**Gelus**

Mesosternum not excavated, the beak free at tip; mes-epimeron narrowly and feebly truncating the humeri obliquely; femora without trace of tooth.

Eyes widely separated on the front; antennal club large, elongate-oval and well developed, pubescent and strongly annulated, the basal joint constituting ⅔ of the entire length; vestiture nearly as in Copturodes; body moderately small.....**Gyrotus**

Eyes narrowly separated or subcontiguous on the front.

Antennal club well developed, distinctly though not very densely pubescent, strongly annulated, the basal joint constituting scarcely ½ of the entire length; scales of the vestiture broadly oval and non-strigose; species small or moderately small in size....**Copturodes**

Antennal club very small, elongate-oval and subglabrous, becoming pubescent at tip, feebly annulated, the basal joint constituting much more than ½ of the mass; ornamental scales elongate and strigose; species very small in size .....**Zygomicrus**

Abdomen horizontal throughout; eyes approximate on the front; elytral humeri not obliquely truncated.

Beak free throughout, the prosternal channel narrow and subobsolete; antennæ stout, the club well developed; femora minutely and equally toothed beneath; body moderately small, densely squamose and with coarse elytral striæ.....**Acoptus**

Beak not quite free, the prosternal groove well defined though shallow and serving as a partial shelter in repose; antennæ very slender, the club small; femora not toothed; body very small and convex, subglabrous above, with widely exposed humeri, the elytral striæ fine....**Psomus**

The few species assigned to Piazurus by LeConte do not belong to the Piazurides of Lacordaire at all, but to the Lechriopides, the mesosternal canal being closed behind and not open in the form of a gutter, as it is in the much larger and broadly rhomboidal Piazurus; that genus differs moreover in its elongate third joint of the antennal funicle and very strongly toothed femora. The genus Gelus, which I have proposed above for *oculatus* and *californicus*, is very closely allied to Lechriops, as shown by a Brazilian representative of the latter before me, but differs in having the abdominal sutures two to four strongly reflexed at the sides, only the second being affected in Lechriops in its much shorter and stouter legs and in its non-contiguous eyes. The *Piazurus subfasciatus* of LeConte, should be reëxamined with a view to determining more fully its generic affinities; it may possibly prove to be non-associable with *oculatus*, and is not represented in my cabinet at present.

The multitudinous small and minute Brazilian species will form numerous genera, and the eleven now before me seem to show that it will be impossible to maintain the groups laid down by Lacordaire. There are several distinct genera at present confused under the name Copturus, intimated indeed by that author.

GYROTUS n. gen.

The single representative of this genus differs considerably in facies from those of Copturodes, because of the coarse punctures of the elytral striæ, widely separated eyes and acutely prominent post-ocular processes of the prothorax; it may be described as follows:—

G. munitus n. sp.—Cylindric-oval, convex and moderately stout, black throughout, the tibiæ, beak and antennæ rufescent; body clothed throughout with a dense crust of large, rounded and non-strigose scales, whitish toward the sides of the prothorax, more narrowly toward base, on the entire under surface and in a few widely scattered, somewhat elevated or thickened clusters on the elytra, also in a large spot at the middle of the elytral flanks; elsewhere dark grayish in color. *Head* well developed, the eyes finely faceted, rather large, separated on the front above by their own width and by much more below, the inner margins feebly arcuate and strongly divergent downward throughout, the interocular surface with a large deep central fovea; beak stout, squamose at base, glabrous and coarsely punctato-rugose thence to the apex, the latter moderately dilated; antennæ moderately slender, inserted behind the middle, the four basal joints of the funicle decreasing uniformly and rather rapidly in

length, the club much longer than the four preceding joints combined, elongate-oval, with its three joints decreasing slowly and regularly in length. *Prothorax* about as long as wide, the sides parallel and nearly straight, with a broadly rounded and slightly prominent swelling near apical third, the sides thence deeply sinuate and oblique to the broadly subtubulate and sinuato-truncate apex; the flanks produced obliquely outward at apex in an acute corneous process behind the lower part of the eyes; sculpture concealed, but coarsely and densely punctate, the darker scales deeply concave. Scutellum small. *Elytra* scarcely more than ⅓ longer than wide, ½ longer than the prothorax and only very slightly wider; humeri not prominent; apex as in Copturodes; striæ consisting of series of very large, rounded and almost contiguous but scarcely united punctures. *Abdomen* rapidly ascending at tip, the first two segments very large as in Copturodes, the third with a small feeble cuspiform median tooth. *Legs* nearly as in Copturodes, densely squamose. Length 4.0 mm.; width 1.6 mm.

Southern California.

The sex of the single specimen before me cannot be determined at present.

COPTURODES n. gen.

This genus differs from Copturus in its less rhombiform body, less unequal first and second funicular joints and completely unarmed femora. The species are numerous within the United States and possibly extend somewhat into Mexico, but probably not much further to the southward; those known to me may be thus distinguished among themselves :—

Body rather stout, the elytra distinctly less than ½ longer than wide.....2
Body elongate and more narrowly subcylindric-oval, the elytra ½ longer than wide or more, always very densely clothed with scales which are usually smaller, the integuments entirely concealed.....8
2—Second ventral segment with two suberect prominences at the apical margin; size large.....**mammillatus** Lec.
Second ventral segment simple.....3
3—Body clothed throughout with large overlapping scales which conceal the entire surface.....4
Body clothed throughout above with large scales which are not mutually contiguous, except in certain small condensed spots and lines, which, on the elytra, form in general two posteriorly arcuate transverse series which are frequently barely traceable.....6
Body very unevenly clothed above, the elytra with small and rather sparse dark and inconspicuous squamules, which are closely decumbent as usual, the pattern of broad white condensed scales more distinctly defined, forming, when complete, the usual two transverse and posteriorly arcuate series; body quite stout.....7

4—Elytra each with a large and abruptly defined dark brown spot. **binotatus** Lec.

Elytra without well-defined dark maculation 5

5—Ground scales of the elytra more or less pale brown or ochreous in color.

Scales of the pronotum more elongate and more distinctly subradial in arrangement from a point on the median line behind the middle ; white pattern of the elytra very obscure .....**cockerelli** n. sp.

Scales of the pronotum shorter and more broadly rounded.

White scales of the elytra chiefly conspicuous in a broad sutural vitta extending from the apex nearly to the base.....**suturalis** n. sp.

White scales of the elytra forming a more distinct pattern, consisting of two uneven posteriorly arcuate transverse series, the sutural vitta always very short.....**adspersus** Lec.

Ground scales of the elytra dark brown in color, with an obscure pattern of pale dots forming the usual two transversely arcuate series. California. **koebelei** n. sp.

6—Inner marginal lines of the eyes very feebly diverging toward their superior limit ; size large, the darker scales of the elytra smaller in size. **missourianus** n. sp.

Inner marginal lines strongly diverging upward ; scales of the elytra virtually uniform in size.

Size large, 3 mm. or more in length.....**operculatus** Say

Size moderate or small, much under 3 mm. in length.

Scales of the elytra almost uniformly white, the condensed spots rather obscurely defined.

Pronotum coarsely punctate ; form noticeably stout.....**sparsus** n. sp.

Pronotum much less coarsely and more densely punctured ; form less stout than in *nanulus* ; size very small.....**floridanus** n. sp.

Scales of the ground of the elytra dark brown, the pale condensed spots much more distinct ; the usual short sutural vitta joining the two transverse series especially developed .....**nanulus** Lec.

7—Posterior offset of the sutural white spot transverse ; pronotal scales rather small toward the middle ; striæ coarse. .....**quercus** Say

Posterior offset posteriorly and outwardly oblique.

Median scales of the pronotum large and rounded ; striæ coarse. **frontalis** n. sp.

Median scales of the pronotum very small, narrow and linear ; striæ quite fine, the subapical umbones much more pronounced....**cavifrons** n. sp.

8—Elytral scales pale, with an oblique lunule on each from the humeri to behind the middle, there curving forward and meeting on the suture at the middle, of dark brown. California.....**lunatus** Lec.

Elytral scales dark, with obscure and ill-defined pale markings.

Eyes most approximate at the middle of the interocular surface. California.

Larger species, more than 3 mm. in length.

Upper internal margins of the eyes more strongly divergent, the front at their superior limit about twice the minimum width wide. **nubilatus** n. sp.

Upper internal margins very feebly divergent, the eyes at their superior limit much less than twice as widely separated as at the point of minimum frontal width.....**mucidus** n. sp.
Very small species, 2.3 mm. in length.....**longulus** Lec.
Eyes most approximate at a point below the middle of the front.
Eyes at their upper limit separated by less than twice the minimum width of the front.....**subcupreus** n. sp.
Eyes at that point separated by twice the minimum width of the front or more.
Point of minimum separation of the eyes only slightly below the middle of the front.....**obscurellus** n. sp.
Point of minimum separation at or below lower fourth, where they become almost subcontiguous.....**dispersus** n. sp.

In this table the characters relating to the eyes of *longulus* are assumed, as no mention of their form is made in the original description. As far as I have been able to discover, the general form and mutual separation of the eyes are affected but slightly by the sex of the individual, and this seems to be the case also in all the tropical species which I have studied.

Minutus Lec. is not included in the table, as it must form a distinct genus because of the structure of the scales which clothe the body, and on account of peculiarities of antennal structure. *Mammillatus* is the largest and finest species of the genus, readily recognizable by its stout form and the large subquadrate blotch of white scales at each side of the base of the pronotum. The new species of the table are described below in order.

C. cockerelli.—Densely clothed throughout with large decumbent scales of a uniform pale ochreous-yellow color, becoming largely white at the sides of the prothorax, and broadly along the elytral suture, with two transverse series of indefinite white blotches curving forward externally, the anterior attaining the humerus; under surface and legs clothed throughout with large white scales. *Head* and basal parts of the beak densely clothed with white scales; inner margins of the eyes strongly, evenly arcuate, the eyes most approximate at about the middle of the front and there separated by $\frac{2}{5}$ of their own width; beak coarsely but not densely punctured; antennal club well developed, oval, pointed, about as long as the four last joints of the funicle, minutely pubescent, with its first joint constituting about $\frac{2}{3}$ of the mass. *Prothorax* slightly shorter than wide, rather abruptly narrowed and broadly subtubulate at apex, the sides feebly bisinuate; sculpture entirely concealed. *Elytra* rather more than $\frac{2}{5}$ longer than wide, but little wider than the prothorax and $\frac{1}{5}$ longer; striæ concealed but marked by a series of conspicuous narrow pointed scales lying in the level of the general crust. Length 3.4 mm.; width 1.4 mm.

New Mexico (Las Cruces).

A single specimen was kindly communicated by Mr. T. D. A. Cockerell, in whose name it gives me pleasure to dedicate a distinct and interesting addition to the genus.

C. suturalis.—Suboval, densely clothed throughout above with large pale brown scales, becoming white in a fine median line and broader vitta at each side of the pronotum, broadly along the elytral suture, more narrowly or obsoletely toward base and sparsely and irregularly in an oblique region extending from the humeri to the suture near apical third; under surface and legs densely clothed with white scales, feebly intermingled with pale brown. *Head* and basal parts of the beak densely clothed with white scales, the eyes well separated, the point of minimum distance asunder being at or somewhat below the middle of the front, where they are separated by about ½ of their own width. *Prothorax* slightly shorter than wide, the sides subparallel and biarcuate, abruptly rounded and convergent anteriorly to the broadly subtubulate apex; sculpture entirely concealed, the scales much smaller and less elongate than in *cockerelli*. *Elytra* nearly as in *cockerelli* and *adspersus*, but more distinctly sinuate at the sides near basal third than in the former. Length 2.5–2.8 mm.; width 1.0–1.2 mm.

Utah (southwestern—Mr. Weidt); Arizona.

A rather small species allied to *cockerelli*, but differing in the conformation of the eyes, these being more widely separated and with the inner margins more abruptly and widely diverging inferiorly, and with their upper angle much less obtuse. In *adspersus* the eyes are nearly as in *cockerelli* but somewhat more narrowly separated and with their inner margins still more strongly arcuate. Of *adspersus* I have before me a very large series taken at Austin, Texas; it also occurs in Colorado and Arizona.

C. koebelei.—Stout, oblong-oval, moderately convex above and clothed densely with large dark brown scales, becoming white at the sides of the prothorax and in two transverse arcuate series of small spots on the elytra; scales dense and almost uniformly white on the under surface. *Head* deeply excavated above between the eyes, the latter separated by about ⅔ of their own width, with the point of minimum distance asunder rather below the middle; beak somewhat rugosely sculptured. *Prothorax* not quite as long as wide, somewhat abruptly narrowed and rounded anteriorly to the broadly subtubulate apex; sides parallel and feebly bisinuate; surface very densely and rather coarsely cribrate. *Elytra* ⅔ longer than wide, ⅓ wider than the prothorax and ⅘ longer; striæ rather coarse and strongly punctured, not entirely concealed by the vestiture, the squamules of the strial punctures rather slender. Length 3.5 mm.; width 1.5 mm.

California (Siskiyou Co.). Mr. Koebele.

The single example before me is in very poor state of preserva-

tion, the scales being largely denuded throughout the body and legs, but, from the small patches remaining, it is certain that well preserved specimens will prove to be densely squamose throughout.

C. missourianus.—Stout, elongate-suboval, black, the scales separated except in the condensed areas, the latter having the scales pale in color, especially evident broadly along the elytral suture and unevenly toward base, also in some small areas subtransversely arranged behind the middle, the scales elsewhere on the elytra small, oval, dark in color and widely separated, the scales of the pronotum large and rounded, each filling one of the coarse, deep and slightly separated punctures. *Head*, basal parts of the beak, entire under surface and legs densely clothed with whitish scales; beak finely, sparsely punctured and glabrous beyond the point of antennal insertion; second joint of the funicle longer than the next two combined. *Prothorax* subconical, not quite as long as wide, the sides feebly convergent and nearly straight almost to the apex, then a little more rounded and convergent to the apex, which is broadly sinuato-truncate and not at all tubulate; surface within the densely squamose flanks coarsely and not very densely punctured, with a short impunctate median line. *Elytra* short and broad, $\frac{1}{3}$ longer than wide, $\frac{3}{4}$ longer than the prothorax and $\frac{2}{5}$ wider, the humeri rather prominent; sides rapidly convergent and rounded behind to the apical prolongation; striæ rather coarse, the squamules slender, broader in the areas of condensation. Length 3.8 mm.; width 1.75 mm.

Missouri (St Louis). Mr. Soltau.

This species, described above from the female, is about as large as *operculatus* and greatly resembles it, but is stouter, with the prothorax more sparsely punctured and more conical, the sides being less arcuate. The squamulation of the elytra is still more uneven. Of *operculatus* I have specimens before me from Dakota, Kansas and Iowa.

C. sparsus.—Stout, oval, rather strongly convex, the body and legs deep black throughout; scales pure white, oval, rather sparse except in a sublateral pronotal vitta and in some small nubilate condensed spots disposed in the usual two posteriorly arcuate series on the elytra; scales of the pronotum moderately large, broadly rounded, each filling one of the large separated punctures, those of the under surface not quite contiguous. *Head* and basal parts of the beak rather densely squamose, the eyes separated at lower third by about $\frac{1}{4}$ of their own width; beak finely punctulate, black, polished and glabrous beyond the point of antennal insertion. *Prothorax* $\frac{2}{5}$ wider than long, the sides subparallel, distinctly but somewhat unevenly arcuate, oblique and feebly sinuate at the apex, the latter broadly sinuate and not at all tubulate; punctures coarse and deep. *Elytra* short, $\frac{1}{3}$ longer than wide, nearly twice as long as the prothorax and $\frac{1}{3}$ wider, the sides quite arcuate; humeri not at all exposed at base, the humeral callus moderately prominent; pos-

terior umbones feeble; striæ moderately coarse, the squamules of the strial punctures narrow. Length 2.75 mm.; width 1.25 mm.

Southern Louisiana. Mr. Soltau.

Allied to *operculatus* but smaller and relatively more obese, with the punctures and scales sparser, the prothorax much shorter and the eyes more narrowly separated. The scales of the elytra are more conspicuous along the narrower intervals toward base. The type is probably a male.

C. floridanus.—Only very moderately stout, elongate-oval and convex, deep black throughout, the tibiæ and tarsi rufescent; scales relatively large, white, dense in the condensed areas, pale brownish elsewhere, largely brownish at each side of the median line of the pronotum; white condensations of the elytra linear and very indistinct, the arrangement scarcely discernible but conforming to the general type prevailing in the genus. *Head* and basal parts of the beak densely albido-squamose, the eyes at lower third separated by but little more than ¼ of their own width. *Prothorax* not quite as long as wide, rather wider at apical third than at base, the sides feebly biarcuate, more convergent and sinuate at the apex, which is feebly sinuato-truncate and scarcely subtubulate; punctures only moderately coarse and distinctly dense. *Elytra* ⅖ longer than wide, ¾ longer than the prothorax and scarcely more than ¼ wider; striæ moderately coarse, punctured, the squamules rather stout. Length 2.0 mm.; width 0.8 mm.

Florida (Haw Creek). Hubbard and Schwarz.

A small species, unusually narrow for this section of the genus and allied to *nanulus*, but differing in the extremely confused ornamentation, smaller size and narrower form. Two specimens.

Of *nanulus*, I have before me a large series from Iowa, Ohio, Kentucky, North Carolina and Maryland; it varies much in the distinctness of the pale markings of the elytra, and, as usual, these seem to be more sharply defined in the females than in the males. The prothorax varies much in length and strength of the lateral biarcuation, and it is possible that I may confound some distinct species together, but the subject is too difficult to pronounce upon in the absence of full and carefully collected series.

C. frontalis.—Stout, suboval, moderately convex, deep black throughout, the entire under surface and sides of the prothorax densely clothed with large white scales, the flanks of the prothorax anteriorly more sparsely and irregularly so; white scales also evident on the median line of the pronotum toward base, and, on the elytra, toward base and scutellum, in a short line on the second interval behind the middle with an oblique posterior offset composed of short lines on the third and fourth intervals, and in a few obscure discal spots elsewhere; the scales of the elytra are rather large but separated,

deep brown in tint and inconspicuous, those of the pronotum large, rounded and brown, each filling one of the coarse punctures. *Head* and basal parts of the beak clothed with white scales, except the deep frontal depression between the diverging upper parts of the eyes, which is clothed with slender brown scales; eyes separated at lower third by fully ⅓ of their own width. *Prothorax* slightly shorter than wide, the sides subparallel, broadly sinuate at the middle and slightly narrowed at base, oblique and sinuate at apex, the latter broad and very feebly sinuate; punctures coarse, deep and contiguous. *Elytra* fully ⅔ longer than wide, ⅘ longer than the prothorax and nearly ⅔ wider, the humeral callus rather prominent; subapical umbones moderate; striæ abruptly defined, coarsely punctate at the bottom, not quite as wide as the flat intervals. *Legs* moderate, the femora densely clothed with blackish scales, with a large spot of white above at the base and another, smaller, near the apex. Length 2.6–2.9 mm.; width 1.1–1.25 mm.

Indiana.

Allied to *quercus*, but differing in its less obese form and in peculiarities of ornamentation mentioned in the table, also in the much larger and more rounded scales of the pronotum. Of *quercus* I have specimens from Illinois, Indiana and District of Columbia.

C. cavifrons.—Stout, suboval, convex, deep black throughout, densely clothed beneath and on the flanks of the prothorax, except anteriorly, with large white scales, also on the median line of the pronotum at base and apex, in the sutural region of the elytra to just behind the middle, where the offset forming part of the posterior transverse series is oblique; externally, there are isolated spots of white forming the two vague, posteriorly arcuate series prevailing throughout the genus; pronotum elsewhere clothed with slender dark squamules, the ground of the elytra similarly clothed with dark scales which are narrow, oval and inconspicuous; lower parts and extreme upper point of the front and base of the beak clothed with white scales, the deep excavation between the upper subsinuous inner margins of the eyes, and also the occiput, in large part clothed with dark and inconspicuous squamules; eyes separated at lower third by distinctly less than ⅓ of their own width. *Prothorax* relatively small, not as long as wide, the sides parallel, feebly sinuate at the middle and obliquely sinuate at apex for a short distance, the apex moderately broadly subtruncate; punctures moderately coarse and rather crowded, transversely oval in form. *Elytra* with rather arcuate sides, fully ⅔ longer than wide, nearly twice as long as the prothorax and fully ⅔ wider, the humeri rather exposed, obliquely rounded; subapical umbones large and conspicuous; striæ not very coarse, abrupt, rather closely punctate along the bottom, very much narrower than the flat intervals. *Legs* rather slender; femora clothed with dark squamules in apical half, with a white subapical spot. Length 2.5–2.9 mm.; width 1.1–1.35 mm.

Kentucky (Frankfort). Mr. Soltau.

This species is allied to the preceding, but may be known by

its finer elytral striæ, and very small and narrow squamules of the median parts of the pronotum and much more prominent subapical umbones of the elytra. Three specimens.

C. nubilatus.—Elongate, suboval, convex, the integument completely concealed by a dense crust of moderately large, widely overlapping scales, which are in general dark coppery-brown in color above, becoming whitish in irregular spots toward the sides and apex of the pronotum and especially at base, also in the middle at base and dispersed in a rhombiform discal spot; on the elytra the pale scales are mingled with brown in a generally oblique area embracing the base and extending to the suture at the middle, and in a less oblique band behind the middle, which is interrupted at the suture; under surface and legs densely clothed with whitish scales, interspersed with violaceous brown. *Head* and base of the beak densely clothed with whitish scales speckled with brown, the eyes at lower third separated by less than ¼ of their own width; beak rather slender and elongate, glabrous and smooth beyond the point of antennal insertion; second joint of the funicle as long as the first and much longer than the next two combined, the club well developed, rather sparsely clothed with short hairs as usual. *Prothorax* nearly as long as wide, widest and broadly rounded just behind the middle, the sides gradually convergent and straight or very feebly bisinuate thence to the apex, which is broadly sinuate; sculpture completely concealed, the scales feebly convex, broadly overlapping and not impressed. *Elytra* fully ½ longer than wide, ⅖ longer than the prothorax and ⅓ wider, a distinct reëntrant angle between the sides of the prothorax and narrowly rounded humeri; sides broadly arcuate; subapical umbones moderate; striæ concealed; scaly crust of the intervals slightly convex. *Legs* moderately slender. Length 3.25 mm.; width 1.25 mm.

California (Monterey).

A single specimen was shaken from the blossoming branches of *Pinus insignis*, early in February. This representative is without doubt the female.

C. mucidus.—Elongate-oval, convex, densely covered throughout with a thick crust of overlapping scales, which, in general, are moderate in size and broadly rounded in form, dark cupreous in color, but largely intermingled with white beneath and on the legs, densely white also toward the base of the pronotum sublaterally and at the middle, also feebly interspersed with white on the disk, and, on the elytra, more largely white in an oblique area from the humeri nearly, but not quite, to the suture before the middle, which area is united by a longitudinal median region on each with a posterior, less oblique and more fully white area from the sides to a little within the middle; subapical regions also speckled with white scales. *Head* clothed largely with cupreous scales at the sides, the eyes at lower third separated by fully ¼ of their own width; beak elongate, glabrous except at base, and deep black. *Prothorax* nearly as long as wide, subconical, the sides feebly convergent and

broadly arcuate from base to apex, straighter or feebly sinuate at about the middle; apex broadly sinuate; cupreous scales broadly overlapping and strongly impressed along their median lines; where denuded the surface is seen to be deeply and moderately coarsely cribrate. *Elytra* ½ longer than wide, nearly twice as long as the prothorax and ⅓ wider, the sides broadly arcuate; subapical umbones rather feeble; striæ concealed, the scaly crust feebly convex along the intervals. Length 3.4 mm.; width 1.35 mm.

California (Siskiyou Co.).

This species is allied to *nubilatus*, but may be distinguished by a somewhat different pattern of elytral ornamentation, conformation of the front between the eyes, less obtuse upper angles of the eyes and other characters. The type is probably a male.

C. subcupreus.—Narrowly cylindric-oval, convex, covered throughout with a dense crust of moderately large, widely overlapping, dark cupreous scales becoming largely white beneath, at the base of the beak and toward the base of the femora, with some scattered white scales on the head and pronotum with a larger spot near each side of the base of the latter, also with a few widely scattered spots of white scales on the elytra, the more distinct of which are one just behind the humeral callus and two, placed obliquely, on each behind the middle. *Head* moderate in size, the eyes separated at lower fourth by scarcely ¼ of their own width; second funicular joint as long as the next two combined. *Prothorax* distinctly shorter than wide, the sides subparallel, becoming abruptly oblique and sinuate for a short distance at the apex, the latter broadly sinuate; sculpture entirely concealed, the scales impressed along their median lines. *Elytra* barely ½ longer than wide, ⅕ longer than the prothorax and scarcely ¼ wider, the sides nearly straight; apex very broadly obtuse; humeri but slightly prominent; subapical umbones distinct; striæ concealed, the scaly crust very convex along the intervals. Length 2.2 mm.; width 0.8 mm.

Massachusetts.

A small species, allied in general constitution and nature of the scaly crust, to the larger Californian forms which precede. The single type before me seems to be a male, but sexual differences are very slight and scarcely recognizable in this part of the genus.

C. obscurellus.—Elongate and cylindric-oval, convex, densely clothed throughout with a thick crust of moderately large, broadly rounded, widely overlapping scales, which are dark chocolate-brown above, with a slight sprinkling of white on the pronotum and white near the sides toward base but only very minutely at the middle of the base, also sparsely interspersed with white almost throughout the elytra, but especially in a dense spot just behind the humeral callus, and in a transverse, posteriorly arcuate, narrow and almost continuous band near apical third; under surface, base of the beak and basal

parts of the femora densely clothed with white scales, only sparsely intermingled with isolated brown scales and solely toward the sides of the under surface. *Head* and eyes well developed, the latter below the middle separated by scarcely $\frac{1}{5}$ of their own width; beak and antennæ black, the second funicular joint shorter than the first but fully as long as the next two combined. *Prothorax* not quite as long as wide, the sides subparallel and broadly, somewhat unevenly arcuate, oblique and sinuate for a short distance at apex, the latter broadly sinuato-truncate; surface completely concealed, the scales very broadly and deeply concave. *Elytra* fully $\frac{1}{2}$ longer than wide, $\frac{4}{5}$ longer than the prothorax and about $\frac{1}{4}$ wider, the sides broadly arcuate; subapical umbones small and feeble; striæ concealed, the crust of scales broadly convex on the intervals. Length 2.8 mm.; width 1.0 mm.

Colorado.

This species is evidently more allied to *subcupreus* than to the Pacific coast species in the form of the antennæ and general facies; it is decidedly larger than *subcupreus*, and differs in the ornamentation of the elytra. In both of them the triangular glabrous space at the middle of the occiput is unusually large.

C. dispersus.—Cylindric-oval and convex, densely clothed with a crust of moderately large overlapping scales, which are uniformly white beneath, on the base of the beak and on the femora except above and toward apex of the latter; scales of the upper surface dark chocolate-brown, interspersed with isolated white scales toward the sides and median regions of the pronotum, sometimes not especially more evidently so toward base, and, on the elytra, in two transversely and posteriorly arcuate regions before and behind the middle and also at apex. *Head* more largely clothed with white scales, the eyes large, broad and well developed, separated at lower fourth of their extent by scarcely $\frac{1}{6}$ of their own width, the inner margins thence widely and rapidly diverging inferiorly and strongly arcuate. *Prothorax* distinctly shorter than wide, the sides parallel and scarcely arcuate, becoming oblique and sinuate near the apex; sculpture entirely concealed, the scales generally more or less impressed along their median lines, especially toward their bases. *Elytra* rather more than $\frac{1}{2}$ longer than wide, twice as long as the prothorax and $\frac{1}{4}$ wider, just visibly arcuate at the sides; humeri rounded for a very short distance to the prothorax, the prominence scarcely distinct; subapical umbones feeble; striæ concealed, the scaly crust but feebly convex along the intervals. Length 2.2–2.5 mm.; width 0.8–0.95 mm.

Canada (Ontario); Kentucky.

The beak in the type is rather slender but becomes unusually rapidly and conspicuously wider toward base; it is probably a female. This species differs from the preceding in its still more narrowly separated eyes.

ZYGOMICRUS n. gen.

This name is proposed for a small species, differing from Copturodes in its subcontiguous eyes, very small and narrowly oval antennal club, with less distinct annuli and still longer basal joint, and in its somewhat shorter second joint of the antennal funicle, which, in the male, is but little longer than the third, and in the female a little shorter than the next two combined.* It also differs in its elongate and distinctly strigose scales, these being disposed sparsely along the strial intervals toward base, behind the middle for a short distance, near the apex and along the suture except at the middle, and also in its nearly simple elytral apices behind the umbones. The type is *Copturus minutus* of LeConte.

TACHYGONINI.

TACHYGONUS Schönh.

The table published by Dr. LeConte (Proc. Am. Phil. Soc., XV, p. 265) indicates groups defined by certain differences in the elongate posterior legs; these groups are retained and increased in number in the following table, which includes all the species known to me at present:—

Hind femora armed beneath with several long slender and erect dentiform spinules, the corresponding tibiæ broad, arcuate and with the external margin irregular; elytra with four tufts of denser pubescence arranged in a very short broad trapezium.

Integuments red, mottled with black; hind femora and basal parts of the tibiæ in great part red; subsutural tufts of the elytra well defined. **lecontei** Gyll.

Integuments deep black throughout, the elytra abruptly red at the apical margin; hind legs black throughout, the femora red above near the base, the hind tibiæ much narrower; subsutural tufts diffused; size much smaller..... **spinipes** n. sp.

Hind femora armed beneath with several long erect and dentiform spines, the tibiæ long, narrow and nearly straight, unmodified externally; elytra black, with a single red band, the pubescent tuft small, central and divided by the suture..... **gracilipes** n. sp.

Hind femora with about two stout spiniform teeth beneath, the tibiæ shorter and sigmoid, unmodified externally; elytra with a central white spot of dense hairs divided by the suture..... **rhombus** n. sp.

*The length of this joint is erroneously stated by LeConte (Proc. Am. Phil. Soc., XV, p. 264).

Hind femora finely serrulate, or with several small teeth beneath; elytra with a small central white tuft divided by the suture.

Black, thinly pubescent with stiff erect hair.....**centralis** Lec.

Pale brown, variegated with dusky; elytra with four black spots, pubescent with erect hair; hind legs dark.....**tardipes** Lec.

Smaller, brown, variegated with dusky; elytra with a more elongate white sutural spot; hind legs brown..... **fulvipes** Lec.

The last two species of the table are unknown to me in nature. The new species defined in the table are described below in order.

T. spinipes.—Form as in *lecontei*, smaller, black throughout, except the tip of the elytra, which is red; antennæ and four anterior legs pale flavo-testaceous; basal half of the hind femora above and distal extremity of the corresponding tarsi pale rufous; beak rufous at tip; upper surface thinly clothed with gray-white, subdecumbent pubescence, which becomes moderately dense toward the sides of the prothorax and in a transverse line expanded at the suture across the middle of the elytra, the expanded part—corresponding with the subsutural tufts of *lecontei*—being but slightly denser; discal tufts minute and situated behind the pubescent band; body beneath densely clothed with white pubescence anteriorly, the abdomen very sparsely pubescent. Length 2.1 mm.; width 1.75 mm.

New Jersey. Mr. Jülich.

Allied to *lecontei*, but much smaller and less pubescent above, with the hind tibiæ much narrower, less bent and only feebly undulated along the external edge. As in *lecontei*, the white hairs of the body and legs are very composite, consisting of three to seven hairs split from a very short common foot-stalk.

T. gracilipes.—Form as in *centralis*, the surface shining, black, the elytral suture narrowly and feebly, and a straight transverse band slightly broader toward the suture and situated just before the middle, testaceous; antennæ, tip of beak and four anterior legs pale testaceous; hind legs deep black throughout, the tarsi piceous; pubescence sparse, with a number of long erect setæ on the elytra and some longer whitish hairs on the suture toward tip, the small central white tuft divided by the suture situated near basal fourth of the elytral suture as usual; body sparsely pubescent beneath, except at the sides anteriorly; elytra with moderately impressed series of very coarse and close-set punctures. Length 2.2 mm.; width 1.5 mm.

Ohio.

The hind legs are very long and unusually slender throughout, the femora with small teeth along the lower edge, two or three of which become very long and spiniform; the tibiæ are slender and nearly straight, the outer contour very broadly and feebly arcuate

and with a series of long stiff erect setæ, the extreme tip very feebly everted.

T. rhombus.—Form nearly as in *centralis*; body shining, black throughout, the four anterior legs and antennæ pale testaceous; hind legs black, except basal ⅗ of the femora, which is rufous; hairs of the upper surface ochreous in color, decumbent, numerous and strongly multifurcate, with numerous long erect black bristles, a sutural series of white setæ near the apex and a transverse sutural white tufted spot before the middle of the elytra; hairs denser and white also on the median line and flanks of the pronotum at base, on the under surface rather dense and white throughout, except near the middle of the abdomen toward base, the last segment bristing with sparse white setæ; elytra with feebly impressed series of coarse and deep punctures. Length 2.0 mm.; width 1.6 mm.

Arizona.

The hind femora and tibiæ bristle with long stiff and erect black setæ and more decumbent whitish hairs; the femora are somewhat swollen beneath near apical third, with about two suberect spiniform teeth; the tibiæ are quite short and strongly sigmoid, being everted toward tip and inverted and narrower toward base; the last two joints of the tarsi are testaceous. This distinct species is represented before me by a rather large and homogeneous series.

The antennal scape in this genus is smaller than in any other type of Rhynchophora known to me, being shorter and narrower than the second joint, to which it is attached axially as in Apion. LeConte has correctly given five small subequal joints following the second, but there is another broader joint properly belonging to the funicle and closely adjacent to the club, which was not observed by that author, so that the funicle is 7-jointed, as in Zygopini; the large curved uncus at the apex of the tibiæ is also similar to that of the Zygopini.

APPENDIX.

I.

The species described by me under the name *Trichochrous exiguus* (Col. Not. VI, p. 497) is probably the same as the *Listrus ferrugineus* of Gorham (Biol. Cent.-Amer., III, 2, p. 330). Mr. Gorham is however gravely in error in assigning the species to Listrus, for the spines of the tibiæ are perfectly evident and, besides, the absence of "upright pile on the body above" is by no means a distinguishing feature of Listrus, since there is a large division of Trichochrous (Pristoscelis ‡ Gor.), which also has no trace of erect hairs.

It is probable also that *Dasytellus subovalis* Csy. (l. c., p. 570), is identical with the *Listrus impressus* of Gorham (l. c., p. 329), although the measurement of Mr. Gorham is too small (1¼ mm.) and the generic reference altogether erroneous. It bears no resemblance to *Listrus canescens*, which is a purely Californian species not occurring in Mexico. Possibly Mr. Gorham alluded to *L. senilis*, a uniformly and densely clothed species which undoubtedly extends its range well into Mexico, but to which he does not seem to refer.

If the *Listrus punctatus* of Gorham, is in reality a Listrus the name is preoccupied by Mannerheim, provided also the species of the latter author is a true Listrus. I have seen neither of them and can therefore give no opinion.

It is probable that the genus Alymeris Csy. (l. c., p. 600) is the same as Melyrodes Gorh.

The following species was overlooked in my revision of the Melyrinæ :—

Dasytes parvicollis Mann.—Elongatus, subcylindricus, supra nigro-æneus, remote subtilius punctulatus, dense griseo-pubescens, subtus niger, capite minore [*laticollis*] rotundato, thorace elytris angustiore, subrotundato, elytris dorso subconvexis. Longit. 1¼ lin.; Latit. ½ lin. Habitat in California. D. Tschernikh.

I cannot give even a doubtful surmise as to the relationship of this species from the description, though it is more probably a Trichochrous than a Dasytes.

II.

My attention was recently called to a paper by Mr. Pic, published in the "Revue Scientifique du Bourbonnais VII," in which

the genus Anthicus has been divided into some sixteen named subgeneric groups, based solely upon such subsidiary characters as size of the body and form of the prothorax. I am unable to state the true value of these names, because the anatomical structure of the pro- and mesosterna is unknown to me, but in one case it seems that the name proposed by Mr. Pic chances to have for one of its types the identical species assumed by me for the type of Hemantus. Mr. Pic's name " Trapezicomus " for *Anthicus floralis* will however also possibly have to give way to " Omonadus," proposed by Mulsant many years before (Nat. Hist. Col. Fr., Colligères, 1866, p. 104). It is also possible, however, that neither of these names will have to supplant Hemantus, for under Trapezicomus Mr. Pic, in addition to *floralis*, groups also *rufivestis*, *beloni* and *bedeli* of Algeria, the first two of which possibly and the last probably will be found to be generically different from *floralis* when the form of the mesosternum is investigated, and, under the name Omonadus, Mulsant includes also *bifasciatus*, based simply upon the form of the prothorax, truncate head and position of the eyes; as these are the same in both *floralis* and *bifasciatus* it matters not which we take for the generic type, and the name Omonadus can therefore be assumed to apply to *bifasciatus*, a species which a study of the mesosternum will probably prove to differ generically from *floralis*.

Mr. Pic regards *basillaris* Say, as the species allied to *floralis* but without the thoracic tubercle, but we cannot absolutely assume this, in view of the general vagueness of Say's descriptions; Say may just as likely have overlooked the very minute tubercle or regarded it as spurious, and, as I believe there are several forms allied to *floralis* but devoid of tubercle, it would simplify the case to assume that the *basillaris* of Say, is identical with *floralis*. It was with this object in view that I gave the synonymy of *floralis* (Col. Not. VI, p. 683).

When the really important anatomical characters of the European species can be studied, several of the names proposed by Mulsant and Pic will be found to stand for distinct genera, but the rest must fall into synonymy. I cannot find that any of the American genera are identical with those of Europe with the exception of Hemantus.

III.

Errata.

Coleopterological Notices II.

Page 317—7th line from bottom; *for* "Pronotum" *read* "Prosternum."

Coleopterological Notices IV.

Page 511—6th line of coarse print; *after* "than" *insert* "any."
Page 541—15th line from bottom; *for* "of these" *read* "of those."

Coleopterological Notices V.

Page 310—4th line of coarse print; *for* "prosternal" *read* "mesosternal."
Page 379—2d line of coarse print; *for* "has" *read* "have."
Page 398—2d line from bottom; *for* "second" *read* "third."
Page 501—10th line of table; *for* "male" *read* "female."
Page 506—7th line under **Decarthron**; *for* "Bndl." *read* "Lec."

Coleopterological Notices VI.

Page 615—2d line from bottom; *for* "with" *read* "within."
Page 648—3d and 9th lines of table; *for* "*abbreviatus*" *read* "*interruptus*."
Page 662—5th line from bottom; *for* "**L. sturmi**" *read* "**L. elegans**" Laf. *Elegans* is not a preoccupied name in Lappus.
Page 676—1st line top; *for* "**V. lætus**" *read* "**V. bifasciatus**" Say. The latter is not a preoccupied name in Vacusus.
Page 734—17th line from top; *for* "coxæ" *read* "trochanters."
Page 738—15th line from top; *for* "coxæ" *read* "trochanters."
Page 741—6th line from top; *for* "femora" *read* "tibiæ."

Coleopterological Notices VII.

Page 476—3d line from bottom; *for* "jointed" *read* "joined."

VII.—*On the Modification of the Apex in Gastropod Mollusks.*

BY FRANK COLLINS BAKER.

Read April 5, 1897.

Some time ago* the writer published some notes on the modification of the apex in Murex, and at the time these papers were published a noted conchologist suggested to the writer that he extend his observations to other groups; the following notes are the results of such suggestion.

One of the greatest, if not the greatest, drawback to investigations of this kind is the paucity of perfect material. Every conchologist knows how difficult it is to secure specimens with a perfect apex. In the collection from which these notes are drawn, only about five per cent. of the specimens are available for the notes embodied in these pages. I am not able to refer to any publication in which similar investigations have been made, although some species have the apex described in almost all recent papers on the Mollusca, particularly those of Pilsbry, Dall, Verrill and Watson. I know of no paper dealing exclusively with the form of the apex in gastropodous mollusks, save my own mentioned above. If there are such, my ignorance of them must be my excuse for not mentioning them.

There appears to be primarily three types of apex, with numerous variations: (1) whorls numerous, carinated, nucleus prominent; (2) whorls numerous, rounded, smooth, nucleus prominent; (3) whorls few, rounded, nucleus buried in the coil of the second whorl. The material examined is not numerous enough to generalize upon at present, but that which has been examined leads to the above conclusion. There are some 15,000 species of gastropodous mollusks of which but a few hundred have been examined for the apex, so that much work must be done before conclusions can be made. In some groups the apex variation seems

*Proc. Phil. Acad. Sci., 1890, pp. 66–72; 1894, pp. 223–224; Roch. Acad. Sci., 1891, p. 130–132.

to be of specific value (Oliva, Voluta) while in others almost no variation exists (Natica, Litornia, Neritina). The study of the apex shows us to what great extent variation takes place after the birth of the mollusk, and how its environment may affect the young mollusk to a specific extent. I venture to ask, therefore, if we cannot trace many of the slight specific differences found in shells, which have caused naturalists to disagree regarding their stability, to this fact of post-embryonic development affected by changes of environment? May we not, in fact, ascribe *great* specific variation to this cause, and may it not also be true that a species born off the Florida coast and carried by currents to the Massachusetts coast might become in the latter place a different species or variety from what the same individual *might* have been, had it lived in the former locality? These are questions which have presented themselves to the writer in the course of his studies of this subject, and they seem to him to be worthy of investigation.

In the present paper the apices of 132 species are described, embracing many of the families of the marine gastropods.

Family OLIVIDÆ.

Genus **OLIVA** Bruguière.

Oliva literata Lamarck. (Fig. 1.)*

Apex smooth, shining, consisting of three and a-half whorls, which rapidly increase in size; the third whorl is twice as high as the second and the fourth whorl is of the same height, but wider; a carina begins at the second whorl and encircles all the volutions a little above the suture of the whorl below; it is faint upon the second whorl, but becomes very strong on the third whorl. On the older whorl a deep channel is formed between the carina and the whorl below. The color of the apex is very like spermaceti. Four specimens examined, which showed no variation.

Oliva reticularis Lamarck. (Fig. 2.)

Apex smooth, shining, consisting of two whorls, of which the first is very large, exceeding the second by two diameters; the first whorl is rounded, knob-shaped and without a carina, the latter beginning on the second whorl, near the suture, and gradually growing stronger as the shell increases with age. The color and texture is like spermaceti. Compared with *literata* this apex is much

* The accompanying plates are numbered XVIII–XX. [Ed.]

larger and very differently shaped, being broadly rounded instead of flattened. Six perfect specimens examined, with no variation from the above description.

Oliva irisans erythrostoma Lamarck. (Fig. 3.)

Apex smooth and shining, consisting of three whorls, which regularly increase in size, each whorl being about twice the size of the one preceding; the first two and a-half whorls are rounded and smooth, and the carina begins on the third and increases in strength as the shell grows; the suture begins to be very deep after leaving the second whorl and soon becomes channeled; color like spermaceti. Three perfect specimens examined, showing no variation.

Oliva araneosa juliettæ Duclos. (Fig. 4.)

Apex smooth, shining, consisting of two and one-half whorls rapidly increasing in size; the first part of the first whorl is very small and the second part very large, rounded and smooth; the carina begins on the last part of half of the third whorl, and very soon becomes heavily marked; color and texture as in the preceding species. Two perfect specimens examined, with no variations.

Oliva duclosi Reeve. (Fig. 5.)

Apex rounded, smooth and shining, consisting of two and a-half whorls, regularly increasing in size; there is no carina on the nuclear whorls, but one commences on the last part of the third whorl, or the first after the apex. The color is yellowish white in the specimens examined. The form of apex is similar to *literata*. Only two specimens were found perfect enough for examination.

Oliva volutella Lamarck. (Fig. 6.)

Apex rounded, smooth, shining, much elongated, consisting of two and a-half whorls, regularly but slowly increasing in size the carina does not appear until the first post-nuclear whorl is reached, but the sutures of the nuclear whorls are deeply channeled. The color and texture is spermaceti-like. This is the most conical apex of any yet examined. Sixteen perfect specimens are before the writer, and there is no variation from the above description.

Oliva biplicata Sowerby. (Fig. 7.)

Apex rounded, smooth, shining, knob-shaped, consisting of two

and a-half whorls, the second very rapidly enlarging; a carina commences on the last half of the second whorl and gradually becomes stronger; sutures deep but not channeled until the second whorl appears. Color and texture as in *volutella*. Fourteen perfect specimens have been examined, with no variation.

Oliva hiatula Gmelin. (Fig. 8.)

Apex rounded, smooth, shining, knob-shaped, but somewhat elongated, consisting of two and a-half whorls, rapidly enlarging; a carina begins on the last half of the second whorl, at first faint, but soon becoming very strong; the suture between the second and third whorl is deeply channeled. Color bluish-black, hyaline in texture. Two perfect specimens examined.

Genus **OLIVELLA** Swainson.

Olivella venulata Lamarck. (Fig. 9.)

Apex large, rounded, smooth, shining, knob-shaped, consisting of one and a-half whorls rapidly enlarging, without a carina; the post-nuclear whorls are very flat-sided and the sutures deeply impressed. The extreme apex of the present species is a good-sized, rounded knob. Color and texture like spermaceti. Eight perfect specimens examined.

Olivella undatella Lamarck. (Fig. 10.)

Apex large, conical, smooth, shining, consisting of three and a-half rounded, regularly increasing whorls. The first whorl is a little flattened, knob-shaped swelling and those following are more or less turban-shaped. A carina is faintly perceptible on the last half of the third whorl, and on the first post-nuclear whorl becomes very strong; the latter whorls also being deeply channeled at the sutures. The color varies, in white specimens being like spermaceti and in dark specimens shining smoky-black. The apex stands up conically from the rest of the whorls and is easily seen with the naked eye. Six perfect specimens examined.

Olivella tergina Duc'os. (Fig. 11.)

Apex small, subconical, smooth, shining, consisting of two and a-half rounded, rapidly increasing whorls. The first whorl is decidedly knob-shaped and rapidly enlarges to meet the second whorl. A carina begins near the suture above the third whorl, encircles the second whorl of the apex and the first and second post-nuclear whorls, and finally disappears in the adult whorls.

The sutures of the post-nuclear whorls are channeled. Color, in all specimens examined, spermaceti-like. Two perfect specimens examined. In this species the outline of the whorls forms a flat-sided triangle from the periphery of the body whorl to the extreme point of the apex.

Olivella nivea Gmelin. (Fig. 12.)

Apex large, knob-shaped, smooth, shining, consisting of two and a-half rounded, rapidly increasing whorls. The first whorl is large and very rapidly increases in size. A carina appears on the last half of the second whorl and rapidly increases in strength. The post-nuclear whorls are very deeply channeled at the suture. Color porcelain white. A large number of specimens examined, with little or no variation. The first one and a-half whorls vary to a small extent in flatness.

Olivella jaspidea Gmelin.

The apex of this species is precisely like that of *O. venulata* Lam. See Fig. 9.

Olivella mutica Say. (Fig. 13.)

Apex small, knob-shaped, smooth, shining, consisting of two and a-half carinated whorls, regularly enlarging; the first whorl enlarges more rapidly than the second. The carina appears on the second half of the first whorl, and is very strong; the nuclear and post-nuclear whorls are strongly channeled at the suture. Color and texture like spermaceti. Five perfect specimens examined.

Olivella nana Lamarck. (Fig. 14.)

Apex small, flattened, smooth, shining, consisting of one and a-half carinated whorls, rapidly enlarging; the carina appears on the first half of the first whorl and is very strong; the sutures of both nuclear and post-nuclear whorls are deeply channeled. Color dark, shining horn. This is the flattest apex in this genus. A large number of specimens have been examined, and the only variation appears to be in the extent of coloration, which changes from horn to white in some specimens where the nuclear whorls join the post-nuclear, and in others it is continued on the first or second post-nuclear whorls.

Olivella gracilis inconspicua Adams.

The apex of this species is in all respects like *nana* in form (it may be a little more rounded in some specimens) and differs solely in color, being pure spermaceti white. Two specimens examined.

Family HARPIDÆ.

Genus **HARPA** Lamarck.

Harpa minor Lamarck. (Fig. 15.)

Apex large, rounded, smooth, shining, consisting of two and a-half whorls, regularly increasing; the last part of the third whorl is lost in the first post-nuclear whorl; the nuclear whorls are without a carina and perfectly smooth, while the post-nuclear whorls are marked by spiral striæ and strong, elevated ribs. The apex is of a beautiful pink color. In the five perfect specimens examined there is no variation from this type.

Harpa conoidalis Lamarck. (Fig. 16.)

The apex is large, and consists of three and a-half whorls, but in all other respects is like that of *minor*. The apical whorl in both species is very flat. Three specimens examined. There is sometimes a lightly impressed spiral line encircling the second nuclear whorl near the suture of the following whorl.

Harpa articularis Lamarck.

Harpa ventricosa Lamarck.

Both of these species have the nuclear whorls of the same number and shape as those of *conoidalis*. In fact, so far as the apex goes, the species cannot be separated. Three examples of each species have been examined.

Harpa nobilis Lamarck.

But a single, barely perfect specimen of this species is before the writer, and, so far as can be made out, it is identical with the preceding species. The whole group of harps seems to the writer to be very closely connected, and it is very doubtful if there are over three or four valid species in the genus. The genus is probably not old enough, geologically, to have acquired stable differential characters.

Family MARGINELLIDÆ.

Genus **MARGINELLA** Lamarck.

Marginella prunum Gmelin. (Fig. 17.)

Apex small, flatly rounded, smooth, shining, consisting of one and a-half whorls, rapidly increasing. Both nuclear and post-nuclear whorls are smooth and shining, and the nuclear whorls are

hyaline in texture and color. The whole apex is very simple; in fact, the simplest kind of an apex.

There appears, if one may judge by the material at hand, to be no variation among the nuclear whorls of this genus. The following species have been examined and the apex does not differ, save at times in size, in the slightest degree:

Marginella bivaricosa Lamarck, *M. guttata* Dillwyn, *M. nivosa* Hinds, *M. curta* Sowerby (apex darker in color than usual), *M. conoidalis* Kiener, and *M. apicina* Menke (apex pinkish).

Family VOLUTIDÆ.

Genus **VOLUTA** Linné.

Voluta musica Linné. (Fig. 18.)

Apex very large, rounded, smooth, consisting of four and a-half whorls, regularly increasing in size. The last nuclear whorl is partly buried in that of the first post-nuclear. The apex is smooth, of a rusty-brown color, and is very broad; the post-nuclear whorls are all armed with good-sized nodules. The whole apex is so large that it may be easily studied with the unaided eye. Five specimens have been examined, and the only variation seems to be in the comparative height of the apex, some specimens having the whorls flatter than in the specimen figured.

Voluta scapha Gmelin. (Fig. 19, 20.)

Apex very large, rounded, smooth, shining, consisting of three and a-half whorls, which start out small and rapidly enlarge in size. The extreme apex (one and a-half whorls) is very flat and the whorls cannot be seen in a lateral view (see Fig. 20); the last two whorls are broadly rounded. The color is dark (or light) brown and the zigzag lines of color so characteristic of this species do not appear until the first post-nuclear whorl is reached. The nuclear whorls may measure 10 mill. in height and 15 mill. in width. This is one of the largest apices in marine gastropods. A number of perfect examples have been examined and the only variation seems to be in the comparative height and breadth of the apex.

Voluta vespertilio Linné. (Fig. 21, 22.)

Apex small (for the genus) rounded, nodular, shining consisting of three whorls, rapidly enlarging. The first one and a-half whorls are flat as in *scapha*, and the following whorls are large

and flatly rounded. All but the first whorl are nodulous, the nodules being placed at the shoulder of the whorls. These nodes become elevated spines on the post-nuclear whorls. The color is whitish, the brown stripes beginning on the post-nuclear whorls. The writer can find no variation in a large number of specimens examined.

Voluta rupestris Gmelin. (Fig. 23.)

Apex large, mammiform, dull, consisting of one and a-half whorls, of which the first is very large, mammiform, its apex bent in and buried in the second half of the first whorl, and the second (half of second) is very flat and narrow. The nuclear whorls are smooth and the post-nuclear ribbed. Color yellowish white, the flames not appearing until the post-nuclear whorls are reached. This is a peculiar apex, with no tendency toward variation.

Genus **SCAPHELLA** Swainson.

Scaphella junonia Hwass. (Fig. 24.)

Apex of good size, rounded, smooth, consisting of one and a-half whorls, rapidly enlarging. The nuclear whorls are smooth and the post-nuclear whorls, for a short distance, are marked by numerous fine, more or less nodular ribs. The color is a dead white, the peculiar squarrish spots appearing on the last half of the first post-nuclear whorl. The whole apex forms a rounded, dome-shaped outline. Three specimens with perfect apices are before the writer, and all show the same characters.

Genus **MELO** Broderip.

Melo Broderipii Gray.

The apex of this species is almost identical with that of *Voluta scapha* (see figs. 19–20). It is very large, rounded, and composed of three and a-half whorls. The elevated spines begin on the last half of the first post-nuclear whorl and gradually grow large and strong. This apex is larger than that of *scapha*.

Melo diadema Lamarck.

The apex of this species is identical with that of *broderipii*.

Family MITRIDÆ.

This family seems to be the hardest from which to obtain perfect specimens. Out of two dozen species, and over a hundred specimens, not a single perfect apex could be found.

Family FASCIOLARIIDÆ.

Genus **FASCIOLARIA** Lamarck.

Fasciolaria gigantea Kiener. (Figs. 25, 26.)

Apex small, rounded, smooth, consisting of one and a-half whorls, rapidly enlarging; the nodules appear on the first post-nuclear whorl; color dead white. The young shell when taken from the egg-capsule (fig. 26) consists of one and a-half spermaceti-like whorls, the point of the first whorl being bent in and buried in the coil of the first whorl. The young shell measures about 4 mill. in length and is very broad.

Fasciolaria tulipa Linné.

Fasciolaria distans Linné.

The apices of these two species are like that of *gigantea; tulipa* has a dark purple, and *distans* a spermaceti-like apex. When the animal leaves the egg there would seem to be no difference of specific importance, those characters being acquired later. The post-nuclear whorls of both species are smooth and shining. Those who find difficulty in separating these two species, may easily do so by observing the heavy spiral callus just beneath the point where the periphery meets the body whorl in *distans*. This is absent in *tulipa*.

Genus **FULGUR** Montfort.

Fulgur pyrum Dillwyn. (Figs. 27, 28.)

The apex is very like that of *Fasciolaria gigantea*, and consists of the same number of whorls. The post-nuclear whorls are strongly shouldered and tubercular. The young shell just from the egg capsule (fig. 28) shows a rounded apex and shouldered second whorl, and the interior of the aperture (outer lip) is strongly and deeply striate, the striations running as far into the aperture as can be seen. The apex is white in color. Of a large number examined, all show the characters expressed above. The apex in the young is almost hidden by the coil of the second whorl.

Fulgur perversus Linné. (Figs. 29, 30.)

Apex large, rounded, knob-shaped, smooth for the most part, consisting of one and a-half whorls regularly increasing in size. The second whorl is nodulous and soon becomes decidedly shouldered where it meets the first post-nuclear whorl. Color

dead white. The young shell from the egg (fig. 30) is large, sinistral, the nucleus is large and knob-shaped, and the second whorl is nodulous and strongly shouldered. It is also spirally striate, strongly costate, and marked with reddish flames as in the adult. The interior of the outer lip is strongly striate. This apex differs from the others in the genus by the presence of the ribs, shoulder and color, in the other species these appear first on the post-nuclear whorls, instead of the nuclear as in this species.

Fulgur canaliculatus Say. (Fig. 31.)

The apex of this species is very like that of *Fulgur pyrum* (fig. 27); the present nucleus, however, is a little more rounded, and the first whorl is more knob-shaped and the initial point deeply buried in the second whorl (there are one and a-half nuclear whorls). The second whorl is faintly shouldered and the first post-nuclear whorl is heavily shouldered, and the latter is strongly nodulous. In color the apex is white, and it is also smooth. About a dozen specimens examined.

Family BUCCINIDÆ.

Genus **CHRYSODOMUS** Swainson.

Chrysodomus antiquus Linné. (Figs. 32, 33.)

Apex of good size, rounded, smooth (?), consisting of two and a-half whorls, slowly and regularly increasing in size; the nuclear whorls are (apparently) smooth, and the post-nuclear whorls are spirally striate and shouldered. The apex is yellowish white in color. The specimens of typical *antiquus* before the writer have almost been ruined by acid, so that the nucleus, while showing perfectly the original form, is yet devoid of all markings. In a specimen of *contraria* Linné (= *antiquus*) (fig. 33), the nuclear whorls are encircled by five strong spiral lines. The apex of this form differs from the typical *antiquus* in being more discoidal and oblique. The writer is convinced that *antiquus* (typical) is striated precisely as in *contraria*. Dealers' shells are of but very little value, scientifically.

Genus **PISANIA** Bivona.

Pisania pusio Linné. (Fig. 34.)

Apex small, rounded, smooth, consisting of one and a-half glossy whorls, regularly increasing; the post-nuclear whorls

(four of them) are nodular. The apex of the first nuclear whorl is a flattened hemisphere. The nodules of the post-nuclear whorls begin quite abruptly. The color is yellowish white. But two specimens of this species have been examined.

Subgenus **TRITONIDEA** Swainson.

Pisania tincta Conrad.

The nucleus is very similar in form to that of *pusio*, but is spermaceti-white instead of yellowish or brownish. The number of whorls is the same in both species. A half dozen specimens examined, one of which had a dark brown apex.

Genus **EUTHRIA** Gray.

Euthria cornea Linné. (Fig. 35.)

The apex of this species is very like that of *Pisania*, excepting that it is more oblique, the first whorl is smaller in comparison with the second and the post-nuclear whorls are ribbed instead of nodulous. It is brownish in color and has one and a-half whorls. But a single example has been examined.

Family NASSIDÆ.

Genus **NASSA** Lamarck.

Nassa glans Lamarck. (Fig. 36.)

Apex small, rounded, smooth, consisting of one and a-half glossy whorls, rapidly and regularly increasing in size. The initial whorl is very small and knob-shaped with its apex bent in, and the second whorl is flatly rounded. The post-nuclear whorls are strongly nodulous, there being four nodules to each longitudinal rib. The line between the nuclear and post-nuclear whorls is very sharply drawn. About four and a-half post-nuclear whorls are nodulous, and then they become smooth and polished. The nucleus is of a rich wine color. Only a single example has been examined.

Nassa trivittata Say. (Fig. 37.)

The apex of this species is very like that of *glans* excepting that it has two whorls and is white in color. All of the post-nuclear whorls are strongly nodulate and spirally-lirate, giving the shell a latticed appearance. The writer has examined three perfect specimens.

Nassa vibex Say.

The apex is like that of *glans*, the same number of whorls, excepting that its color is yellowish-white. A dozen specimens examined.

Nassa incrassata Gmelin.

Apex like that of *trivittata*, the same number of whorls, color white in some specimens and wine-colored in others. Five specimens examined.

Nassa tegula Reeve.

Apex like those of *trivittata* and *incrassata*, the same number of whorls which are wine-colored in some specimens and spermaceti-white in others. In a lot of five perfect specimens, two were white and three were wine-colored.

Nassa scabriuscula Powis.

The apex of this species is in all respects like the last, excepting that the whorls are a trifle narrower, especially the initial whorl, and they are white. Two specimens examined.

Nassa mutabilis Lamarck. (Fig. 38.)

This nucleus differs from the preceding in having but one and a-half whorls, which are more rounded, especially the first which is knob-shaped and large. The color is spermaceti-white and the whorls are shiny. The first three post-nuclear whorls are costate after which they become smooth. Several specimens examined.

Family COLUMBELLIDÆ.

Genus **COLUMBELLA** Lamarck.

Columbella mercatoria Linné. (Figs. 39, 40.)

Apex of good size, rounded, smooth, consisting of two whorls, rapidly enlarging. The whorls are very flat, the first one particularly so (fig. 40), and in a lateral view the first whorl shows simply as a flat cap. The nuclear whorls are perfectly smooth, but the post-nuclear whorls are spirally lirate. In perfect specimens the apex is deep purple in color, but in worn specimens it is white. A number of specimens examined with no variation.

Columbella fastigiata Sowerby. (Fig. 41.)

Apex of good size, rounded, smooth, consisting of three and a-half whorls regularly increasing in size. The first two whorls are

as in *mercatoria* and the extra one and a-half whorls are narrowly rounded. The lateral outline makes an obtuse cone. Color as in the preceding species. Three specimens examined.

Columbella rustica Linné.

Apex in all respects like that of *mercatoria.* Sometimes lighter in color. Four specimens examined.

Columbella fuscata Sowerby. (Fig. 42.)

Apex small, conical, elevated, smooth, consisting of two and a-half regularly increasing whorls, which are spermaceti-like. This apex differs from the preceding in its sharply conical form. About a dozen perfect specimens examined.

Columbella avara Say.

The apex of this species is like that of *fuscata.* A number of specimens examined.

Family MURICIDÆ.

Genus **MUREX** Linné.

For the sake of comparison the following species of this genus are introduced, but have been published in the works cited above.

Murex scolopax Dillwyn. (Fig. 43.)

The nucleus consists of two smooth, glossy, fulvous whorls, of which the second is twice as large as the first; a carina begins at the apex and after traversing the first and second whorls in an oblique direction, finally ends in the suture above the third whorl. The top of the first whorl is flat, the lateral outline of the whorls descends outwardly in a straight slant to the carina, and from the carina to the suture below it slants inward. The carina of the last whorl is much lower nearer the suture than that of the first, giving the two whorls somewhat the appearance of a stumpy smoke-stack of a locomotive. The last nuclear whorl ends with a triangular varix, which is thick, whitish and semitransparent.

Murex aduncospinosus Beck. (Fig. 44.)

The nucleus consists of two and a-half blunt, conical, glossy, fulvous, flat sided whorls, which increase regularly from the apex; the last whorl is margined below by a very fine thread just at the suture; the lateral outline shows a cone of about three regularly increasing whorls, of which the third is twice as large as the first. There is a rounded varix of considerable size at the end of the last nuclear whorl.

Genus **VITULARIA** Swainson.

Vitularia salebrosa King. (Fig. 45.)

Apex small, angular, carinated, consisting of one and a-half whorls, rapidly increasing. The first whorl is flat and cap-like, and the second is wide and angular. A carina begins at the initial point of the first whorl and encircles the nuclear whorl and the post-nuclear whorl; on the latter it is nodular and ribbed. Color of apex white. But a single specimen examined.

Genus **PURPURA** Bruguière.

Subgenus **POLYTROPA** Swainson.

Purpura lapillus Linné. (Fig. 46.)

Apex small, rounded, smooth, knob-shaped, consisting of one and a-half whorls very rapidly increasing. The nuclear whorls are smooth and rounded, but the post-nuclear whorls are bicarinated. The carination of the post-nuclear whorls commences very suddenly after leaving the nucleus. A number of specimens examined.

Purpura saxicola ostrina Gould.

The apex in this species is exactly like that of *lapillus*. Two dozen specimens examined.

Genus **CONCHOLEPAS** Lamarck.

Concholepas peruvianus Lamarck. (Fig. 47.)

Apex small, rounded, smooth, knob-shaped, consisting of two and a-half whorls, narrowly rounded and white in color. The post-nuclear whorls are strongly ribbed and striate, and the last whorl nearly conceals the nucleus. Two perfect specimens examined.

Family JANTHINIDÆ.

Genus **JANTHINA** Lamarck.

Janthina globosa Swainson.

The apex of this species is very small and is buried in the volutions of the post-nuclear whorls. There is no line of junction between the nuclear and post-nuclear whorls, and the number of nuclear whorls cannot be counted. All of the whorls are of a delicate purple color. A dorsal view of the apical whorl is like fig. 40, and a lateral view like fig. 39.

Janthina communis Lamarck.

Same as *J. globosa*.

Family TRITONIIDÆ.

Genus **GYRINEUM** Link. 1807.

Ranella Lamarck. 1812.

Gyrineum albovaricosa Reeve. (Fig. 48.)

Apex small, rounded, smooth, shining, consisting of two and a-half regularly increasing whorls. The post-nuclear whorls are very nodulous and are shouldered. In some specimens the nuclear whorls appear a trifle malleated. The color is white or horn.

There seems to be a a great amount of uniformity among the nuclear whorls of this genus. The following species all have apices of the same type as *albovaricosa*, varying only a trifle in relative heights and widths. The number of whorls is the same in all; a number of specimens of each species have been examined.

Gyrineum elegans Beck.
Gyrineum lampas Lamarck.
Gyrineum subgranosum Beck.
Gyrineum spinosum Lamarck.
Gyrineum lividum Reeve.
Gyrineum affine Broderip.
Gyrineum pulchrum Gray.

Genus **TRITONIUM** Link. 1807.

Triton Montfort. 1810.

Of a collection of some twelve species of this genus, comprising about a hundred specimens, not a perfect apex could be found. From an examination of a broken nucleus, I should say the apex was similar to that of Gyrineum.

Family CASSIDIDÆ.

Genus **CASSIS** Lamarck.

Cassis granulosa Lamarck. (Fig. 49.)

Apex small, rounded, smooth, shining, white, consisting of two and a-half whorls. The first whorl is very small and narrow, and its apex seems to be buried in the coil of the second whorl. The last two whorls are broad and rounded. The post-nuclear whorls are nodulous. The whole apex has the appearance of a mamma very much flattened at the top.

Cassis cameo Stimpson.
Cassis flammea Linné.
Cassis rufa Linné.
Cassis sulcosa Brug.
Cassis testiculus Linné.
Cassis pila Reeve.
Cassis saburon Lamarck.
Cassis vibex Linné.
Cassis glauca Linné.

All of the above species have precisely the same form of nucleus as that of *granulosa*. A number of specimens examined.

Genus **CASSIDARIA** Lamarck.

Cassidaria echinophora Linné. (Fig. 50.)

Apex small, rounded, smooth, shining, consisting of one and a-half whorls, rapidly enlarging. There is a distinct, elevated line where the nuclear and post-nuclear whorls join, and the latter are encircled by numerous beaded spiral lines. This is quite a constant nucleus. Color spermaceti-like. Two specimens examined.

Genus **ONISCIDIA** Swainson.

Oniscidia cancellata Sowb.

The apex of this species is like that of the last species, excepting that it is a little longer. A single specimen examined.

Family DOLIIDÆ.

Genus **DOLIUM** Lamarck.

The members of this genus have a rounded apex very like that of Cassis (Fig. 49) excepting that the whorls are wider and very dark horn-color or chestnut-color. The number of whorls varies somewhat. The nucleus is smooth and polished, and the post-nuclear whorls are encircled by beaded spiral lines. The line of junction between the nuclear and post-nuclear whorls is very sharply drawn. A number of specimens of each species examined.

Dolium galea Linné. Three and one-half whorls.
Dolium fasciatum Linné. Three and a-half whorls.
Dolium perdix Linné. Three whorls.

Dolium malea Val. Two and a-half *white* whorls.
Dolium maculatum Lamarck. Three light horn-colored whorls.
Dolium olearium Linné. Three whorls.

Genus **PYRULA** Lamarck.

Pyrula papyratia Say. (Figs. 51, 52.)

Apex small, rounded, smooth and shining, white, consisting of one and a-quarter whorls, very rapidly enlarging. The nuclear whorl looks very like a young Helix. The post-nuclear whorls are beautifully reticulated. The dorsal view (fig. 50) shows a very rapidly enlarging volution and the sharp line between nuclear and post-nuclear whorls. Several specimens examined.

Pyrula ficus Linné.

This species has an apex like that of *papyratia*, but with one and a-half whorls. Five specimens examined.

Family CYPRÆIDÆ.

Genus **CYPRÆA** Linné.

Cypræa exanthema Linné.

The apex of this species is of the same type as fig. 41, excepting that it is a trifle wider. It consists of three and a-half smooth, dark-brown whorls. Four specimens examined (young).

Cypræa spadicea Swainson.

In this species the outline of the whorls forms a /\ shape, very much spreading at the bottom. There are three and a-half smooth, yellowish-brown whorls. Two specimens examined (young).

The collection of *Cypræa* before me numbers over 160 species, yet the two species quoted above are the only ones showing the young shell, which alone shows the character of the apex. From what I can learn from the adult forms of the other species, I should say that all have the same type of apex, though probably differing in the number and relative width of the whorls.

Family STROMBIDÆ.

Genus **STROMBUS** Linné.

Strombus gigas Linné. (Fig. 53.)

Apex small, rounded, smooth, white, consisting of two and a-half whorls, regularly increasing. The nuclear whorls are smooth,

but the post-nuclear whorls are strongly ribbed and spirally striate. The lateral outline of this species shows a graceful, rounded curve. A half dozen perfect specimens examined.

Strombus minimus Linné.

The apex of this species is similar to that of *S. gigas*, has two and a-half rounded whorls, but is much broader and more pyramidal. Two specimens examined.

Family PLANAXIDÆ.

Genus **PLANAXIS** Lamarck.

Planaxis planicostata Sowerby. (Fig. 54.)

Apex small, pointed, smooth, shining, consisting of three and a-half regularly increasing whorls. The color is a deep wine-red. The post-nuclear whorls are coarsely spirally ribbed. The lateral outline of the apex of this species shows a sharp pyramid. A number of specimens examined.

Family VERMETIDÆ.

Genus **VERMICULARIA** Lamarck.

Vermicularia spirata Philippi. (Fig. 55.)

Apex small, knob-shaped, smooth, lustreless, consisting of one and a-half whorls rapidly increasing in size; color yellowish; post-nuclear whorls spirally ribbed and carinated. This species shows a wonderful degree of constancy in the form of the nucleus. About twenty specimens examined.

Family LITORINIDÆ.

Genus **LITORINA** Férussac.

Litorina aspera Philippi.

The nucleus of this species seems to be in all respects like that of fig 42, and consists of two and a-half hyaline whorls.

The following species do not differ in the form of the nuclear whorls:

Litorina scabra Linné. Nucleus yellowish in color.

Litorina conspersa Philippi. Nucleus purplish in color.

Litorina philippii Carpenter. Nucleus hyaline.

Litorina scutulata Gould. Nucleus brownish in color.

Litorina patula Gould. Nucleus brownish in color.

Litorina palliata Say.

Litorina obtusata Linné.

These two species have a flat nucleus of one and a-half whorls, similar in form to fig. 50, excepting that all the whorls are smooth. They are yellowish or brownish in color. A number of specimens of each species have been examined.

Famlly NATICIDÆ.

Genus **NATICA** Lamarck.

The nuclear whorls of all the species of this genus seem to conform to the following diagnosis: Apex small, smooth, rounded, polished, consisting of one and a-half narrow, rapidly increasing whorls. Color variable. The following species have been examined (fig. 56):

Natica lineata Chemnitz (dark horn).
Natica vitellus Lamarck (yellowish).
Natica alapapilionis Chemnitz (hyaline).
Natica adansonii Récluz. (hyaline).
Natica maroccana Dillwyn (hyaline).
Natica mamilla Linné (white).
Natica lamarckiana Récluz. (pinkish-horn).
Natica opaca Récluz. (white).
Natica canrena Lamarck (hyaline).
Natica heros Say (blackish).
Natica duplicata Say (bluish or whitish).
Natica labrella Lamarck (*two* whorls, hyaline).
Natica hebræa Mart. (yellowish).
Natica flemingiana Récluz. (two whorls, white).
Natica conicus Lamarck (two whorls, hyaline).

A large number of specimens have been examined.

Family TROCHIDÆ.

Genus **CALLIOSTOMA** Swainson.

Calliostoma langieri Philippi. (Fig. 57.)

Apex small, rounded, shining, rapidly increasing, consisting of one and a-half whorls. The first half whorl is smooth and the second whorl is encircled by several (four or five) heavy spiral lines. The post-nuclear whorls are at first encircled by granular spiral ridges, which soon become smooth. On the last whorls the spaces between the ridges become impressed. Two specimens examined.

Genus **GIBBULA** Risso.

Gibbula formani Payr.

The apex of this species is in all respects like that of *Calliostoma langieri*. Three specimens examined.

Genus **EUCHELUS** Philippi.

Euchelus denigratus Chemnitz.

Apex similar in form to *Calliostoma langieri*, but more rapidly enlarging, smooth and brownish red in color. A single specimen examined.

Genus **CLANCULUS** Montfort.

Clanculus perniceus Philippi. (Fig. 58.)

Apex smooth, pink or red, rounded, consisting of one and a-half whorls regularly increasing. The first part of the first whorl is buried in the coil of the succeeding whorl. The post-nuclear whorls are beautifully beaded. A number examined.

Family NERITIDÆ.

Genus **NERITA** Bruguière.

All of the species examined conformed to the following diagnosis and were similar to fig. 50 in form.

Apex small, flat, smooth, more or less hyaline or yellowish in color, consisting of one and a-half whorls rapidly increasing in size. The post-nuclear whorls are strongly marked with growth lines.

The following species have been examined:

Nerita polita Linné.

Nerita plicata Linné (nuclear whorls more elevated, not so flat).

Genus **NERITINA** Lamarck.

Apex like that of *Nerita*, but whorls not so rapidly increasing. The following have been examined:

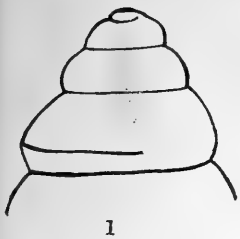
Neritina picta Sowerby.

Neritina virginea Linné.

Neritina dispar Pease.

Neritina meleagris Lamarck.

A number of specimens of each species have been examined.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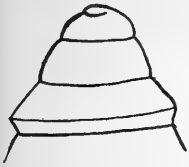
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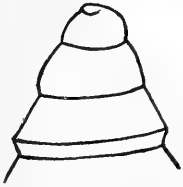
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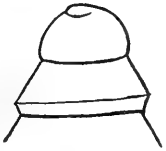
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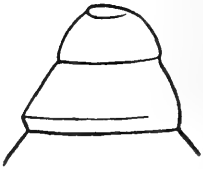
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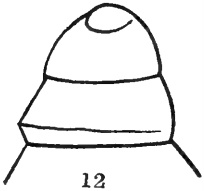
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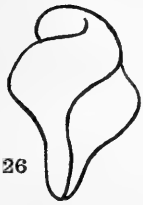
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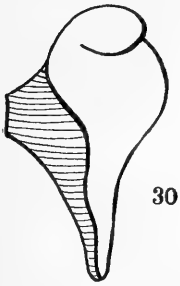
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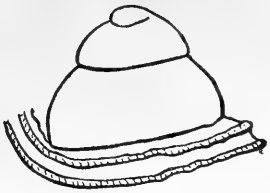

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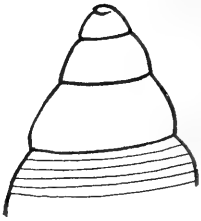

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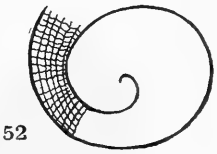

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The names of groups higher than genera are in SMALL CAPITALS; names of synonyms and of species assigned to erroneous genera are in *italics*.

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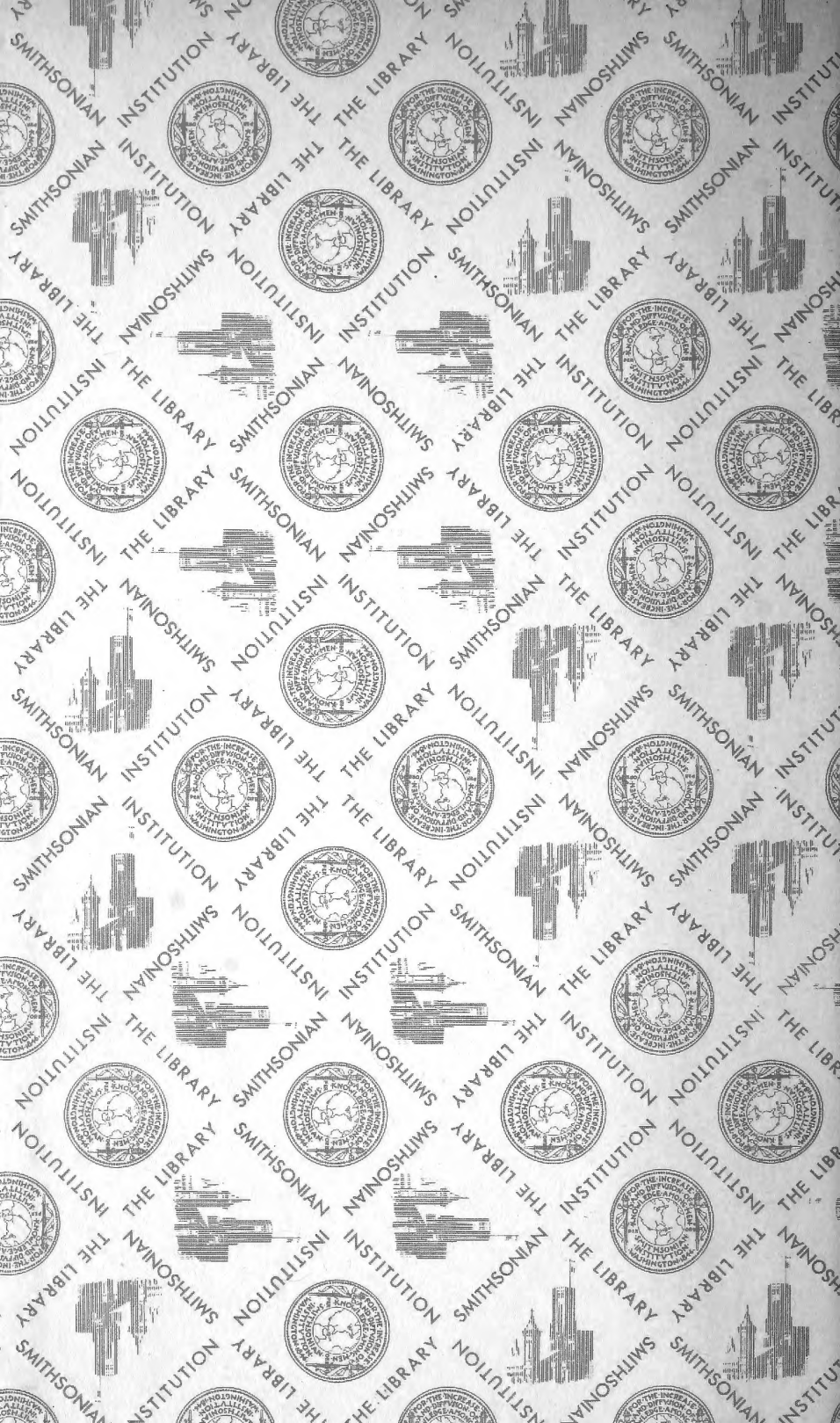
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