An essay of comparative Chaetotaxy,
or the arrangement of characteristic bristles of Diptera,

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I propose the term *Chaetotaxy* for the arrangement of bristles on the different parts of the body of the diptera, the composition of this term being analogous to *phyllotaxy*, the order or arrangement of the leaves of plants. The characters derived from the number and position of bristles *(macrochaetae)*, have been gradually gaining ground in dipterology, but it has not been attempted to introduce a uniform nomenclature for them.

The study of the diptera of South Eastern Asia, on which I have been recently engaged, excited for the first time my more immediate interest in the bristle-bearing families of diptera *(Diptera chaetophora* they may be called), whilst my attention had hitherto been confined to the Tipulidae, Tabanidae, Syrphidae etc., which are all bristleless (I propose to call them *Diptera eremochaeta*). I soon perceived that I could not proceed much further with the study of the *Diptera chaetophora*, without an attempt at a comparative chaetotaxy; and this gave occasion to the present essay.

In the choise of terms, my principal aim was to prefer such that are more or less obvious, that is, to derive the names, bestowed upon the *macrochaetae* from the places of their insertion. The bristles on the vertex, for instance, I call *vertical bristles;* those on the sides of the front, *fronto-orbital* etc. Such terms offer the double advantage of being easily remembered and not easily disputed; many of them have been anticipated by earlier writers. In following this plan however, I met with a difficulty in the incomplete or uncertain

terminology*) of certain parts of the body of the diptera, especially of the thorax, and this afforded me an opportunity for developing it. In doing this, I purposely preferred a purely *conventional*, to a *homological* or *anatomical* nomenclature The latter is much easier to praise, than to carry out, being often subject to uncertainty and dispute. Thus, what dipterologists hitherto called *metanotum*, has been recently proved to belong to the mesothorax (see the paper of Mr. Hammond, in the Journal Linn. Soc. Vol. XV), and if the argument is sustained, we will have either to change the term for another, or to continue to use it as a merely conventional term. The difficulties of descriptive entomology are great enough without such uncertainty of terms, and it is evident that a conventional terminology offers more chances of fixity; it may very well exist *alongside* of a homological and anatomical terminology. It was principally the *pleura* which required some development of the nomenclature of its different regions, and of the sutures which divide them. The term *pleura* itself, being conventional, and not anatomical, I have formed the new names of the combinations of this word with other words, indicative of the position of the parts which I intended to name. (*Mesopleura*, *Metapleura* etc.)

Bristles easily fall off, and the scars which they leave are not always recognizable; in such cases we may sometimes be in doubt, whether we have a defective specimen, or an individual aberration, before us. Statements about chaetotaxy must therefore be *made, as well as received*, with some caution.

It is hardly necessary to add, that in this, as in all my previous publications, I adopt Loew's terminology (explained in the Monogr. N. Am. Dipt. Vol. I), as my rule and the basis to start from; only I prefer the latin terms to their equivalents in english. Although somewhat incomplete and too hastily written, that chapter was composed by Loew at a late period of his career, and with the full benefit of a long experience. It was a deliberate attempt (as Loew says in the introduction to it) to act as an arbiter between the con-

*) I deliberately prefer *terminology*, which is consecrated by usage and by the best writers, to *horismology*, which is not to be found in Webster's Dictionary, but in the incorrect form of *orismology*.

flicting terminologies of previous writers, and for this reason, it deserves the highest consideration. In the nomenclature of bristles, I have taken into account the terms introduced by earlier writers, as far as consistency permitted it.

Not sufficient attention has been paid to the *functions* of the macrochaetae in Diptera, and to the remarkable circumstance, that while they occur, with great regularity, through a long series of families, they are wanting in others.

Among the *Orthorhapha*, the diptera *eremochaeta* (bristleless) form the rule, the *chaetophora* the exception; but this exception comprises the large and important families of *Asilidae* and *Dolichopodidae*. (The bristles on the legs of the Mycetophilidae and Culicidae cannot are not properly *macrochaetae.)*

Among the *Cyclorhapha*, the diptera *chaetophora* are the rule, the *eremochaeta* form the exception, but a very important one, the large family of *Syrphidae*.

Macquart thinks, and he may be right, that the macrochaetae serve as a protection to the parts of the body upon which they are inserted; that they act as buffers in cases of sudden contact. In the Introduction to his: *Nouvelles Observations sur les Tachinaires* (Anm. Soc. Entom. Fr. 1845, p. 239—240.) he says: „En examinant la situation et la direction de ces soies, qui sont d'ailleurs les mêmes dans la plupart des Muscides, il est impossible d'en méconnaître la destination. Elles protègent toutes les parties supérieures de la tête contre les chocs, et l'on ne peut guère douter que ces moyens de préservation n'aient été accordés à cette famille immense, à l'exclusion de la généralité des autres diptères, pour compenser la faiblesse des téguments. Les quatre soies occipitales, en se dirigeant en arrière, défendent le cou; les deux stemmatiques, tournées en avant, préviennent les dangers auxquelles les ocelles sont exposés, surtout pendant le vol; les laterales du rang intérieur, dirigées en dedans, forment une voute pour abriter le crâne qui recouvre le cerveau; enfin, celles du rang inférieur dans les femelles, tournées en avant, defendent les côtes du front, élargis dans ce sexe." Macquart might have continued in the same strain about the bristles of the thorax: the supra-alar bristles protect the root of the wings from above; the mesopleural perform the same office in front; the metapleural fan of

bristles (in certain families) acts as a screen in front of the haltere etc. Hence the persistency of the certain bristles in the same places, not only through the immense divisions of the Calyptrata and Acalyptrata, but even among more distant families, like Asilidae and Dolichopodidae; hence also the possibility of a uniform terminology.

Still, this hypothesis of Macquart's does not explain how certain families can exist without any *macrochaetae* at all. The integuments of a Syrphus are apparently not harder than those of a Tachina, and yet they are unprotected by bristles? — The explanation may perhaps be found in the mode of flight of the different groups of diptera. In examining the list of the *Diptera eremochaeta*, it will be noticed that most of the families belonging to them possess the power of regulating the momentum of their flight, which involves the faculty of poising themselves in the air. Observe the flight of a Syrphus, the cautious way in which he turns round a solid object and repeatedly touches it with the tip of his tarsi, without alighting, and compare it to the headlong flight of a Calliphora. The most bristly of all the diptera and the least cautious in their flight are the Calyptrata, those very flies which C. C. Sprengel, in his „Das entdeckte Geheimniss der Natur, 1793", called the *stupid flies* (die dummen Fliegen), for their clumsiness, their inability to discover honey in flowers and the ease with which they are deceived by odors and appearances. Stratiomyidae, Tabanidae, Bombylidae, Syrphidae, all have the power of poising, and all belong to the *eremochaeta*. Therevidae and Empidae, who also have that power, are provided with only very few macrochaetae.

Without following out this suggestion at present, I will connect it with another generalization and recommend both to the attention of observers. *That faculty of poising seems, for some as yet unknown reason, to be connected with contiguous eyes in the male sex.* Most of the above-named families of *Diptera eremochaeta*, which possess that faculty (Tabanidae, Bombylidae*), Syrphidae etc.) have *holoptic* males (as I will call them for brevity's sake). The *Diptera chaetophora* hardly ever have holoptic males (even among the Orthorhapha, as the Asilidae and Dolichopodidae); the only exceptions, as far as I remember,

*) An exception among the Bombylidae is *Toxophora*, which has some conspicuous macrochaetae, and the male of which is, nevertheless, holoptic.

occur among certain Calyptrata (for instance *Hydrotaea, Ophyra, Homalomyia*), and just these possess, more than their relatives, the faculty of regulating their momentum. *Diaphorus* (Dolichop.) is also holoptic.

The further discussion of this subject would draw me beyond my present aim, which is a merely practical one, the settlement of the terminology of the macrochaetae, and, by that means, the utilization of a set of characters which, it seems to me, have not yet been sufficiently appreciated in descriptive entomology.

I. *Terminology of the parts of the thorax.*

This terminology refers especially to the Diptera Cyclorhapha; but the same sutures and regions of the pleurae can be recognized, more or less distinctly in the Orthorhapha. Some of the sutures sometimes become less distinct or obsolete; for instance in the Tipulidae.

A. Sutures.

Dorsopleural suture. It runs from the humerus to the root of the wing, and separates the mesonotum (or tergum) from the pleura.

Sternopleural suture. Horizontal suture, below the dorsopleural and parallel to it; it separates the mesopleura from the mesosternum.

Mesopleural suture. Runs from the root of the wing downwards, and separates the mesopleura from the pteropleura.

B. Portions of the pleura.

Mesopleura, square piece in front of the root of the wing and between the dorsopleural and sternopleural sutures. It answers the *anterior lateral plate of the mesothorax* of Lowne (Anat. of the blowfly, Plate 5, f. 5) and to the *parapteron* of Hammond (On the thorax of the blow-fly, J. Lin. Soc. XV, Tab. I).

Pteropleura, situated under the insertion of the wing, and behind the mesopleural suture. It is the *posterior lateral plate of the mesothorax* of Lowne and the *episternum of the mesothorax* of Hammond (l. c.).

Sternopleura; it is that portion of the mesosternum, which, from its position, forms a part of the pleura. It is con-

venient to have a separate name for it, as very important bristles are inserted upon it, although it is not separated by any suture from the middle portion of the mesosternum.

Hypopleura, a distinct piece, above the two last pairs of coxae and behind the sternopleura, from which it is separated by a suture. It answers the *side of the metasternum* of Lowne, and the *epimeron of the mesothorax* of Hammond.

Metapleura, immediately above the hypopleura and behind the pteropleura; a more or less convex, tubercular piece between the root of the wing and the haltere; in the Asilidae, it bears a characteristic, fan-like, row of bristles; between it and the metanotum the *callus metanoti lateralis* of Loew (Mon. N. A. Dipt. I, p. XIV) is placed.

C. Other terms for parts of the thorax.

Scutellar bridges, the little ligaments which, on each side of the scutellum connect it with the mesonotum, crossing the intervening suture.

Praesutural depression, a triangular depression, usually existing in the angle, formed by the transverse mesothoracic suture and the dorso-pleural suture; a slight swelling at its bottom is the *praealar callus.*

Praealar and **postalar callus**; more or less distinct tubercles, which often exist, the former in front of the wing, the latter between its root and the scutellum; they often bear characteristic bristles (In my former writings I have occasionally used the term *praescutellar callus*, for post-alar; but the latter is preferable).

The word *callus*, here and elsewhere, is taken for the german *Schwiele*, in the sense of tubercle, swelling, and not merely of a hardness of the skin (which is the sense of callus in Webster's Dictionary). In this, as in other cases, I have preserved the terminology adopted by Loew, in the Monogr. N. A. Dipt. Vol. I (1862).

Supra-alar cavity, an excavation of the mesothorax, above the root of the wing, along the edge of which the supra-alar bristles are inserted. It is divided in an anterior and a posterior portion by a little ligament, which runs towards the root of the wing **(alar freuum)**.

II. *The terminology of the bristles.*

I. In studying the chaetotaxy of the diptera it was natural for me to begin with those families, in which the arrangement of the bristles is the most simple, that is, with the Diptera Acalyptrata. After having adopted a terminology for these, the next step was to ascertain, how far it was applicable to the other great divisions of diptera. I found that the homologies were to striking that there was no great difficulty in applying the same nomenclature of bristles to all the large divisions of the order. The terminology given below refers therefore, first of all, to the Acalyptrata (especially the Ortalidae and Trypetidae); but at the end of this paper a brief sketch of its application to the principal other divisions is given. This sketch is necessarily approximative, and not exhaustive; many other characteristic hairs and bristles remain, in each family, to be observed, described and, perhaps named; this is left to the specialist; my aim was, by indicating the homologies, to insure the uniformity of the nomenclature.

II. It must be borne in mind that in enumerating the *lateral* bristles of the head or thorax, *one side* only is always considered. Thus: *two fronto-orbital bristles* means that there are two on each side of the head. On the contrary the bristles on the central portions of the head or thorax are enumerated *in pairs*. Thus: *vertical bristles*, one inner and one outer pair, means that there are two vertical bristles on each side, one of which belongs to the inner, the other to the outer pair.

III. The *abdominal bristles* do not require any especial terminology; their position is easily defined by naming the abdominal segment on which they are inserted. Only the *marginal* bristles may be distinguished from the *discal*, as Rondani has done it (Prodr. III, p. 244).

In describing the bristles on the *legs*, the rule enunciated by Prof. Mik (in his Dipterologische Untersuchungen, Vienna 1878, p. 3, note) should be followed: „On the legs, I distinguish a *front* and *hind side*, and *upper* and *under side*. When a leg is stretched out horizontally, and perpendicularly to the longitudinal axis of the body, the front side is that which is turned towards the head; the hind side that which looks towards the anus; the meaning of upper and underside follows as a matter of course. — I call *praeapical bristles* those which occur principally on the front side of the hind femora of many Dolichopodidae; single, elongated, erect bristles." The same term of *praeapical bristle* was used by Dr. Schiner for a characteristic bristle at the end of the tibiae in some Acalyptrata (especially *Sciomyzidae*). Thus the former would be the *femoral*, the latter the *tibial* praeapical bristle.

A. Cephalic bristles.*)

Vertical bristles, so called from their position on the vertex; there are two pairs of them, the *inner* and the *outer* one; both are inserted more or less behind the upper and inner corner of the eye. They are either erect, or the bristles of the inner pair are converging, those of the outer diverging. These two pairs of bristles are the most persistent of all, among the Acalyptrata, although even they disappear in some genera.

Post-vertical pair of bristles, in the middle of the upper part of the occiput, behind an ideal straight line, connecting the vertical bristles of the inner pair. They are generally small or absent; large and conspicuous in *Tetanocera.*

Ocellar pair of bristles, on the ocellar triangle, they are always diverging and pointing forward; — often wanting.

Fronto-orbital bristles, placed on each side of the front, near the orbit, immediately below the vertical bristles, on the little stripes which generally run down from the vertex on

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*) The terminology of the parts of the head is confused and contradictory in different writers, and for this reason an explanation is necessary.

Frontal orbit I call the whole interval between the frontal stripe and the eye The term is not always appropriate, especially for the *Tachinidae,* where that interval occupies the greater part of the front; but I prefer to retain it, rather than to change the terminology adopted by Loew, in the Monogr. N. Am. Dipt. Vol. I. These parts are the *Wangenscheitelplatten* of Prof. Brauer (Die Zweiflügler des Kais. Mus. in Wien.) and the *optica frontis* of Rob. Desvoidy. When there is no distinct frontal stripe, as in some Acalyptrata (for instance the Ephydridae), the dividing line of the orbits is merely an ideal one.

There is no separate term in Loew for the portion of the face, very distinct in many Cyclorhapha between the lower part of the frontal fissure and the antennal foveae; a stripe which generally contains, in the Calyptrata, a vertical ridge, bearing a row of bristles. We have no other choice but to use Robineau Desvoidy's term *facialium* (plural *facialia*), also adopted by Walker. This piece is very distinct in the *Ephydridae,* and although level here, it is bounded by sutures and often bears a row of hairs. Stenhammar calls it *epistomatis partes laterales,* which is too cumbrous for use.

each side of the front of the Ortalidae. There is only one of them (on each side), or two, one below the other; often none. In the Ortalidae, they are generally placed high on the front; in other families (Tetanocera, Sapromyza etc.) they reach lower.

Lower fronto-orbital bristles, occupy the lower part of the front, above the antenna, along the orbit. They are differentiated from the ordinary fronto-orbital bristles in not being quite in a line with them, that is, in being inserted either a little nearer to the orbit (Trypetidae), or a little farther (Scatophagidae); they also differ from the upper fronto-orbital bristles in being smaller, or inserted closer together. They are not of frequent occurrence.

Vibrissa (Meigen, Vol. I, XXIX) a stout bristle on the lower end of the facialia, immediately above the peristomium and below the antennal foveae, on each side, often accompanied by some smaller bristles. Vibrissae are characteristic of some families; they are wanting in the Trypetidae and Ortalidae.

Facial bristles,*) inserted in a series, on each side of the middle portion of the face, above the vibrissae, along the facialia; they are especially conspicuous in the Tachinidae. They are rare among the Acalyptrata; the Ephydridae, for instance, have some weak ones on each side of the face.

In some genera other characteristic bristles occur, less persistent than those enumerated above, that is, appearing sometimes in one species and disappearing in another, in the same genus. Such is an **occipito-orbital bristle,** in some Ortalidae, inserted on the posterior orbit of the eye; one or several **genal bristles,** on the cheek, near the lower corner of the eye etc. A row of bristles along the posterior orbit of the eye in the Dolichopodidae, have been aptly called by Mr. Loew **cilia of the posterior orbit,** similar bristles

*) Rondani (Prodr. III, p. 244) calls the facial bristles *setae orales*, a term which is misleading, because *oralis* means belonging to the *mouth*, as well as belonging to the *face*. (We have the *oral organs*, *oral margin*, both referring to the mouth). Rondani's other terms *setae verticales*, *ocellares*, *frontales*, are the same as mine.

exist in the Diptera calyptrata, in the Asilidae etc. They are often stubble-shaped.

B. Thoracic dorsal bristles.

I divide the thoracic dorsum in regions, as they are indicated by the existing structural features: the dorsal stripes, indicative of the position of the longitudinal thoracic muscles, and the thoracic transverse suture (or rather furrow), separating the anterior from the posterior bundles of the vertical muscles. Thus we obtain: the dorso-central region in the middle (III), and the dorso-humeral (I) and dorso-alar (II) regions on each side. This division will be found very convenient for localiziing any bristle we may have to describe. — These roman numerals will be sometimes used by me to represent the corresponding regions Thus *supra-alar* bristles (II), will mean supra-alar bristles (dorso-alar region).

I. *Dorso-humeral region.* It is bounded by the anterior end of the thorax and the thoracic transverse suture on two sides, and by the dorso-pleural suture and dorso-central region on the two others. I distinguish here:

1. The **humeral bristle** (Loew, Europ. Helomyziden), inserted on the humeral callus; in the Acalyptrata either *one*, or none at all; in the Calyptrata often several.

2. The **post-humeral bristles,** as far as I know, with rare exceptions *two,* inserted immediately above the dorso-pleural suture, between the humeral callus and the root of the wing; both are inserted at the bottom of the praesutural depression, a triangular depression which usually exists here in the Cyclorhapha.

3. A **praesutural bristle,** immediately in front of the thoracic suture, above the praesutural depression. It is *not* found in the Ortalidae, but occurs in most Trypetidae, Sciomyzidae, Sapromyzidae. It may be homologous with a bristle in the same place in the Diptera Calyptrata, but which is less conspicuous among the other bristles which they have in the same region, and which I call *intra-humeral.* The Asilidae possess very characteristic and persistent praesutural bristles (two or more).

The Acalyptrata, as far as I am aware, have no other bristles in the dorso-humeral region. The Diptera Calyptrata have several bristles besides, which may be called the **intra-humeral bristles.**

There are often two, sometimes three or more of them, and they are inserted between the outer dorso-central row on one side, and the humeral callus and the praesutural depression on the other (compare below, the notice on the diptera Calyptrata).

II. *Dorso-alar region*, between the transverse suture and the scutellum on one side, and the root of the wings and the dorso-central region on the other. In the Acalyptrata this region only contains the group of

Supra-alar bristles, usually three; *one* is inserted on the post-alar callus (which is often indistinct in the Ortalidae), very near the scutellar bridge and almost in a line with the praescutellar bristles; the *second*, is in front of the first, just at the top of a little ridge, or ligament *(alar frenum)*, which descends to the root of the wing and crosses the supra-alar cavity; the *third* is in front of the second, on the edge of the anterior portion of that cavity. These bristles are not placed in a straight row; their bases form a triangle. A *fourth* supra-alar bristle sometimes exists in the Ortalidae behind the mesothoracic transverse suture and above the posterior post-humeral bristle. As far as I can ascertain, this last bristle is distinctive of the Section Ortalina, I do not find it in the other sections of the Ortalidae. The diptera Calyptrata often have a series of more than three supra-alar bristles along the edge of the anterior supra-alar cavity. Even among the Asilidae, the supra-alar bristles form a distinct group.

The diptera Calyptrata show other bristles in the same region; they often form a longitudinal row of two or three, placed between the supra-alar group and the outer dorso-central row. They may be called **intra-alar bristles.**

III. *Dorso-central region*, bounded by two imaginary lines, drawn from the scutellar bridges forward, and coinciding with a space free of bristles, that exists on the outer side of the dorsal rows and that is often occupied by a dorsal thoracic stripe. This region contains the **dorso-central bristles**, arranged in two or four longitudinal rows. They are often wanting in the Ortalidae. In the Dolichopodidae, the intermediate pair of rows is represented by two, sometimes only one *(Liancalus)* row of peculiar, minute bristles, which Mr. Mik (Dipterol. Unters. Wien 1878 and also Verh. Zool. Bot. Ges. 1880,

p. 600) calls the **acrostichal bristles.** In the absence of dorsal rows of bristles (for instance in the Ortalidae, Tetanocera etc.) there is often a transverse row of four (or two) bristles, in front of the scutellum; they represent the terminal bristles of the (here non-existing) dorsal rows. I call them **praescutellar bristles.** Sometimes (in Trypeta), there is only a single pair of praescutellar bristles, while a second pair, more in front, and farther apart, represent the (absent) *outer* dorsal row. The praescutellar bristles are always inserted *between* the scutellar bridges. A bristle, usually existing immediately *outside* of the scutellar bridge, almost in a line with the praescutellar bristles, belongs to the dorso-alar region and has been already mentioned above as the hindmost bristle of the supra-alar group. In the Asilidae there are often two *longitudinal* short rows of small bristles in front of the scutellum; they may be called *praescutellar rows.*

C. Thoracic pleural bristles.

Prothoracic bristle (Loew, Monogr. N. Am. Dipt. III, p. 33), a strong bristle, immediately above the fore coxae, which exists in Loew's division Ortalina. The bristle called: *Borste über der Vorderhüfte* in Loew's paper on Helomyzidae, p. 16, is homologous to this. It also exists in Cordylura, but not in Scatophaga; in the Calyptrata, several bristles are generally found here.

Mesopleural bristles, inserted on the mesopleura, in the angle, formed by the horizontal dorso-pleural suture and the vertical mesopleural suture. There are often (for instance in the section *Ortalina*), several bristles here, arranged in a row, along the vertical mesopleural suture; there are two such bristles in Scatophaga, none in Dryomyza, nor in Helomyza. In the diptera Calyptrata, these bristles form a conspicuous row.

Sternopleural bristles, one or several, on the sternopleura, below the longitudinal, sternopleural suture. In Loew's divisions Ortalina and Cephalina, there is one such bristle, above the middle coxae. Loew calls it „Mesothoracic bristle", which name I could not preserve however as too indefinite. There is one such bristle in Scatophaga, one or two in Helomyza and Blepharoptera, two in Sapromyza, three in Dryomyza;

none in Loew's Platystomina. In some Anthomyiae, I perceive three (one anterior, two posterior), in some Dexiae and Tachinae also three (two anterior, one posterior); in Sarcophaga three (one anterior, one posterior and one between them).

Pteropleural bristles inserted on the ptero-pleura are of rare occurrence and generally difficult to perceive; Trypeta, for instance, has a weak bristle, inserted on the pteropleura, under the root of the wing.

Metapleural bristles on the metapleura: they are especially conspicuous in the Asilidae, where they form a fan-like row.

Hypopleural bristles, on the hypopleura, as far as I have observed occur only in some of the Diptera calyptrata, which have a row or a tuft of them.

*Application of the terminology of the bristles to the principal large divisions of diptera.**)

Diptera acalyptrata. To illustrate the chaetotaxy of this division, I select the genus *Trypeta*, as being provided with the most complete set of bristles among the Acalyptrata. The chaetotaxy of the Trypetid *Platyparea poeciloptera* may be expressed thus.

Head. Vertical bristles, outer pair but little shorter than the inner; *postvertical* pair small; *ocellar* pair of moderate size; *fronto-orbital* (2); lower *fronto-orbital* (3).

Thoracic dorsum. I. *Humeral* (1), *post humeral* (2), *praesutural* (1). II. *Supra-alar* (3). III. A *praescutellar* pair; a second pair more in front, but farther apart.

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*) A *arabic* numeral, placed in brackets after the name of a bristle or bristles, indicates the number of them; the roman numerals, *whether placed before*, or, *in brackets, behind*, indicate the region of the thoracic dorsum where the bristle is inserted: I. Dorso-humeral region, II. dorso-alar, III. dorso-central Thus one *intra-alar* bristle (II), means: one intra-alar bristle (dorso-alar region). This addition may seem superfluous, because the term *intra-alar bristle* already implies that the bristle belongs to the dorso-alar region; still, I have occasionally used it because I thought that, owing to the novelty of the subject, it would be easier thus to recall the position of the different bristles.

Pleura. *Mesopleural* (2), *sternopleural* (1), *pteropleural* (1, very small).

Scutellum (4).

This is the usual type of chaetotaxy in the genus *Trypeta* in the wider sense; in describing therefore that of any given species, it will suffice to say: *chaetotaxy normal* and to indicate the differences. Instead of *two* fronto-orbital bristles, there is sometimes only one; instead of *three* lower fronto-orbital bristles, there are often only two; in some cases there are three dorso-central pairs of bristles, the third being in front of the suture (Loew, Die Europ. Bohrfliegen, p. 5); the scutellum has sometimes only two bristles, sometimes as many as six.

If we compare the above formula with the chaetotaxy of the asiatic Trypetid *Ptilona* v. d. W., we perceive at once important differences, which lead us to the conclusion that the genus, although a Trypetid, cannot be referred to *Trypeta* in the wider sense of Meigen and Loew. Ptilona (at least a species from the Philippine Islands, which I have before me, and which seems closely allied to *P. brevicornis* v. d. W.), has no ocellar bristles; only *one* fronto-orbital, inserted very low down, a little above a single fronto-orbital of the lower row. On the thorax: I, no praesutural, III, only one pair of praescutellar bristles. The rest is normal. I hold the absence of the praesutural bristle (I) as the more important and decisive character.

Some african species of *Dacus*, according to Loew, have no dorso-central bristles at all (The asiatic Dacus, which I can compare have one praescutellar pair).

Loew (l. c.) describes the lateral bristles of the thoracic dorsum as forming two rows on each side; I believe that we gain a much clearer view of them when we consider *separately*, those of the dorso-humeral and of the dorso-alar region. As soon as I adopted this mode of grouping, I became aware of the importance of the praesutural bristle (I), as characteristic of a true Trypeta, and of a bristle behind the suture (II), which occurs in the section Ortalina, but is wanting in the other sections of the Ortalidae.

In contrast to the complete chaetotaxy of Trypeta, I will give an instance of an incomplete one, in *Psila fimetaria*.

Head. Vertical bristles: two pairs of medium size; ocellar pair very small; no postvertical, no fronto-orbital.

Thoracic dorsum. I. One praesutural. II. Only two supra-alar, the posterior one is wanting. III. A praescutellar pair. (All the other dorsal bristles are wanting.)

Pleura. No bristles. *Scutellum.* Two.

Diptera calyptrata. *Cephalic bristles.* The vertical (improperly called „soies occipitales" by Macquart, Ann. Soc. Ent. 1845, p. 239), postvertical and ocellar („soies stemmatiques of Macquart"), are easy to distinguish among the other hairs and bristles; the fronto-orbital bristles („soies laterales of Macquart") afford important characters in this family and are sometimes very numerous, forming one or several rows. The facial bristles are also of importance here.

Pleural bristles. They are represented by one or several prothoracic bristles above the fore-coxae; by a number of mesopleural and two, three or four sternopleural, the position of which may afford valuable generic characters. Most of the Calyptrata, except the Anthomyidae, have a tuft or row of bristles on the hypopleura, a region which is destitute of them in the other families of diptera.

The *dorso-central* region contains the usual four rows of bristles, more or less complete;*) the *dorso-humeral* region one or

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*) The *outer* row is called by Mr. Kowarz „die *inneren* Dorsalborsten" (Die Dipterengatt. *Lasiops*, in den Mitth. d. Münchener Vereins, 1880, p. 125, Note), because he applies to the Muscidae the terminology adopted by Mr. Mik for the Dolichopodidae. But I believe that, in a terminology generally applicable, it will be found much more conveuient, even unavoidable, to distinguish the *inner* and *outer* pairs of rows of dorso-central bristles. When the *inner* rows are very much differentiated, as is the case in the Dolichopodidae, the may be called by the name proposed by Prof. Mik for them *acrostichal bristles*. But it must be borne on mind that these bristles represent the *inner rows* of the dorso-central bristles of great many diptera; and that it is, for this reason, unbecoming to call „innere dorsal

several bristles on the humeral callus, two posthumeral, on the praesutural triangular depression, and a few other bristles, inserted in the interval between the humeral callus, the praesutural depression and the outer row of the dorso-central region; these bristles I have called the *intra-humeral bristles*. In the Anthomyina there are usually only two such bristles; one of them seems to be the homologue of the *praesutural* bristle of the Acalyptrata, and is inserted immediately above the praesutural depression, the other is in front of the former, near the humeral callus. In *Calliph. erythrocephala*, *Lucilia caesar* etc. I perceive four such bristles, that are more conspicuous than the others; three along the praesutural depression, the fourth near the humeral callus.

The *dorso-alar* region contains (usually) two, *posterior supra-alar bristles*, inserted on the post-alar callus; the second of them, as usual among the Acalyptrata also, is placed immediately above the *alar frenum;* and a row of *anterior supra-alar bristles*, three or more, along the edge of the anterior supra-alar cavity. The other bristles of this region may be called the *intra-alar bristles* and form a longitudinal series of two or three, between the supra-alar bristles and the outer row of the dorso-central. They sometimes form a spurious, irregular row or series with the intra-humeral bristles of the dorso-humeral region.

The passage from hairs to bristles is to gradual among the Calyptrata, that the *number* of bristles of a given kind is sometimes difficult to state, and sometimes variable in the same species, adventitious hairs assuming the proportions of bristles. The more hairy a species is, the more it seems liable to such variations.

In the *Oestridae*, as an exception, the differentiation between the Macrochaetae and ordinary hairs is feebly developed in some genera and not at all in others.

Borsten" that pair of rows which in reality is the outer. This is one of those cases where it seems to me a change in the nomenclature adopted by former authors becomes unavoidable.

Myopidae. Macrochaetae almost undeveloped, hardly distinguishable from hairs or minor bristles; undistinguishable in Conops; in Stylogaster a pair of conspicuous vertical bristles and distinct fronto-orbital ones.

Dolichopodidae. Only one (outer pair) of *vertical bristles*; a *postvertical* is so placed that it may be interpreted as the inner vertical pair. *Ocellar pair* very high on the vertex, between the vertical bristles and very conspicuous. *Cilia of the posterior orbit* (Loew); *humeral* (1), *posthumeral* (2), some *intra-humeral* (I), distinct *supra-alar* and *intra-alar* bristles (II). In the dorso-central region two dorso-central outer rows; two (sometimes only one; *Liancalus*) rows of small bristles, representing the inner dorso-central rows, and which Mr. Mik has called the *acrostichal bristles*. (Dipterol. Untersuch. Wien, 1878.) On the pleura, in Dolichopus, a characteristic prothoracic bristle.

Asilidae. The cephalic bristles are indistinct among numerous hairs. A pair of ocellar bristles, and another pair, immediately behind, are sometimes discernible. A series of occipito-orbital (often stubble-shaped) bristles, are homologous to the cilia of the posterior orbit (Loew) of the Dolichopodidae.

On the thorax, one (Leptogaster), or more, praesutural bristles (I) are characteristic; several supra-alar bristles on the post-alar callus (II); and a number of intra alar bristles (Asilus); in Leptogaster, a very characteristic single intra-alar bristle (II). Often two longitudinal praescutellar rows of a few short bristles. On the pleurae, sometimes a few mesopleural bristles (Laphria), often hardly distinguishable from hairs, and a characteristic fan-like row of metapleural bristles.

Empidae. The characteristic bristles are often, as in the Asilidae, indistinct among other hairs; but whenever these are less dense, some of the bristles become easily recognizable; one larger humeral, and several smaller ones; posthumeral bristles; a fan-like metapleural row, similar to that of the Asilidae etc.

Bombylidae. It is only in a very few genera of this extensive family that the macrochaetae are differentiated in a more

or less striking manner from ordinary hairs. Thus in *Toxophora* there is a number of conspicuous macrochaetae on the thorax; but as their bases are hidden by other, shorter hairs, their homologies can only be guessed at; on the head, there is an ocellar pair, but no other macrochaetae. *Mulio obscurus* has many macrochaetae about the thorax, the nomenclature of which is as uncertain as that of the macrochaetae of Toxophora; the abdomen of Mulio also, shows conspicuous rows of large bristles. The north-american *Systropus*, although so little hairy, that the macrochaetae would be easily perceptible, has none whatever. The same may be said of *Phthiria*. In the genera of Anthracina and Bombylina, which form the bulk of the family, the dense hairiness or fur prevents to discern any macrochaetae. Still, traces of them may be occasionally seen. For instance, among the yellowish fur of some Bombylii, a pair of black hairs are often visible above the root of the wing, which may represent supra-alar bristles; in Anthrax flava and congeners, a tuft of macrochaetae exist on the post-alar callus.

Therevidae. With the species of Thereva, which are covered with a dense fur, we experience the same difficulty as with the Bombylidae, but that difficulty vanishes with the glabrous or subglabrous species, and here we at once observe much more marked homologies with the normal chaetotaxy of the other families. There are none of the normal cephalic pairy bristles; even the ocellar pair, elsewhere so persistent, is wanting. No humeral bristles; a row of three or four bristles, which must be considered as posthumeral, as they are inserted on the triangular praesutural depression (which is distinctly visible here, although it cannot exactly be called a depression). Two anterior supra-alar bristles (on the edge of the anterior supra-alar cavity), and one posterior (on the post-alar callus). Two pairs (sometimes only one?) of praescutellar bristles, one exactly in front of the other. Four scutellar bristles.