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THE HONORARY SECRETARY.

"It will flourish, if naturalists, chemists, antiquaries, philologers, and men of science in different parts of *Asia*, will commit their observations to writing, and send them to the Asiatic Society at Calcutta. It will languish, if such communications shall be long intermitted; and it will die away, if they shall entirely cease." SIR WM. JONES.

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Part II.—PHYSICAL SCIENCE.

No. I.—1874.

On the general Theory of Duplex Telegraphy.

By Louis Schwendler.

(Received December, 1873, read 4th February, 1874.)

Introduction.

The name of "Duplex Telegraphy" has been given to that mode of Electric Telegraphy which admits of the simultaneous transmission in opposite directions of signals between two stations through a single wire. That this name is far from happily chosen, is evident; but, as it is current and has already gained a recognized footing, it is not considered advisable to endeavour to replace it now by a more rational one, and it will therefore be adhered to throughout this paper.*

In the following investigation I shall endeavour to develop the mathematical theory of "Duplex Telegraphy" in its most general form, with the object of determining not only the best arrangement for any particular method, but also the relative values of different methods.

It is manifest that having from general considerations decided on the best method, and further determined the best arrangement for this method, the remaining difficulties, due to the nature of the problem itself, will be exhibited in a clearer light, and the means of overcoming them may then be more easily discerned.

* The German language possesses a peculiarly suitable word in "*Gegensprechen*" and the idea is fully rendered by "*Gleichzeitiges Gegensprechen.*"

It is believed, however, that the sequel will shew, that if the best method be adopted, and for this method the best arrangement be selected, to suit the particular line on which the method is to be employed, the difficulties that stand in the way of Duplex Telegraphy will hardly be greater than those which are encountered every day in ordinary single Telegraphy.

Imperfect Historical Sketch.

Having access to but scanty records in this country, I am not in a position to give an exhaustive history of this most important invention, and consequently the following sketch is necessarily incomplete, and must be taken as merely introductory, it being relegated to those better situated in this respect than myself to clear up the doubtful points of priority, and produce, what is much required, a complete history.

The idea of sending signals in opposite directions simultaneously through a single wire is by no means a new one. As early as 1849, Messrs. Siemens and Halske of Berlin took out a patent in England* for the simultaneous transmission of a plurality of messages by a suitable combination of wires, and, although this patent does not refer directly to Duplex Telegraphy as it was subsequently understood, it must notwithstanding be regarded as a forerunner of it. In point of fact Dr. Wr. Siemens's idea represents the general problem of which Duplex Telegraphy is only a particular case.

In 1854 Dr. Gintl of Vienna tried his "compensation" method of "duplex" working between that capital and Prague,† and on the 30th November of the same year read a paper before the Kaiserlich Königliche Acadamie of Science of Vienna‡ on the practical solution of the same problem by employing a Bain's electro-chemical Telegraph apparatus instead of a Morse's receiving instrument.

In the summer of 1854, after Dr. Gintl's experiments between Vienna and Prague had brought the subject prominently to notice, Messrs. Siemens and Halske of Berlin, and Hr. Frischen independently, invented the "differential" method.

In January 1855, Edlund§ made experiments on the line between Stockholm and Gothenburg. He employed a "differential" method, which he had invented in 1848 for the purpose of measuring accurately Faraday's "extra-currents."

In papers read at Paris on the 16th July and 6th August 1855‖

* 23rd October, 1849. The actual wording of the English patent is unknown to me.

† Polyt. Central bl., 1853, p. 1475.

‡ Wien Akad. Sitzungsber., XIV.

§ Pogg. Ann., 1856, vol. 98, page 634.

‖ Pogg. Ann., 1856, vol. 98, page 123.

before the Academy of Science by M. Zantedeschi, he claims the honour of having first suggested the idea of Duplex Telegraphy, for as early as 1829 he had proved the possibility of the simultaneous transmission of currents in opposite directions through a single conductor. Having never seen his original communication of 1829, it is impossible for me to say how far these early ideas of Zantedeschi bear on the problem; but it is certain that both he and Dr. Gintl took a great deal of trouble to prove an erroneous theory, *viz.*, that two distinct electrical currents can pass simultaneously in opposite directions through the same conductor without in any way interfering with each other. Such a supposition is in direct opposition to the electrical laws which were already known in 1829,* and besides is in no way required in order to explain the simple phenomenon of Duplex Telegraphy.†

None of the above methods, however, came to have extended, or indeed any, practical application. They appear to have been attempted doubtingly and without confidence, and, although the trials are generally reported to have been successful, yet the methods were rejected as impracticable, and came to be regarded as merely of scientific interest.‡

Only recently, after a torpid existence of almost twenty years, has Duplex Telegraphy been revived, and come to be the leading topic in Telegraphy, securing, after such a lapse of time, the amount of public interest it rightly deserves.

To Mr. Stearns, an American Telegraph Engineer, is due the honour of having appreciated the real value of Duplex Telegraphy, and of having (by giving the system, modified by improvements of his own, an extended application on the lines of the United States) proved its thorough practicability.

Enquiry into the Causes which have delayed the Introduction of the System.

When Steinheil in 1837 announced his discovery of the feasibility of employing the earth to complete the electric circuit instead of a return wire, Telegraph Engineers immediately recognized its immense mercantile value, and did not delay to verify his results.

Now, in the career of Telegraphy, the invention of duplex working ranks second only in importance to Steinheil's discovery. The utilization of the earth reduced by one half the number of wires required to carry a given traffic: Duplex Telegraphy again almost halves this number. In

* Ohm published his classical work "Die galvanishe Kette mathematisch bearbeitet" in the year 1828.

† Dr. Wr. Siemens, Pogg. Ann., vol. 98, page 123.

‡ For the light in which Duplex Telegraphy was regarded up till quite lately, see *Schellen, Dub, Sabine, Blavier, Kuhn,* &c.

the face of this fact it is not easy to understand why the one idea received immediate and universal application, while the other, of only about 10 years more recent date, has met until now with universal neglect; but on closer examination it will be found that there have been perfectly comprehensible, although not all rational, influences at work.

An enquiry into the circumstances, therefore, that have caused the discovery of a system, the introduction of which must mark the second great era in Telegraphy, to lie fallow for nearly twenty years is of the utmost interest and cannot fail to be instructive with regard to the prospects of future progress.

From an examination of the methods originally proposed for duplex working, it will be found that they do not in any way essentially differ from those which may now come into actual use. The causes therefore, which have prevented the introduction of the system, must be sought for external to the methods.

The first of these, we find, is that the invention was in advance of the requirements of the age. Telegraph lines had already been constructed, which were quite capable of carrying the given traffic and even more. Further, any increase in traffic could be easily met by an increase in the number of wires on the existing Telegraph posts, instead of by resorting to a system, which had a complex appearance, and after all might not answer.

However, although the above considerations explain the course of events in certain limited instances, and up to a certain time, they do nothing towards justifying the costly expedients that have been generally adopted until recently in preference to introducing Duplex Telegraphy. For instance, the reconstruction and multiplying of long overland lines, and especially the laying of a second submarine cable when the traffic became too great for one.

It is true that the successful application of any duplex method requires lines of a more constant electrical condition, receiving instruments of a larger range,* and Telegraph operators of a somewhat better professional education; but, surely, these three conditions have not all *at once* become fulfilled (since 1872) so as to make Duplex Telegraphy possible only just now? No—the causes, which have delayed its introduction so long, have been of a much less technical and more irrational nature.

The mere fact of the duplex methods appearing complex prevented Telegraph administrations from thinking seriously of introducing them.

* By the "range" of a telegraph instrument I understand the ratio of the largest to the smallest force by which the instrument in question can be worked without requiring a fresh mechanical adjustment. For instance, Siemens's beautiful relays can be easily adjusted to a range of 20, *i. e.*, they can be made to work with one cell through an external resistance equal to their own resistance, and with 10 cells through no external resistance, *without* giving the tongue a fresh adjustment.

The ingenious methods were never tried with that zeal and perseverance which is necessary to carry a new invention successfully through. They were indiscriminately rejected after a few trials made without method or consideration, and the real conditions of success or failure were never examined or pointed out. Thus naturally a prejudice was created against Duplex Telegraphy, and it was fostered by a host of school literature up to the latest time as pointed out before. Further, not a single physicist or electrician investigated the question with a view to ascertaining what quantitative effect the variable condition of lines has on duplex working as compared with single working.

If such an investigation had been made, it would have been found that the technical obstructions in the way were by no means so formidable as had been represented, and that the electrical condition of the lines, as well as the perfection of the instruments, and the professional education of the staff, would have fully admitted of the successful introduction of Duplex Telegraphy at least 10, if not 20, years ago.

It is true indeed that the suggestion of using condensers for balancing the charge and discharge of a line has only been made very lately, being one of Stearns' happy ideas; but this should have been no reason against introducing the system on short and overworked lines, where the charge and discharge is imperceptible. If only one Telegraph administration had shewn the perfect practicability of the system on a short line, the cloud of prejudice would have been dissipated, and suggestions for overcoming the charge and discharge on long overland lines and submarine cables would have been readily enough given, and thereby large capitals saved.

To sum up, therefore, we have the following causes which acted persistently against the introduction of Duplex Telegraphy.

Firstly, the invention was in advance of the age.

Secondly, the Telegraph profession, young as it is, is far more conservative than is good for the advance of Telegraphy, and on the whole Telegraph administrations and staffs have by no means that professional education which is required to conduct practical experiments with a clear understanding, and thence deduce rational conclusions. Thus prejudice was created, which was increased from year to year by authors of school literature writing most discouragingly of the subject.

Thirdly, unfortunately, during all that time no physicist found it worth his while to investigate the duplex methods with a view to ascertain quantitatively what can be expected of them, and how they actually compare, with respect to safety, with single working.

Fourthly, duplex working itself could not progress, because it was neither tried nor investigated, and hence no suggestions for overcoming the difficulty of charge and discharge were called for.

Great honour must therefore be given to Mr. Stearns who brought up the subject again so prominently, and who by his zeal succeeded in introducing it on a large scale, and so elevated the ingenious methods from the questionable position of "interesting scientific experiments."

I think far less of his idea of introducing condensers or Ruhmkorff's coils to balance the charge and discharge of lines, than of his having taken the neglected child up again, against the prejudice of his own profession, and shown that it could have a healthy existence even in the backwoods of America. I trust that these remarks will not be considered irrelevant in the present investigation, since they tend to shew how real progress in one of the youngest branches of applied science may be retarded for a considerable period by nothing but prejudice of the profession themselves, for whom progress should be the first essential; and administrations will see how much the advance of Telegraphy will always depend on their recognizing and encouraging by experiment inventions that are theoretically sound and tend in the right direction.

General Considerations.

Before entering on the solution of the problem for any particular duplex method, it will be advisable once for all to state definitely the nature of the general question before us. This will not only save time, but the subsequent special solutions can then also be made under a general guide, and thus being well linked together, the whole investigation will become far more lucid and concise than it otherwise would be.

While in ordinary (single) Telegraphy the signals are always produced in the same way, *i. e.*, by the signalling current arriving through the line from the distant station, the signals in Duplex Telegraphy may be produced in either of two ways, essentially different from each other. Namely, if the times of sending from the two stations fall together, *i. e.*, no current, or double current, or any difference of currents, is in the line, the signals, so long as this state of the line exists, are produced wholly or partly by the battery of the receiving station. Signals produced in this way we shall call "duplex signals," and these signals alone indicate the essential difference between duplex and ordinary Telegraphy.

If, however, the moments of sending from the two stations do not fall together, the signals are then produced as in ordinary telegraphy, and may be appropriately designated "single signals."

It will be clear then that when the two stations are at work at the same time "duplex signals" and "single signals" must necessarily follow each other in accidental succession. Nay, one and the same signal produced in either station may be partly a "duplex" and partly a "single" signal.

To secure, therefore, regularity of working, the signals produced in either way should be invariably of equal strength.

Further, as in Duplex Telegraphy the receiving instruments must be always permanently connected up with the line, it is one of the first requirements that the out-going or sent current from any station should in itself have no effect whatever on the receiving instrument of *that* station, in order that the instrument may be entirely free to receive signals from the distant station. Thus we invariably have two conditions to fulfil in duplex working, independent of the particular method adopted, namely:—

1. *The receiving instrument of each station should not be affected by its own sending.*

2. *The duplex signals and single signals must be of equal strength.*

If these two conditions, which are necessary and sufficient, could be always fulfilled, Duplex Telegraphy would be entirely on a par with single Telegraphy, for the sending would not only not interfere with the receiving—the more important condition of the two—but the received signals would also be constant in strength, and, therefore, frequent adjustment of the receiving instrument would be no more required than in single Telegraphy.

Theoretically of course every duplex method hitherto suggested fulfils these two conditions, otherwise the method would have to be rejected *a priori* and could not find any place in this paper.

Practically, however, the different methods may behave very differently with respect to the fulfilment of these two conditions, nay, even one and the same method is sure to give quite different results in this respect by only altering the magnitude of the resistances of which the arrangement consists. For in practice variations, especially in virtue of the line having by no means a constant electrical condition, are necessarily going on. These unavoidable variations it is clear may cause very different quantitative disturbances of the two conditions (1) and (2) either if we compare different methods, or the same method under different resistance arrangements.

To make the foregoing clear, we will designate:—

By p the force which acts on the receiving instrument on account of not being able to fulfil the first condition absolutely;

By P the force which acts on the same instrument, when the distant station is sending *alone*, *i. e.*, "single signals;"

And by Q the force which acts on the same instrument, when both stations are sending *simultaneously*, *i. e.*, "duplex signals."

Then the first condition (1) is expressed by:—

$$p = 0 \qquad \text{(I)}$$

and the second (2) by

$$P - Q = 0 \qquad \text{(II)}$$

Further if p cannot be always kept rigidly equal to zero (on account of unavoidable variations in the system) we should at least have:—

$$\frac{p}{P} = D \text{ as small as possible } \ldots\ldots \quad \text{(III)}$$

and if P cannot be always kept rigidly equal to Q, we should at least have:—

$$P - Q = S \text{ as small as possible. } \ldots\ldots\ldots \quad \text{(IV)}$$

p, P and Q being functions of the resistances and electro-motive forces of the system, which are known so soon as the particular duplex method has been selected.

The general problem which is to be solved for duplex Telegraphy may now be clearly stated as follows:—

D *and* S *are two known functions which must be rigidly equal to zero when no variation in the system occurs; and which for any given variation in the system must be as small as possible, and approximate rapidly towards zero as the variation in the system becomes smaller and smaller.*

Thus the solution of the problem for any given duplex method will always be a question of the Minima and Maxima Calculus.

Having then ascertained the best arrangement for each duplex method, the methods can be compared *inter se*, and that method will be best and should be selected for use which for any given variation in the system gives the least absolute magnitude to the functions D and S.

If we suppose, however, that the particular duplex method is not given, the problem to be solved becomes more general, but would still be entirely within the limits of the Variation Calculus, furnishing no doubt a very interesting and important application of that most powerful mathematical instrument. The general solution would at once determine the best method possible, after which special solutions would give the best arrangement for that best method.

It is, however, not my intention to endeavour to solve here the duplex problem in this most general form. To be able to indicate so general and desirable a solution is by no means identical with being able to effect it. The task before me is far more simple, since, as already pointed out, I shall investigate each duplex method separately to determine its best quantitative arrangement, and ultimately compare the different methods to ascertain their relative values.

To do this, the question may be attacked in two different ways, depending on the purpose for which the solution is required.

Namely, either the solution is to be made when considering the line as a variable conductor only, but not acting perceptibly as a Leyden jar; or the line is to be considered as constant in conduction and insulation, but acting as a Leyden jar of large capacity. In the first case the solution would be directly applicable to short overland lines (not over 200 miles in length), and in the second case to submarine cables, which, if good, may always be considered sensibly constant in conduction and insulation.

Further, as a long overland line acts both as a variable conductor and as a Leyden jar of sufficiently large capacity, it would then be necessary to give a solution with respect to both these effects. To obtain, however, the same result without rendering the problem too intricate, it will be best to separate the two questions from the beginning, and afterwards combine their solutions judiciously for application to the case of overland lines.

1st PROBLEM. *What is the best arrangement of any given duplex method when the line is regarded as a variable conductor, but not as acting perceptibly as a Leyden jar?*

2nd PROBLEM. *What is the best arrangement of any given duplex method, when the line is regarded as a Leyden jar of large capacity, but not as a variable conductor.*

The second problem may be expressed more clearly as follows:—

2nd PROBLEM. *What must be the distribution of condensers along a given resistance, in order that the two essential conditions* (I *and* II) *may be least disturbed for a speed of signalling variable between two fixed limits?**

It is clear that the nature of these two problems is very different, because in the first we have to deal with forces constant with respect to time, while in the second the forces acting are functions of time, *i. e.*, of the

* A telegraph line always acts as a condenser with capacity and conduction resistance in each point of its entire length, while an artificial condenser, such as a Leyden jar, which we are able to produce sufficiently cheaply, has only capacity but no perceptible conduction resistance in each point. This is in fact the essential difference between a line and a condenser, and, therefore, in order to render their charges and discharges under the same circumstances as nearly as possible equal, as is required for duplex working, it will be necessary to find the law according to which to distribute a certain given system of condensers along a given resistance.

This law will clearly be a function of the signalling speed within its limits of variation. For instance, say the signalling speed is constant, or its range zero, then clearly one condenser connected to any point of the given resistance would suffice; only the magnitude of the capacity of this *one* condenser would be determined by its position with respect to the resistance, and in addition to this would of course be fixed by the signalling speed and the known capacity of the line.

Further, say the speed of signalling is variable between 0 and ∞, or its range is infinite, then clearly only an infinite number of small condensers distributed along the given resistance in the very same manner as the capacity is distributed along the line would strictly answer the purpose: in fact, the condenser required in this imaginary case would be nothing more or less than a second Telegraph line, identical with the one used for signalling. In practice, however, the speed of signalling varies only between narrow limits, and therefore the number of condensers required to reproduce as nearly as possible the action of the line with respect to charge and discharge, will become few, especially if the best system of distribution has been determined. Until this law is known we can do nothing but find it approximately by experiment, however tedious it may be to do so.

signalling speed. (The forces in this case are proportioned to the *true currents.*) The latter problem being far the more intricate and for my special purpose only of secondary importance, I shall begin with the solution of the first.

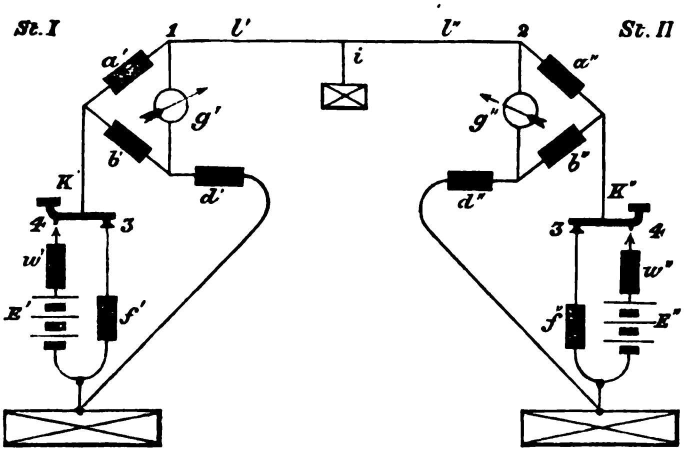
Solution of the 1st Problem for any given Duplex Method.

What is the best arrangement of any given duplex method, when the line is regarded as a variable conductor, but not as acting perceptibly as a Leyden jar?

I. The Bridge Method.*

This arrangement for duplex working is based on the well known method of comparing electrical resistances "Wheatstone's Bridge," and Figure 1 gives the general diagram, when this method is applied for duplex working.

Fig I.



It has also been proposed to use Ruhmkorff's coils for balancing the effect of charge and discharge. This method, however, I believe must be always much inferior to the one of using condensers, inasmuch as the strength of a Voltaic induction current scarcely depends on the speed of signalling, while the charge and discharge of a line, it is well known, is not at all an inconsiderable function of the signalling speed.

Therefore, if the strength of the induction current had been adjusted to balance the charge and discharge of the line for a certain signalling speed, the balance would be considerably and at once disturbed if the speed varied even slightly; and since so long as hand signalling is used a certain variation in the speed of signalling will always exist, this method will prove a failure, or at all events will render fresh adjustments more frequently necessary than when condensers are used.

* Dr. Wr. Siemens mentions this method in Pogg. Ann. Vol 98, p. 122, 1856.

Explanation of Diagram.

E, electromotive force of the signalling battery.

β, internal resistance of the signalling battery.

k, Telegraph key of peculiar construction to be described hereafter.

g, the receiving instrument connected up in that branch of the bridge which when measuring resistances would contain the galvanometer. The letter g represents also the resistance of the receiving instrument.*

a, b, and d are the branches of the bridge.

f, the resistance between the rest-contact of the key and earth.

w, an additional resistance to be inserted in the battery branch for reasons to be given further on.

i, the resistance of the resultant fault ("real absolute insulation" of the line) acting at a distance l' from station I and at a distance l'' from station II (both l' and l'' expressed in resistances so that $l' + l'' = l$ equal the "real conductor resistance" of the line).

Further:

L' the "measured conductor"† resistance of the line when measured from Station I,

$$\therefore L' = l' + \frac{i\,l''}{i + l''}$$

L'' the "measured conductor"* resistance of the line when measured from station II,

$$\therefore L'' = l'' + \frac{i\,l'}{i + l'},$$

ρ' the complex resistance of the duplex arrangement in station I, *i. e.*, the resistance between point 1 and earth.

ρ'' the complex resistance of the duplex arrangement in station II, *i. e.* the resistance between point 2 and earth.

To be quite general we must suppose that the Telegraph line, which connects the two stations I and II, has a different resistance when measured from station I than when measured from station II, and that therefore the best resistance arrangement of station I must be also different from that of station II with respect to magnitude of resistances.

The resistances which are similarly situated in both the stations will be designated by the same letters, and to indicate the station to which they belong, each letter will have *one* accent in station I and *two* accents in station II.

Mr. O. Heaviside Phil. Mag. Vol. XLV, 1873, states that Mr. Eden of Edinburgh claims to have suggested this method at about the same time as Mr. Stearns of Boston U. S. Am. took out a patent for it.

* Siemens's polarized relays are well adapted for this purpose on account of their great sensitiveness and wide range; d'Arlincourt's relays would also answer well.

† Generally these measured values L' and L'' will be different from each other, especially for long overland lines. They can become equal only under two conditions, either if the resistance of the resultant fault (i) is so great that the total conductor resistance of the line ($l' + l'' = l$) can be neglected against it, or for any magnitude of i, if the latter has a position in the middle of the conductor, *i. e.* when $l' = l'' = \frac{l}{2}$

Further, if a relation between the resistances of one station has to hold good between those of the other station also, the letters will be used without any accents.

The great practical advantage of the Bridge method, it will be clear at once, is that any kind of receiving instrument which has been used for single working may also be employed for Duplex Telegraphy. This fact must always be of great consideration for any administration that contemplates the general introduction of Duplex Telegraphy.

General expressions for the two functions "D" *and* "S."

To obtain the functions D and S, we have first to develope the general expressions for the forces p, P, and Q, say for station I.

By p' we understand the force which acts on the receiving instrument g' of station I when that station is sending alone. (Station II at rest.)

p', in our particular case, is therefore proportional to the current which passes through the galvanometer in a Wheatstone's Bridge when balance is not rigidly established, thus

$$p' \propto E' \frac{\Delta'}{N'}$$

where $\Delta' = a' d' - b' (L' + \rho'') = a' d' - b' c'$

and

$$N' = g' (b' + d') (a' + c') + f' \left\{ g' (a' + b' + c' + d') + (c' + d') (a' + b') \right\} + a' c' (b' + d') + b' d' (a' + c')$$

Further, by P' is understood the force which acts on the receiving instrument in station I, when station II is sending alone: *Single Signals.*

This force in our particular case is proportional to the current which passes through the receiving instrument of station I when station II is sending alone, and we have consequently

$$P' \propto C'' \mu' \psi'$$

where C'' is the current which enters the line at point 2, when station II alone is sending; $C'' \mu'$ the part of this current C'' which arrives actually at point 1 (on account of leakage between points 2 and 1, a part of C'' is lost), and $C'' \mu' \psi'$ that part of the current $C'' \mu'$ which ultimately produces the signal (*single signal*) in station I. The current $C'' \mu'$ arriving at point 1 branches off in two, one part goes through a' and the other through g' to earth.

Further $$C'' = E'' \frac{m''}{N''}$$

$$\therefore P' \propto E'' \frac{m''}{N''} \mu' \psi'$$

where $$m'' = g'' (b'' + d'') + d'' (a'' + b'')$$

$$\mu' = \frac{i}{i + l' + \rho'}$$

$$\psi' = \frac{f'(a' + b') + a'(b' + d')}{(f' + d')(a' + b' + g') + b'(a' + g')}$$

and N'' an expression identical in form with N'.

Further by Q' we understand the force which acts on the receiving instrument of station I, when both stations are sending simultaneously: *Duplex Signals.*

This force is again proportional to the current which under these circumstances passes through the receiving instrument g' of station I.

This current can be expressed by

$$E' \frac{b'}{n'} - \sigma' \phi'$$

and therefore:

$$Q' \propto E' \frac{b'}{n'} - \sigma' \phi'$$

σ' being the current actually in the line at point 1 when both stations are sending simultaneously; and this current, being the algebraical sum of two currents may be either +, 0, or —. We will suppose that σ' contains the sign itself.

Further we have

$$\sigma' = \frac{E' m'}{N'} - \frac{E'' m''}{N''} \cdot \mu'$$

$$n' = (b' + d' + f')(a' + g') + b'(f' + d')$$

and ϕ' is a function which becomes indentical which ψ' if we put

$$w' + \beta' = f'.$$

Therefore the two functions D and S are for the Bridge method (station I) most generally expressed as follows:

$$D' = \frac{E'}{E''} \frac{N''}{N'} \cdot \frac{1}{\mu'} \frac{\Delta'}{m'' \psi'} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (III')$$

$$\text{and } S' = E'' \frac{m''}{N''} \mu' \psi' - \frac{E' b'}{n'} + \sigma' \phi' \quad \ldots\ldots\ldots\ldots \quad (IV')$$

and similar expressions will be obtained for station II, namely

$$D'' = \frac{E''}{E'} \frac{N'}{N''} \cdot \frac{1}{\mu''} \frac{\Delta''}{m' \psi''} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (III'')$$

$$\text{and } S'' = E' \frac{m'}{N'} \mu'' \psi'' - \frac{E'' b''}{n''} + \sigma'' \phi'' \quad \ldots\ldots\ldots\ldots\ldots \quad (IV'')$$

Rigid fulfilment of the first condition, i. e., $D = 0$.

For station I, we have $D' = 0$
which equation can only be satisfied by $\Delta' = 0$
since the other factor of D' cannot become zero for quantities larger than 0 or smaller than ∞. Then substuting for Δ' its value, we have

$$a' d' - b' (L' + \rho'') = 0 \quad \ldots\ldots\ldots\ldots \quad (V')$$

or balance in station I, when that station is sending and station II is at rest, must be rigidly established.

Therefore, if balance in station I is disturbed, say by L' varying or by any other cause* external to L', we must have means of conveniently re-establishing balance without delay. This of course could always be done by altering either all the branches, a', b', and d', or any two of them, or only one of them; but it is clear that so long as the variation of L' which disturbs the balance does not exceed certain limits, balance may be regained by altering only *one* of the three branches available, and as this will also be more convenient in practice than altering two of the branches, or all three simultaneously, we shall make the supposition that :—

'*Balance is re-established by an appropriate re-adjustment of one of the three available branches.*'†

The question therefore is, which of the three branches, a, b, or d, is the best adapted for the purpose ?

To decide this we must remember that for station II, in accordance with the first condition ($D = 0$), a similar equation has to be fulfilled, namely

$$a'' d'' - b'' (L'' + \rho') = 0 \quad \ldots\ldots\ldots\ldots \quad (V'')$$

Now ρ' the complex resistance of the arrangement in station I, is a function of all the resistances in station I, and similarly ρ'' the complex resistance of the arrangement in station II, is a function of all the resistances in station II. Therefore, generally, if in order to obtain balance, say in station I, any of the three branches a', b', d' were adjusted, ρ' would alter in consequence of this re-adjustment, and thereby the balance in station II (equation V'') would be disturbed, and vice versâ. In other words the re-adjusting in one station would interfere with the balance in the other station,

* Causes of disturbance to balance external to L' are inappreciable in practice and therefore may be neglected from the beginning.

† Finally, when the best resistance arrangement has been found, the resistance of the different branches will be expressed in terms of L, and therefore to keep the best arrangement when L varies between any two given limits will involve necessarily a simultaneous alteration of the resistance of all the branches.

If, however, the variation of L is small in comparison with L itself, an alteration of *one* branch for the purpose of re-establishing balance is justified, and would be absolutely correct if the variation of L were infinitesimal.

and therefore rigid balance could be only attained after a series of successive adjustments in both the stations, and then only, from a theoretical point of view, approximately, introducing practical difficulties almost insurmountable.

However, examining the positions of the three branches, it will be seen at once that b acts as the galvanometer branch of a bridge for any current arriving through the line. Thus if we were to fulfil the condition,

$$a\,d - f\,g = 0 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad \text{(VI)}$$

for both stations, the value of ρ would become at once independent of b,* and consequently any adjustment of b' to re-establish balance in station I would not affect in the slightest degree the balance in station II, and *vice versâ*.

Thus, presupposing the fulfilment of this condition (equation VI) for both the stations, the branch b would evidently be the best suited for adjustment.† Under these circumstances it would then be clear that balance in either station can be obtained by a *single* adjustment of b, and therefore we may call equation VI "*the immediate balance condition*," and the fulfilment of this condition, being of the greatest practical importance to ensure the success of duplex working, we are justified, nay even compelled, to use this relation (equation VI) as the basis for all subsequent investigations.

We will therefore suppose henceforth, that

$$a\,d - f\,g = 0 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad \text{(VI)}$$

is rigidly fulfilled for both the stations.

But, as the value of f depends on the position of the key, which during signalling moves from contact 3 to contact 4 and back, the rigid fulfilment of equation (VI) necessitates at once that

$$w + \beta = f \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad \text{(VII)}$$

not only for both the contacts 3 and 4, but also for all the intermediate positions of the key. Thus supposing that $w + \beta = f$, *i. e.* the resistance from contact 4 through battery to earth equal to the resistance from contact 3 to earth, a key constructed in such a way that contact 4 is not broken before contact 3 is made, and that contact 3 is not broken before contact 4 is made, would fulfil the required condition entirely. Keys of this kind can be easily enough constructed. It is true that in any such key, there will be always a moment when the contacts 3 and 4 are simultaneous, and when therefore the resistance to earth is not f, as it ought to be, but only

* $\rho = \dfrac{(g + d)(a + f)}{a + d + f + g} - \dfrac{(ad - fg)^2}{F(b)}$

Therefore if $ad - fg$ is very near zero, ρ becomes most rapidly independent of b.

† Further, it must be remarked that, even if the condition $ad - fg = 0$ be not rigidly fulfilled, still by adjusting in the branch b we have "*accelerated*" balance, whereas by adjusting in a or d we should on the contrary have "*retarded*" balance.

$\frac{f}{2}$. If it is, however, considered that the time during which this error lasts is very small compared with the time it takes to make a signal, its disturbing effect will never be appreciable in practice, *i. e.* ρ will remain sensibly constant during the time the key is moved to produce a signal.

There will be no practical difficulties connected with the fulfilment of equation (VII), and therefore also none with the fulfilment of equation (VI); for β the internal resistance of the signalling battery is the only quantity which of itself can alter in time. However, this variation of β for any efficient form of signalling battery being invariably steady and small, it will be always possible to neutralize its action in time by a simple re-adjustment of w.

If Leclanché's cells are used, or well prepared Minotti's, a weekly adjustment of w should be sufficient. The measuring of β will always be an easy matter.*

Rigid fulfilment of the 2nd Condition, i. e., S = 0.

The general expression for S′ was

$$S' = \frac{E'' m''}{N''} \mu' \psi' - \frac{E' b'}{n'} + \sigma' \phi' \quad \ldots\ldots\ldots\ldots\ldots \quad \text{(IV')}$$

Remembering that by equation (VII)

$$w' + \beta' = f'$$

we know that $\psi' = \phi'$, and substituting further for σ' its value, the general expression for S' becomes :—

$$S' = \frac{E'' m''}{N''} \mu' \psi' - \frac{E' b'}{n'} + \left\{ \frac{E' m'}{N'} - \frac{E'' m''}{N''} \mu' \right\} \psi' \quad \text{(IV')}$$

and this form of S shews at once that it is perfectly immaterial for duplex working by the Bridge method whether the same or opposite poles of the two signalling batteries be put to line,† for in both cases equation (IV′) becomes :

$$S' = \frac{E' m'}{N'} \psi' - E' \frac{b'}{n'} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad \text{(IV')}$$

Further, it will be seen that the right hand member of equation (IV′)

* My friend Mr. R. S. Brough suggested the following very simple method for keeping

$$w + \beta = f \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad \text{(VII)}$$

Insert a small galvanoscope in the branch b, for which balance is established with respect to the received current, *i. e.*

$$ad - fg = 0 \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad \text{(VI)}$$

Now note the deflection on the galvanoscope when both stations are sending simultaneously, and again when the station for which β is to be measured is sending *alone.* Then clearly if these two deflections are equal, $w + \beta$ must be equal to f. If the two deflections are not equal then alter w until they become equal. After the determination is made, the galvanoscope is short circuited.

† In practice however I prefer to put the same, namely, the positive poles to the line, as then defective insulation will not be felt so much.

can be transformed* into $E'\frac{\Delta'}{N'}$, which is egual to p', or we have generally

$$S = p$$

i. e. the difference of forces by which duplex and single signals in the same station are produced is equal in magnitude and sign to the force by which balance in that station is disturbed.

Consequently the rigid fulfilment of the first condition $(D = 0)$ will entail the rigid fulfilment of the second condition $(S = 0)$ and this it will be clear is only due to the fact that the complex resistance ρ is independent of b, and that the key during signalling does not alter ρ; whence it follows that the perfection of the key in this respect is of the greatest importance. There are, however, no practical difficulties connected with the construction of a key which fulfils condition (VII) perfectly.

By the aid of the relations given in equations (VI) and (VII) we have therefore gained the great practical advantage, that Duplex Telegraphy will be entirely on a par with single Telegraphy, if the means of attaining rigid balance are sufficiently accurate, convenient and rapid.

But, even supposing that we are unable to keep that balance rigidly for any length of time (on account of L varying), we can nevertheless bring the regularity of duplex working as near as possible to that of single working by making D and S as small as possible for any given variation of L.

Rapid approximation of the two functions* D *and* S *towards zero.

For station I we had

$$S' = p' \propto \frac{E'\,m'}{N'}\psi' - \frac{E'\,b'}{n'} \quad \ldots\ldots\ldots\ldots \quad (IV')$$

which we may also write

$$S' = p' \propto \frac{E'b'}{n'}\left\{\frac{1}{1-\dfrac{\Delta'}{m'\,\psi'}} - 1\right\} \quad \ldots\ldots\ldots \quad (IV')$$

---

* We have

$$\psi = \frac{k}{n}$$

$$N = \frac{mk - \Delta n}{b}$$

$$\therefore S = \frac{E\,b\,\Delta}{mk - \Delta\,n}$$

$$= \frac{E\,b\,\Delta}{b\,N}$$

$$= \frac{E\,\Delta}{N} = p$$

since $$\frac{m'}{N'} = \frac{b'}{k' - \Delta' \frac{n'}{m'}}$$

and $$\psi' = \frac{k'}{n'}$$

Further if we call b' the value of b which in station I establishes rigid balance for any given values, a', d' and L', we have

$$\Delta' = b.' \, \delta L'$$

where $\delta L'$ is the variation of L' which throws the balance out, and which variation may be either positive, zero or negative ($\delta L'$ shall contain the sign in itself).

Further substituting

$$\frac{m' \, \psi'}{b'} = y'$$

and $$\frac{E' \, b'}{n'} = G'$$

The expression for S' may be written as follows:—

$$S' = p' \propto G \left\{ \overbrace{\frac{1}{1 - \frac{\delta L'}{y'}} - 1}^{F'} \right\} = G' \, F'$$

which is the best form of S' for our purpose.

The function S' consists of two factors, namely, of G' which, at or near balance, is proportional to the current by which duplex and single signals in Station I are produced; and of F' which at balance $= 0$.

Therefore to make S' as small as possible when balance is disturbed, we can only do so by making F' as small as possible, which is evidently the case for $y' = \frac{m' \, \psi'}{b'}$ a maximum. Further

$$D' = \frac{p'}{P'} = \frac{S'}{P'}$$

$$S' = G' \, F'$$

and since at or near balance

$$P' \propto G'$$

it follows that

$$D' = F'$$

i. e. the 1st condition is also fulfilled by

$$y' = \frac{m' \, \psi'}{b'} \text{ a maximum.}$$

Our problem for station I would therefore be most generally solved if we make the function y' a maximum, remembering that the variables contained in y' have to fulfil two condition equations, namely the *immediate balance* (equation VI) and *the balance* (equation V).

Substituting for m' its value, and remembering that

$$\psi' = \frac{a'}{a' + g'}$$

on account of the *immediate balance* condition (equation VI), we get

$$y' = \frac{a' (g' + d')}{a' + g'} + \frac{a' d'}{b'}$$

But

$$\frac{a' (g' + d')}{a' + g'} = \rho'$$

the complex resistance of station I (the expression for ρ has become thus simple on account of the immediate balance condition VI).

Further

$$\frac{a' d'}{b'} = L' + \rho''$$

(on account of balance in station I, being established, equation V).

Thus we have

$$y' = \rho' + \rho'' + L'$$

for station I.

And similarly

$$y'' = \rho' + \rho'' + L''$$

for station II.

Therefore the rapid approximation of both the functions D *and* S *towards zero in both stations is obtained, if we make the complex resistances* ρ' *and* ρ'' *maxima.*

Now the form of ρ shews at once that it has a maximum for

$$(a + f) = (g + d)$$

which, in consequence of equation (VI), gives at last

$$\mathbf{a} = \mathbf{g} = \mathbf{d} = \mathbf{f} \quad \ldots\ldots\ldots \quad \text{(VIII)}$$

From the development of this result it will be clear that the relation expressed by equation (VIII) must hold for either station independent of L.

All that now remains is to determine b, and further to fix the absolute magnitude of any one of the branches. Before doing this it is however necessary to enquire what the other factor of S, namely G, becomes in consequence of fulfilling the regularity condition as expressed by equation (VIII).

The current which passes through the receiving instrument to produce "single" as well as "duplex" signals is at balance expressed by

$$G = E. \frac{a\,g}{(a + g) \left\{ L\,(a + g) + 2\,a\,(g + d) \right\}} \times \text{const.}$$

which expression has a maximum for either a or g.

The maximum of G, with respect to a, it will be seen, contradicts the regularity condition, since $a = g = d$ could only satisfy

$$\frac{d\,G}{d\,a} = 0$$

if d were negative, a physical impossibility.

However, the maximum of G with respect to g, gives

$$\frac{d\,G}{d\,g} = L\,(a^2 - g^2) + 2\,a\,g\,(d - g) = 0$$

which is satisfied by

$$a = g = d$$

This is a fortunate coincidence and speaks well for the Bridge method.

Now substituting for a and d their value g in the expression for the current G, we get

$$G = \frac{E}{4}\,\frac{1}{L + 2\,g} \times \text{const.}$$

and this expression multiplied by $\sqrt{g}$ gives the magnetic effect of the receiving instrument, namely:

$$M = \frac{E}{4}\,\frac{\sqrt{g}}{L + 2g} \times \text{const.}$$

which has an absolute maximum with respect to g for

$$g = \frac{L}{2}$$

Further substituting in the balance equation (V)

$$a = d = g = \frac{L}{2}$$

we get $$b = \frac{L}{6} \quad \dots\dots\dots\dots\dots\dots\dots \quad \text{(IX)}$$

We have therefore the following two equations by which the problem is generally solved

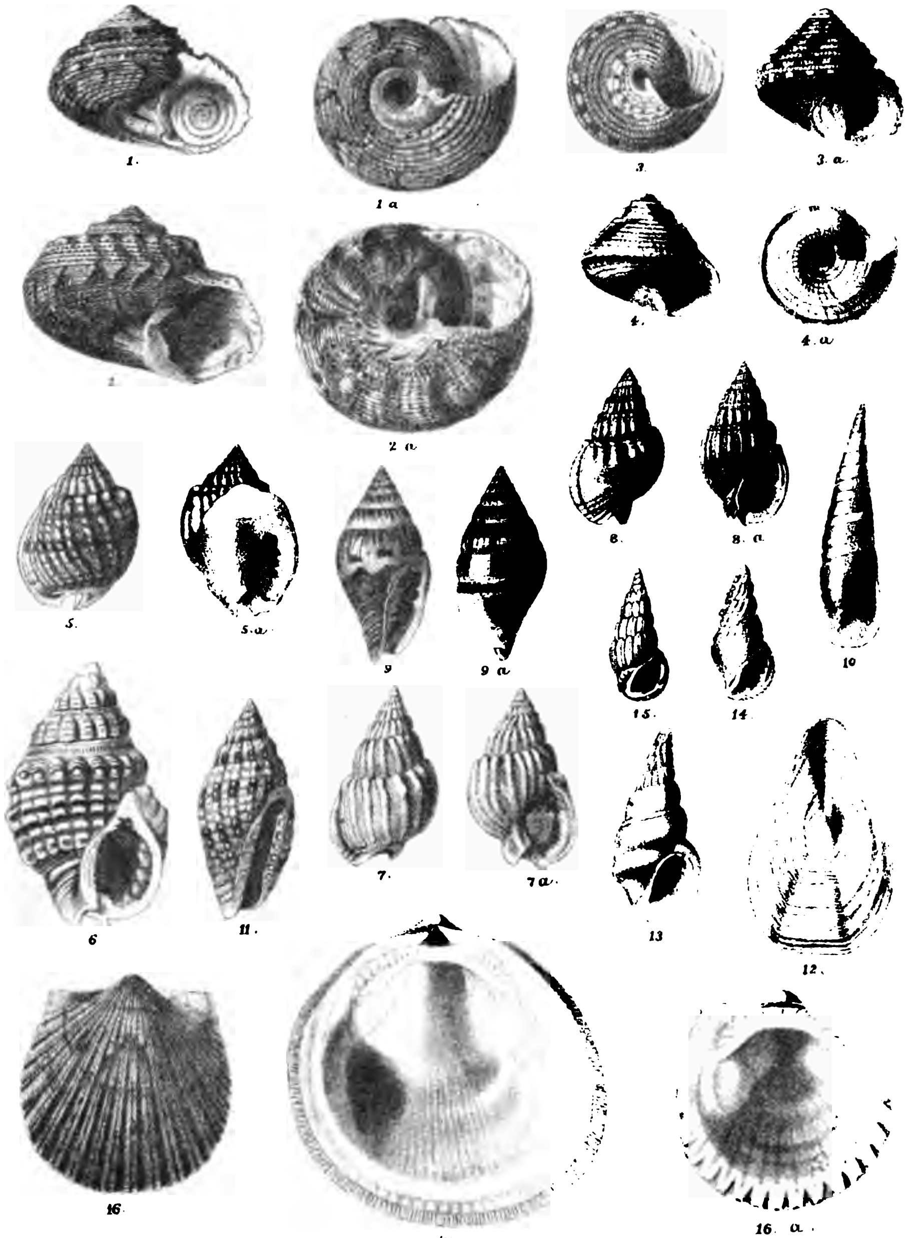
$$\mathbf{a} = \mathbf{g} = \mathbf{d} = \mathbf{f} = \frac{\mathbf{L}}{2} \quad \dots\dots\dots \quad \text{(VIII)}$$

$$\mathbf{b} = \frac{\mathbf{a}}{3} = \frac{\mathbf{L}}{6} \quad \dots\dots\dots\dots\dots\dots \quad \text{(IX)}$$

by L being understood the measured conductor resistance of the line from that station for which the best resistance arrangement is to be calculated.

General Results.

1. The branches of the bridge with the exception of the one lying opposite the line must be equal to each other and severally equal to half the measured conductor resistance of the line.



1 Trochus Masoni.
2. T. Warnefordi
3. T. Tennerra
4. T. Casta
5. Nassa callospira
6 N. sistroidea.
7. N. sinusigera.
8 N. Stoliczkana.
9. Mitra Cernica.
10. Eulima murifica.
11 Cithara amabilis
12. Scutus abnormis
13 Rissoina percrassa
14. R. evanida.
15. R. minuta
16. Pectunculus planatus

17. Limopsis compressa

2. The branch lying opposite the line should be equal to the 6th part of the measured conductor resistance of the line, and in this, the smallest of all the branches, readjustment of balance should be made only.

Nos. 1 and 2 necessitate the alteration of all the branches if L, the measured conductor resistance, alters within wide limits. A determination of L will therefore be required from time to time.

From the development of these general results it will be evident that they fulfil the following conditions:

I. The irregularity of signals in the one station is entirely independent of the irregularity of signals in the other station.

II. The irregularity of signals in each station is due only to balance not being rigidly established.

III. If balance in either station is disturbed, a single adjustment in the branch b *will re-establish that balance.*

IV. Any disturbance of balance will have the least possible effect on the received signals.

V. Maximum current at balance.

VI. Maximum magnetic effect of the maximum current on the receiving instrument.

(*To be continued.*)

Descriptions of new Marine Mollusca from the Indian Ocean, *by* Messrs. G. and H. Nevill.

[Received and read 4th March, 1874.]

[With Plate I.]

The present paper is a continuation of two which were published in Vol. XXXVIII for 1869 of the Society's Journal, at pp. 65 and 175. The types of all the species now described are in the extensive collection belonging to the Trustees of the Indian Museum, to whom also we are indebted for the use of the drawings from which the accompanying plate has been executed. A considerable number of the more interesting forms were obtained by Mr. Wood-Mason, who in 1872 spent two months dredging at the Andaman Islands; in the large and fine collection of shells made on this occasion, particularly interesting owing to the careful manner in which the specimens were preserved, their exact habitat recorded, &c., very many interesting novelties still remain to be described. We regret that figures of the three new species of *Marginella* have been accidentally omitted from the plate, we hope, however, to figure them before long with our next paper.

CONUS (CHELYCONUS) PRETIOSUS, n. sp.

A single specimen of this lovely shell was dredged alive by Mr. Wood-Mason at about 45 fths.; it most resembles *C. subulatus*, K., from which it can be distinguished by its more pyriform, elegantly produced shape, by its being nearly perfectly smooth (on the under side only, on ⅔rds of the last whorl, are unusually distant, impressed grooves to be traced, and even these are almost obsolete); in colour it is like Fig. 457 of the Thesaurus (*C. spectrum*) being white, throughout closely dashed with wavy, brown, slightly pinkish splashes, these markings are somewhat larger and more distinct on the spire, and also form two irregular bands on the body whorl; apex very sharp, spire much produced, composed of 14 whorls, acutely angled in the middle (as in *C. Malaccanus*), above this angle spirally striated, striæ numerous, near the apex very slightly granular; interior of the aperture a beautiful pink, white near the margin; epidermis thin, smoothish, compact.

Long. 60 Mil., Diam. 25 Mil., Long. Apert. 48 Mil.

Andamans.

CONUS (CHELYCONUS) MASONI, n. sp.

This shell may prove to be the true *C. muscosus* of Lamarck, it certainly resembles most closely the shell figured by Reeve, Pl. XXIX, Fig. 167c, as the young of the West Indian *C. characteristicus*, Ch. and identified by him as the variety named *muscosus* by Lamarck; Mr. Wood-Mason dredged at the Andamans, at a depth of 15 fths., ten living specimens of this interesting species; its affinity to the true West Indian *C. characteristicus* is remarkable, but, besides its much smaller size and different habitat, it can be distinguished by being more contracted at the base, by the apex being very sharp and pointed instead of obtuse, by the two spiral grooves being undulated, especially strongly near the apex, giving the shell almost a coronated appearance; the coloration, as remarked by Reeve, is of a different pattern from that of typical *C. characteristicus*, being composed of much broader flames, interspersed with more numerous and finer zig-zag lines, and the spire, instead of being ornamented with rather numerous and somewhat narrow brown markings, possesses few but very broad flames of that colour; there is also a very marked difference in the striæ near the base: in *C. characteristicus* these are more raised and rounded, as well as regularly, though somewhat distantly, reticulated with brown and white, in our East Indian species this reticulation does not exist, and these striæ, especially the upper ones, instead of being raised are pricked in; the epidermis is thin, close and compact.

Long. 25 Mil., Diam. 14½ Mil., Long. Apert. 21½ Mil.

CONUS (RHIZOCONUS) SEYCHELLENSIS, n. sp.

Shell like *C. Ermineus*, Born, but constricted in the middle of the body whorl, more attenuated at the base, with the whorls of the spire more convex; colour a uniform brilliant orange, here and there of a lighter shade, faintly stained with light-brown at the extreme base.

Long. 39 Mil., Diam. 19 Mil.

Seychelle Islands. Rare.

MARGINELLA (GLABELLA) PICTURATA, n. sp.

Shell small, rather thick, resembling a miniature *M. gemma*, A. Ad. (? = *festiva*, Rv. var.) whorls six, spire conically exserted; rufous-brown, throughout indistinctly mottled, round the centre a rather broad white band and row of distant, regular, square, dark-brown spots, a second less distinctly marked band near the base of the last whorl; columella regularly four-plaited, aperture straight, very narrow, outer lip much thickened and reflexed, marked with three brown spots.

Long. 3½ Mil., Diam. 1¾ Mil., Long. Apert. 1¾ Mil.

Mauritius. (Coll. Dr. Stoliczka and Indian Museum).

MARGINELLA (VOLVARINA) INCONSPICUA, n. sp.

This small species belongs to the same group as the succeeding, both being allied to *M. neglecta*, Sow.; shell white, shining, smooth, whorls three to four, the last one contracted at the base, swollen above; margin of the outer lip slightly flexuous, two upper plaits on the columella small and transverse, the two lower ones large and nearly perpendicular.

Long. 3½ Mil., Diam. 1¾ Mil., Long. Apert. 2 Mil.

Mauritius (Coll. Dr. Stoliczka and Indian Museum).

MARGINELLA (VOLVARINA) DEFORMIS, n. sp.

This small shell resembles no species of the genus known to us, except *M. suavis*, Souv., Journ. de Conchil., 1858, p. 376; the present species, however, differs in not having its last whorl as regularly cylindrical, but abruptly inclined to one side, making the aperture shorter and more contracted, and giving the shell a somewhat deformed appearance; the two lower plaits on the columella are of a different character, instead of being nearly transverse, as are the two upper ones, they are almost perpendicular; on the last whorl instead of three, there are only two pink bands, both very broad, the band on the upper whorl is also just above the suture, not beneath it.

Long. 4½ Mil., Diam. 2¼ Mil., Long. Apert. 2 Mil.

Ceylon. Rare.

CITHARA AMABILIS, n. sp., Pl. I. Fig. 11.

Shell small, oblong, fusiformly ovate, spire short; whorls seven, longitudinally strongly ribbed, ribs rather distant, on the last whorl unusually convex, these ribs, on the last three whorls, are formed of swollen, almost spherical granules, on the two apical whorls they are very small, colourless and without sculpture, on the other two the ribs are also colourless, but with the interstices transversely, rather distantly and very regularly ridged; white, with a double row of bright brown granules on the 5th and 6th whorls, with three of the same double rows on the last whorl; outer lip thickened, very regularly ridged, columellar margin reflected and ridged, aperture very straight, with a very small notch at the top.

Long. 7 Mil., Diam. 3 Mil.

Mauritius.

MITRA (PUSIA) CERNICA, n. sp., Pl. I. Fig. 9.

Shell small, stout, glabrous; whorls eight, obtusely rounded, apex decollated, longitudinally, somewhat indistinctly plicately ribbed, ribs smooth, wide, close together, in the interstices transversely minutely striated, sculpture altogether obsolete on the back of the last whorl; colour rich chesnut-brown, with a moderately broad white band round the middle of the last whorl, ornamented in its centre with a row of square, distant, regular brown spots, this white band can be traced indistinctly near the suture of the upper whorls; interior of the aperture prominently ridged, columella five-plaited.

Seven or eight specimens of this pretty species have come under our notice, its nearest ally seems to be *M. pardalis*, Küst.

Long. 12½ Mil., Diam. 5½ Mil.

Mauritius.

NASSA (HIMA) SISTROIDEA, n. sp., Pl. I. Fig. 6.

Shell fusiformly ovate, thick, yellowish-brown, with a narrow black belt just above the suture, and a second broader one in the centre of the last whorl; whorls five to six, depressed into a sort of groove next the suture, obliquely rather closely longitudinally ribbed, entire surface spirally ridged with white, forming small, somewhat indistinct, white granules where the ridges cross the longitudinal ribs; inner lip with the callus defined, of a deep mauve colour, with three plaits at the base: outer lip simple, strongly varicose, interior a deep mauve colour, irregularly ridged with white near the margin and with a single white zone near the centre; operculum typical. Totally unlike both in form and colour the other species of the genus in these seas, it has some analogy with certain species of *Sistrum*.

Long. 17 Mil., Diam. 11 Mil.

Andamans. (Coll. Rev. J. Warneford, Dr. Stoliczka and Indian Museum).

NASSA (TELASCO) STOLICZKANA, n. sp., Pl. I. Fig. 8.

There is only one species of the genus that at all resembles this interesting form, viz., *N. semiplicata*, A. Ad. (China, Benson) numerous specimens of which we have seen in all stages of growth from Madagascar, Mauritius, Ceylon, and Arakan; the shell here described is considerably smaller, more regularly and closely longitudinally ribbed, the interior more richly stained with brown, the last whorl sculptured with incised, transverse lines over ⅘ of its length, whereas in *N. semiplicata* there are merely a few almost obsolete striæ at the base; in *N. Stoliczkana* there is also a very distinct second sutural row of well-developed granules, not existing in *N. semiplicata.*

Long. 10 Mil., Diam. 5½ Mil.

Calicut. (Coll. Dr. Stoliczka and Indian Museum).

Nassa [Arcularia] callospira, A. Ad. [? juv. ? n. sp.] Pl. I. Fig. 5.

We have long hesitated whether to regard the shell here figured as a new species, or merely as a not fully developed form of *N. callospira* in which the characteristic callosity does not extend to the apex; in this latter typical stage, the Indian Museum possesses a single specimen also from the Andamans, the sculpture appears to be perfectly identical, the ash-coloured bands are somewhat more apparent in the form figured; the interior of the typical specimen is a light yellow, especially vivid within the canal, but in the form here described, the interior, in the seven or eight specimens seen, is a pure white.

Long. 10½ Mil., Diam. 7 Mil.

Andamans. (Coll. Rev. J. Warneford, Dr. Stoliczka, and Indian Museum).

Nassa [Niotha] sinusigera, A. Ad. var. Cernica, Pl. I. Fig. 7.

At first we thought this Mauritian form might be separated as a distinct species, none of the eight or nine specimens seen are filleted with brown in the manner figured and described by Reeve in his monograph of the genus, the variety here named and figured being merely stained with that colour at the sutures and at the base of the last whorl, especially vividly round the basal canal; the present variety, moreover, can scarcely be described as "granulated at the sutures," though indeed there is a slight trace of something of the sort; in other respects it agrees with the figure and description of the typical form.

Long. 11½ Mil., Diam. 7 Mil.

Mauritius. (Coll. Dr. Stoliczka and Indian Museum).

Rissoina minuta, n. sp., Pl. I. Fig. 15.

Shell very small, shining, white, somewhat resembling *R. obeliscus*, Recl.; whorls eight, angularly turreted, the first three thin, embryonal, without sculpture, sometimes decollated in the adult, the others ornamented with longitudinal, thick, slightly oblique, and somewhat irregular ribs, interstices smooth; last whorl with a single spiral row of prominent granules near the base, at the termination of the ribs; outer lip thickened, smooth.

Long. 2½ Mil., Diam. 1 Mil.

Andamans. (Coll. Indian Museum and Rev. J. Warneford).

Rissoina evanida, n. sp., Pl. I. Fig. 14.

Shell very small, white; whorls six, convex, the first two embryonal, shining and smooth, the rest longitudinally sculptured with oblique, somewhat indistinct and distant undulations, disappearing altogether on the latter half of the last whorls, spirally striated throughout, striæ close and somewhat scabrous, causing the outer lip to be minutely but regularly denticulated; columella abruptly twisted backwards, making a sharp angle at the base of the aperture. This species resembles *R. nivea*, A. Ad. from Australia, but is a smaller shell, composed of fewer whorls, spirally striated throughout, instead of only on the basal portion of the last whorl, the ribs also are not so strongly developed and are more oblique, the peculiar formation of the aperture and its canal are, however, exactly similar.

Long. 2½ Mil., Diam. 1 Mil.

Andamans.

Rissoina percrassa, n. sp., Pl. I. Fig. 13.

Shell large, very thick, white; whorls seven, angularly turreted, the last equal in size to the other six, the first five sculptured with very massive, longitudinal ribs, on the last two whorls the sculpture is obsolete, traces only can be seen near the columella, the last whorl has a transverse, rather indistinct furrow beneath the suture and a very broad, rounded and callous rib, extending from the top of the aperture to the margin of the outer lip, becoming somewhat indistinct near its termination; columella thickened and reflected, outer lip very thick and callous, angled near the centre at the point where the previously mentioned rib joins it. The furrow below the suture and the broad rib near the base of the last whorl are characteristics not known in any other species of the genus; it is also a more callous shell.

Long. 8 Mil., Diam. 3 Mil.

Mauritius. Rare.

Arcuella, n. sub-gen.

Differing from typical species of *Eulima* by regular spiral striation and by the columella being twisted back, so as to form an acute angle at the base of the aperture.

Eulima [Arcuella] mirifica, n. sp., Pl. I. Fig. 10.

Shell slender, aciculate, white and shining; whorls fifteen, very narrow and tortuous, regularly and closely but very minutely spirally striated throughout, a somewhat superficial groove is apparent, a little below the centre, on all except the last and first five or six whorls; columella thickened, twisted and bent backwards, forming a sharp angle at its junction with the outer lip; interior of the aperture striated; varices certainly exist on the whorls, but they are too indistinct to be traced satisfactorily; in shape this shell somewhat resembles *Eulima tortuosa*, Ad. and Rv.

Long. 8 Mil., Diam. 1½ Mil.

Ceylon. A single specimen only has been found.

TROCHUS [SOLARIELLA] CASTUS, n. sp., Pl. I. Fig. 4.

Shell conoidal, glabrous; white, ornamented with brown, sometimes in distant broad flames, sometimes in minute close reticulations, base white, on the outer half only, streaked or marbled with brown; whorls five to six, angular, spirally keeled, keels prominent, four to five; outer half of the base with five, distant, impressed spiral lines; round, and entering into, the open, deep umbilicus some six spiral rows of close oblique granules, the outer row of which is the largest.

Alt. 7½ Mil., Diam. 9 Mil.

Ceylon. (Coll. H. Nevill and Indian Museum.)

TROCHUS [CLANCULUS] TONNERREI, n. sp., Pl. I. Fig. 3.

Shell small, turbinated, similar in shape to our *C. Ceylonicus*, J. A. S. for 1869, p. 157, (? = *depictus*, A. Ad.); white, above marked with broad flames of chesnut-brown, on the base closely mottled with the same colour; whorls five, convex, with four rows of spiral, coarsely granulated keels on each whorl, last whorl at the periphery almost rounded, with two rows of the spiral keels more strongly developed than the rest; interior of the aperture striated, forming a slight denticulation at the outer margin; base slightly convex, with nine rows of granulated keels, margin of the umbilicus thickened and rather indistinctly twisted or denticulated, somewhat as in *C. scabrosus*, Phil., in this respect differing essentially from *C. Ceylonicus* and most others of the sub-genus; it is somewhat allied to *C. Kraussii*, Phil. I have named this shell in honour of Dr. Fabre Tonnerre, who some years ago presented to the Asiatic Society of Bengal a valuable collection of birds, shells, &c.

Alt. 6 Mil., Diam. 7 Mil.

Aden.

TROCHUS [MONILEA] WARNEFORDI, n. sp., Pl. I. Fig. 2.

Shell flatly conoidal; whorls six, angular, spirally ribbed with rather distant, slightly undulating costulations, keeled at the periphery; on the angle of the last whorl, a row of slightly raised transverse undulations, giving the shell a coronated appearance; brown, irregularly and minutely reticulated with white; base smooth, glabrous, closely ribbed, ribs somewhat superficial, flat, with a smooth thickened callosity round the umbilicus, forming a tooth on the margin of the columella; interior of the aperture barely striated. The only species at all resembling this fine shell are *Monilea rigata*, Phil., *M. callifera*, Lam. (also found in our Indian Seas) and our *M. Masoni;* it can, however, be easily distinguished from all of them by the above characters.

Alt. 9½ Mil., Diam. 13½ Mil.

Andamans. Rare.

TROCHUS [MONILEA] MASONI, n. sp., Pl. I. Fig. 1.

Shell in form resembling *M. callifera*, Lam. but more depressed; whorls six, closely and acutely spirally keeled, alternate keels larger, very closely, obliquely decussated, both on the ridges and in the interstices, whereas in *M. callifera* the ridges only are decussated; flesh-coloured or white, above radiately striped at wide intervals with reddish-brown, partially continued on the base, throughout irregularly and closely mottled with brown; base closely ribbed, ribs scabrously decussated, a broad and raised callosity round the open umbilicus, this callous rib being very closely and regularly convexly striated; columellar margin very thick and callous, much contorted, interior of the aperture barely striated, nacre very thick and brilliant.

Alt. 11 Mil., Diam. 16 Mil.

Andamans. (Coll. Rev. J. Warneford, Dr. Stoliczka, and Indian Museum).

SCUTUS [?] ABNORMIS, n. sp., Pl. I. Fig. 12.

Shell colourless, thin, oblong, slightly arched; apex nearly central, broad anteriorly and squarely truncated, posteriorly abruptly and peculiarly compressed, forming in the centre, from the apex to the margin, a deeply excavated trough, with a corresponding raised, acute projection in the interior; concentrically and continuously striated, striæ anteriorly abruptly angled. This remarkable shell is unlike that of any mollusc hitherto described, and should probably form the type of a new genus; unfortunately neither Dr. Stoliczka nor ourselves have as yet been successful in obtaining it alive, it therefore seems best to class it temporarily as a species of *Scutus*, although it differs from all the known species of that genus in being posteriorly, not anteriorly, acuminated and compressed; the internal, acute ridge is also peculiar.

Long. 31 Mil., Diam. 19 Mil.

Penang (Dr. Stoliczka). Chandpur, Bay of Bengal.

LIMOPSIS COMPRESSA, n. sp., Pl. I. Fig. 17.

Shell resembling *L. Japonica*, A. Ad. but more compressed and the umbones more prominent, it is much less inæquilateral than *L. cancellata*, Rv.; the interior is of a distinct green hue, irregularly and somewhat indistinctly longitudinally striated; there are about fourteen teeth, slightly and irregularly tinged with chesnut-brown, on each side of the hinge; externally it is sculptured with rather crowded longitudinal striæ, scabrously decussated and with the alternate striæ larger; umbones prominent and acute; epidermis very long, thick, and silky.

Long. 20 Mil., Diam. 20 Mil., Alt. 5 Mil.

Andamans. Dredged alive at 8-13 fths. (J. Wood-Mason).

[Coll. H. Adams, Esq., Dr. Stoliczka, Rev. J. Warneford, Indian Museum.]

PECTUNCULUS PLANATUS, n. sp., Pl. I. Fig. 16.

Shell flat, orbicular, umbonal margin perfectly straight and much produced; white, mottled and variegated with reddish-brown, longitudinally ribbed, ribs about 24, each one divided by a deep groove in the centre, throughout closely, almost fimbriately, decussated with crowded transverse striæ; margin deeply incised; teeth 14 on the posterior and 11 on the anterior side; interior mottled with brown, distantly grooved. I know of no species at all like this interesting Pecten-like species, perhaps it most resembles *Pect. vitreus*, Lam.

Long. 14 Mil., Diam. 14½ Mil., Alt. 4 Mil.

Andamans.

TRITON [GUTTURNIUM] ORIENTALIS, n. sp.

This beautiful species is well figured by Reeve, Pl. XI, species 38, though it seems almost incredible that he could have confused it with the South American *Triton gibbosus*, Brod., correctly figured later on in the Iconography, Pl. XIV, species 38 b. and c. The outer lip and four varices are very broadly and flatly expanded, the canal is more produced than in the true *T. gibbosus* and slightly umbilicated, as in *T. labiosus*, Wood; the columellar margin and interior of the aperture are white, the sculpture and epidermis are similar to those of *T. gemmatus*, Rv.; operculum normal.

Long. 33 Mil., Diam. 20 Mil.

Four living specimens were dredged by Mr. Wood-Mason at the Andamans.

We take this opportunity to point out that the shell described by Sowerby in the Thesaurus, Pl. 328, Figs. 537-8, from the Red Sea, as *Cypraea Macandrei*, is a mere variety of *C. Beckii*, Gaskoin from the same locality.

Pease having described, Journ. American Conch. for 1867, a *Mitra* (*Nebularia*) *assimilis* (very doubtfully distinct from *Nebularia caeligena*, Rv.), we propose to change to *Mitra* (*Turricula*) *Garrettii*, the shell described as *Mitra assimilis* by Garrett, Proc. Zool. Soc. for 1872.

The shell described by Lienard as *Leptoconchus Robillardi*, Journ. de Conchil. for 1870, p. 305, and figured by ourselves in the Society's Journal for 1871, Pl. I, fig. 1, is *Coralliobia fimbriatus*, A. Ad.; we are indebted to Mr. Henry Adams for pointing out the probability of the above identification and for giving us an opportunity of examining a typical specimen.

Explanation of Plate I.

		Page
1.	*Trochus Masoni*, n. sp., × 2;	28
2.	*T. Warnefordi*, n. sp., × 2	27
3.	*T. Tonnerrei*, n. sp., × 3;	27
4.	*T. castus*, n. sp., × 2;...	27
5.	*Nassa callospira*, A. Ad., × 2;	25
6.	*N. sistroidea*, n. sp., × 2;	24
7.	*N. sinusigera*, A. Ad., × 2;...	25
8.	*N. Stoliczkana*, n. sp., × 2;	24
9.	*Mitra Cernica*, n. sp., × 2;...	24
10.	*Eulima mirifica*, n. sp., × 4;	26
11.	*Cithara amabilis*, n. sp., × 4;	28
12.	*Scutus abnormis*, n. sp., nat. size;	28
13.	*Rissoina percrassa*, n. sp., × 3;	26
14.	*R. evanida*, n. sp., × 7;	25
15.	*R. minuta*, n. sp., × 7;	25
16.	*Pectunculus planatus*, n. sp., × 2;	29
17.	*Limopsis compressa*, n. sp., × 2;	28

Remarks on some Indian Fishes,—*by Surgeon Major* Francis Day.

(Received March 25th; read April 1st, 1874.)

Amongst a small collection of Burmese fishes presented last year by Mr. Theobald, of the Geological Survey of India, to the Indian Museum, I found a species of Goby of the genus *Sicydium* which appears to be undescribed. The exact locality in which it was captured has not been recorded, but I believe it to be identical with a specimen in my collection from Pegu, which, being in Europe, is not available for comparison.

Sicydium fasciatum, sp. nov.

B. iv, D. 61 $\frac{1}{10}$, V. 6, A. 11, C. 13, L. v. 70, L. tr. 15.

Length of head, of caudal fin and height of body each 1/5 of the total length. *Eyes*, diameter 2/9 of length of head, nearly $1\frac{1}{2}$ diameters from the end of snout and $1\frac{3}{4}$ apart. Body subcylindrical: head rather flattened superiorly and broader than high, its breadth being equal to its length excluding the snout. Cleft of mouth horizontal extending to below the middle of the orbit: lips rather thick: snout overhanging the mouth. *Teeth*, in the upper jaw small and implanted in the gums in a single row: those in the lower jaw large, conical, recurved, some distance apart, the anterior ones being the largest and the posterior one likewise somewhat larger than the lateral ones. *Fins*, dorsal spines rather filiform and projecting beyond the membrane, being 3/4 as high as the body beneath: pectorals nearly as long as the head: ventrals short forming a complete disk. *Scales* somewhat irregularly arranged, extending forwards nearly to the eyes, those anterior to the dorsal fin and also in front of the anal much smaller than the others. *Colours* reddish-brown, with about six vertical darker bands on the body wider than the ground colour, some dark spots likewise present: under surface of the body dirty yellowish-brown. Fins nearly black with a light, nearly white, edge.

Habitat—Burma to $2\frac{1}{4}$ inches in length.

Semiplotus McClellandi, Bleeker.

A fine specimen of this fish in excellent condition also existed in the same collection, this being the first time that it has been found so far to the eastward. During my recent tour in Assam, I ascertained that its distribution is much more extensive than had been hitherto recorded. Under the native name of *Lah-bo-ee*, it is common in the upper portions of the Boreli river near Tezpur. I also obtained it near Goalpara, and from all the affluents of the Brahmaputra that I visited in Upper Assam, but it is generally known as the *Sun-de-o-ree* or *Rajah mas.* Fishermen assert that it was termed Rajah's fish, because all that were caught had to be taken to the native Rajahs for their special eating. As food it does not appear to possess any very excellent flavour, whilst it seems too common to render it necessary to issue any strict orders regulating its consumption. I did not find it in the main stream of the Brahmaputra, and it is said only nominally to reside in the clear side rivers.

LABEO DYOCHEILUS, McClelland.

Goreah or *Heel goreah*, Assam.

B. III, D. 3/10, P. 18, V. 9, A. 8, C. 19, L. l. 43, L. tr. 8/8.

Length of head 1/5, of caudal 2/9, height of body 1/4 of the total length. *Eyes*, diameter 2/11 of length of head, 3 diameters from end of snout. Snout with pores and a lateral lobe, the lower labial fold interrupted. *Fins*, the dorsal commences nearer the snout than the base of the caudal, whilst it is somewhat in advance of the ventrals. *Scales*, 6½ rows between the lateral line and the base of the ventral fin. *Colours*, bluish slate colour becoming lighter on the abdomen: fins black.

Habitat—Throughout Assam.

This species is a distinct *Labeo* and not a *Cirrhina;* it attains a large size.

Barbus hexagonolepis, McClelland, or *Bokar* of the Assamese, is entirely distinct from *Barbus hexastichus*, McClelland, or *Lobura* of the Assamese, with which it has been identified. The mouth of the latter has a considerable resemblance to that of *Barbus tor*, but the shape of the opercular bones at once distinguishes it from that species.

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Record of the Khairpur Meteorite of 23rd Sept. 1873.—*By* H. B. Medlicott, Esq., *Officiating Superintendent of the Geological Survey of India.*

[Received July 1st, 1874.]

At the meeting of January of this year several fine specimens were exhibited of a meteorite that had fallen on the 23rd September, 1873, partly in the State of Bhawalpur and partly in the Multan district, on either side of the Sutlej. The largest pieces and the greatest number fell close about the village of Khairpur, 72° 12′ E. long., 29° 56′ N. lat., 36 miles east-north-east of Bhawalpur. It has hence been called the Khairpur Meteorite, though the name seems to be a very common one throughout this region of the Punjab. As we are not likely to obtain any more information on the subject, what has been received may be recorded. It is not as exact as could be desired, but as much so as can usually be attained without special inquiry on the spot.

The position of the known falls have been recorded on maps, received from Major Minchin, Political Agent for Bhawalpur, and from Captain Lang, Deputy Commissioner for the Multan district. The number of stones that fell about Khairpur is not mentioned. Five are accounted for, but from the terms of the forwarding letters it may be inferred that others were procured. On the Multan side, Captain Lang mentions the finding of 7 pieces, 4 at different spots near Gogewala well, close to E. S. E. of Mahomed Moorut; two at Khurampur on right bank of the Sutlej, and one at Araoli two miles to N. W. of Khurampur. Of these one only is in known hands.

It was received from Col. Ralph Young, R. E., Commissioner of Multan, as having fallen near Mylsi, which is 12 miles from the nearest of the above named places; but the stone is probably one of those seven. The range thus covered by the fall has a marked lineal direction, bearing 35° S. of E., N. of W., with a length of sixteen miles and a breadth of about three.

List of Specimens.

		lbs.	oz.	gr.
A	Lahore Museum, weight, ...	10	12	126
B	Indian Museum, ...	9	11	219
C	„ „	7	14	236
D	Geological Museum, ...	1	2	412
E	„ „		3	79
F	„ „		6	70
	Total ..	30	2	266

The five first fell at Khairpur. In the letters forwarding B and C, and D and E, separately, it is said "These stones were taken from several pieces that fell in the neighbourhood of Khairpur:" and that they were "found imbedded in the earth at a depth of about 1½ feet at various places, about a mile and a half from Khairpur to the eastward, and about a mile apart." F is the one from the Mylsi Pergunnah.

All are very irregular in shape, and more or less broken. Some of these fractures are evidently done by hand, others probably at the moment of falling; while several seem to have occurred during the fall, the glazing being partially renewed. In two of the latter cases, the fracture forms a nearly plain surface.

Nothing exceptional is apparent in the composition of this Meteorite; it is a stone of the usual steel gray colour, and dense crypto-crystalline texture.

The specific gravity of F is 3.66.

Several accounts of the appearance of the fall are appended:

Note by the Rev. G. Yeates, *Church Missionary Society, Multan, received through* Major Minchin.

1. "On the morning of the 23rd of September, 1873, at 5.10 A. M., a meteor was observed from a spot about 12 miles south of Multan, in the Punjab (Lat 29° 20′ East, Long. 71° 40′ or nearly so).

"The observer was on the ground in the middle of a wide plain with nothing to obstruct the view. The morning was remarkably fine and clear, the sky unclouded, there was a faint glow of light in the East, but the sun was still about 45 minutes below the horizon.

2. "It is difficult to estimate the size of the meteor, as it was more a cluster of meteors, each one far exceeding the size and brightness of a star of the first magnitude, than a 'fireball.' The breadth of the train left behind them must have been from 3° to 5°. Venus was at the time about 25° above the horizon and very bright, but she was thrown quite in the shade when compared with the brightness of the meteor.

"Its first appearance in the west, towards which the observer's face happened to be turned, was so like a rocket which had reached its height and was just bursting, that the first impression was that some one in a distant village was amusing himself, at that early hour, with one that had remained over from a last night's display: but this idea was speedily dispelled, as, instead of dying out, it rapidly increased in brightness and continued to move on towards the observer, leaving a tail or train behind it. Its motion was not very rapid but steady, and by the time it had reached about 10° of the meridian, which it passed south of zenith, it assumed an exceedingly brilliant appearance, the larger fragments glowing with an intense white light with perhaps a shade of green, taking the lead in a cluster, surrounded and followed by a great number of smaller ones, each drawing a train after it, which blending together formed a broad belt brilliant fiery red. At this time it lit up the whole country, casting deep shadows and having the effect produced by the electric light. In this way it proceeded until it reached a point nearly due east, paling again a little as it drew near the horizon, when, about 20° above it, it appeared to go out, rather than to fall.

"The train it left continued very bright for some time and was distinctly traceable for more than three quarters of an hour afterwards; at first changing to a dull red, then, as the morning broke, to a line of silvery gray clouds which broke up into separate portions and floated away on the wind.

3. "From the rough diagram attached, it will be noticed that the course of the meteor was unusually long, extending through very nearly 180°, its first appearance, as sketched, was as near as possible in a spot close to the star Algenib, which was just faintly visible, about 15° above the horizon in the west. It then passed close under Orion, the lowest star of which (Rigel) was very near if not on the meridian, and disappeared on the other, east side, about the same height from the horizon as it was noticed at, in the beginning of its course.

"For some time after the meteor had disappeared, but while the train still continued to attract notice, there was perfect stillness which was interrupted by a loud report followed by a long reverberation which gradually died away like the roll of distant thunder.

"The report seemed to come from the south, in which direction there was a tope of Pepuls, about quarter of a mile off, but one man, who was a witness of it, said it seemed to him to come from the north, as he said the artillery were practising in Multan. The time that elapsed between the bursting of the meteor, when first noticed, and the report was about four minutes."

Mr. Yeates describes the meteor in the meridian as attaining an altitude of 50° from his point of view, which seems to be about 30-40 miles from the projected path of the meteor, and about 50 miles from Khairpur in the direction of the major axis of the area covered by the fall.

The following observations are extracted from a letter of Major Minchin's.

"I was in camp at a place about 6 miles from Ooch and 50 miles from Bhawalpur at the time, and was roused from sleep by a brilliant light followed by a loud thunderclap. The next day we heard from Bhawalpur that the explosion of the meteorite was so violent as to shake the house and slam all the doors; and in the course of a few days the Tuhsildar of Khairpur sent me in 3 meteoric stones, 2 of which were forwarded to you and one to the museum at Lahore, which he reported had fallen at places about a mile apart and about a mile beyond Khairpur, which is 36 miles east of Bhawalpur.

"One of the meteorites fell close to a man who had gone out into the jungle for the purpose of nature, and frightened him so much, that he hardly knew what occurred and was under the impression that the stone pursued him for two hours; but he shewed the spot where it fell which was the first piece found. I have had the spot marked approximately in the map you sent, and which is herewith returned, some portions fell in the Mylsi district on the right bank of the Sutlej.

"At Bhawulgur in this State, 80 miles from Khairpur, the meteor was seen but no explosion was heard; and I have been informed that it was seen at Bunnoo and Kohat on the frontier and also from the Terar hills above Peshawur.

"A correspondent in the *Pioneer* mentioned having seen it at Jodhpur, and Mr. W. Beckett saw it near Moradabad on his way from Nynee Tal. Stating it roughly, the meteorite would appear to have been visible within a radius of 300 miles of Khairpur."

The following observations are taken from the *Pioneer* newspaper, of the 30th September.

"*Multan, 24th Sept.*

"Sir,—The appearance of an extraordinary meteor, of which I daresay you will have notice from other quarters, may justify my venturing to describe it as seen from the neighbourhood of Multan, and under very favourable circumstances.

"Duty called me to be on the Shujabad road, about 13 miles south of Multan, on the morning of the 23rd instant. I had stopped for the night in one of the rest-houses, and rose early to continue my journey southward. While my man was getting the dog-cart ready, I walked on enjoying the fresh breeze which was from the south, and after a long and wearisome hot season was most grateful and reviving. I had gone on about half a mile and the cart had just come up to me when, as I turned my face full to the west, crossing over the road from the east, a brilliant star made its appearance right opposite me, about 15 degrees above the horizon. It moved on slantingly upwards and towards us, bursting almost immediately as a rocket, but without scattering to any extent, all the fragments or stars keeping close together, and marching on its way steadily but slowly across the whole heavens, crossing the meridian about 60° from the horizon close under the constellation Orion which was close to the meridian at the time, and proceeding on to a point in the east nearly exactly opposite to that at which it first appeared.

"From its first appearance it increased rapidly in brightness, and long before it had got half way, lit up the whole country with a greenish light, not unlike the effect of the electric light. The different fragments into which it broke up were distinctly visible, more than twenty of them I should say, all of a brilliant palish green, moving in parallel courses, two or three of the larger ones taking the lead in the centre, and each of them leaving a tail of red light behind it; these tails blending into one formed a huge band of light from one end of the heaven to the other.

"From the moment it shone out brilliantly we all stood, spell-bound, in perfect silence, the more marked in the dead stillness of the morning, and as it died out we stood watching the wonderful path it had trod. The effect was most thrilling, when silence was first broken by the *Ya Allah* of one of the servants. We still remained motionless, expecting nothing further, when a loud report, as of a number of cannon in the distance, shook the very ground under us, reverberation rolling on for a considerable time and dying away at length like distant thunder. Unfortunately, I had no watch about me at the time, nor indeed, had I, should I have thought of looking at it, to count the minutes between the explosion and the time its sound reached us, as I did not anticipate hearing it, but I should say, from experience in such things, that about three and half minutes must have elapsed. This, counting 1,100 feet per second, which is, I believe, the rate at which sound travels, would give about 45 miles as its distance at the time of its disruption. Its explosion must have taken place almost immediately after entering our atmosphere, through the denser part of which it must have passed. It had all the appearance of being very close: indeed for a moment the feeling was that it was coming unpleasantly so, and contrasted remarkably with the dark background of the sky, which it did not illuminate.

"The train left behind remained very bright for some time and gradually faded. It was evidently affected by the wind, as it first broke up into a heavy irregular line, then into small detached clouds, which remained visible for upwards of an hour afterwards, and only disappeared when the brightness of the sun rendered them indistinct.

"This month has been very prolific in small meteors. I have noticed them in greater numbers than usual, but this one exceeds anything I have ever witnessed. On getting to Shujabad, 12 miles distant, I found that the noise had aroused many; some saw it, but it was difficult to judge from the description given whether it appeared more over-head or not. What I have heard of it here too, since my return, is too vague to form any opinion from. Perhaps other accounts of it may throw light on its extent, &c." G.

"*Bhawulpore State, 24th September.*

"Sir,—On the morning of 23rd September, at 5 A. M., the following phenomenon was observed on the Chenab left bank, some sixty miles south-west of Bhawulpore. A luminous globe suddenly appeared under a clear sky, which lighted up the earth, in the full blaze of sun-light. The electric globe shot across towards the north-east over about sixty degrees of space, and seemingly was not more than a few hundred yards above the earth, when it disappeared in a shower of shooting stars. But six or seven minutes must have elapsed before the sound of its explosion was heard, which was a double detonation like the discharge of two heavy pieces of artillery close together, followed by loud and prolonged reverberation. Then all was still. The sun rose and the morning was fresh and the breeze cooler than usual at this time of year, giving the idea to the observers who were bound for the "Happy Hunting Grounds," that the blazing phenomenon had cleared the atmosphere in a remarkable manner. According to the lapse of time above noted, between the disappearance of the fire globe and the sound of its explosion, its fragments may have struck the earth from 77 to 91 miles off, somewhere between the Chenab and Sutlej rivers.

SHIKAREE."

These few and superficial data are recorded for the information of experts in the phenomena of meteorites. This fall seems specially remarkable for the very oblique direction of its course to the earth's surface.

Contributions towards a knowledge of the Burmese Flora.— *Part I.—By* S. Kurz.

[Received May 25th, read August 5th, 1874.]

In the present paper I purpose giving an abridged enumeration of Burmese plants, phanerogamic and cryptogamic, as far as they have come to my knowledge. The Burmese Empire is as yet too incompletely explored for the present communication to be looked upon otherwise than in the light of an attempt at collating the scattered material either published or deposited in Herbaria. An exploration of Ava, the Arracan Yomah and the Chittagong hills, will furnish large additions of Khasya hill plants, while the Tenasserim and Martaban hills abound in Malayan forms.

A bare list would have been of little use to the Indian botanist and still less so to the resident in Burma; I have, therefore, given short outlines of the distinctive characters of the genera as well as of the species. Such conspectuses are not always based upon sound characters, which in many cases can only be ascertained by a close examination of all the species composing the several genera; but still they will be found serviceable for handy identification of the plants of the better explored provinces of Burma. In the framing of the generic tables, I have chiefly followed the authors of the 'Genera Plantarum.' Of citations I have given only a selection, giving preference to illustrations. The remaining synonyms or references to synonyms may be found in Hooker's Flora of British India so far as that work has been published.

I have avoided as much as possible critical discussions, and have taken in hand only essential matters: to have done otherwise would only have increased the bulk of my contributions without materially assisting in the encouragement of the exploration of the Burmese Flora; for which purpose this enumeration is written.

I have also given further particulars about the habitats of the species and notices about frequency. Such are necessarily understood to refer only to provinces wherein I have myself travelled (Andamans, Pegu, Prome, Martaban and partially Arracan and Chittagong): information regarding the rest had to be compiled from herbarium-material. Flowering and fruiting time are given, but cannot always be relied upon, for the reason that contradictory dates are sometimes given by collectors.

I wished to have introduced here the soil question from an Indian point of view, but defer doing so until my experiences in this direction are more matured and have been verified by future explorations. In Burma my attention was directed more towards the woody vegetation, and the necessary information as regards this will be given elsewhere. Herbaceous growth is for the greater part more regulated by physical and climatal factors, which in connection with moisture, the most powerful element in nature, bring about the greatest changes in vegetation. But still not an inconsiderable number of herbs are found in Burma and elsewhere in India which belong to Unger's class of *soil-steady* (bodenstaetig): such are especially many limestone and laterite plants, and, everywhere, the saline ones. The indication of the forests, etc., in which they grow will, however, at once give a more or less reliable key to the soil-requirements; the forests being more dependent upon the substratum than the herbaceous growth.

I have purposely selected for the different varieties of Burmese forests general denominations instead of naming them after characteristic trees, as is usually done. The sorts of forests or combinations of forest trees as distinguished by me are, so to say, the exponents of a complex of climatal physical and partially chemical influences which produce everywhere habitually and generically identical or representative equivalents. Thus we have sal-forests in India and eng-forests in Burma; dry forests in Behar and Northern Hindostan and again in the Prome district; mixed forests in the low Terai lands of the Himalaya and savannah forests in the Bengal Gangetic alluvium as well as in Burma; and so it is with the tidal forests, hill-forests, etc.

The distinction between *evergreen* and *deciduous* forests must always be the leading one in tropical countries, and such forests differ always most conspicuously in their vegetative components.

The former are divided into the littoral forests (tidal and mangrove), the result of saline influence; further into swamp-forests, the product of superabundance of fresh-water and heavy inundations during rains. Then come the tropical forests, which are more regulated by moisture and amount of shade than by substratum, although great differences (not so much habitually as specifically) are observable in those that grow on permeable or on half-permeable strata, on silicious sandstones or on metamorphic or permeable laterites, the latter rich in purely Malayan types, the former poorest of all (with those growing on limestone in Tenasserim I am not acquainted). The last sort of evergreen forests are the hill-forests, rather confusedly huddled together by me, but sufficiently distinguished for present requirements. The lower damper ones of these are a modification of the tropical forests below them, while the drier ones consist chiefly of pines, oaks, *Ericineæ*, etc., and pass soon into the temperate forests, which contain a great number of winter-deciduous trees but are not represented in Burma except on a few peaks above 6500-7000 feet elevation. Here the slope and resultant amount of light and moisture, and not so much the quality of rock, are the principal regulators, at least so it is on the metamorphic and older formation, while limestone, etc., will form exceptions. Higher up the influence of elevation modifies and changes vegetation according to well-known laws.

The leaf-shedding or deciduous forests form the other large class of Indian forests, and cover in these regions a greater area than the former. These grow either on impermeable strata, such as compact calcareous sandstones, and form then the "dry forests," where catechu trees and several Hindustani trees and arboreous *Euphorbias* find their home, while higher up on the crests of the Yomah they become formed almost exclusively of an arboreous *Hiptage*, often accompanied by several rather temperate forms like *Heracleum*, *Vaccinium*, *Hymenopogon*, etc. On laterite and gravelly strata, and also on very stiff plastic clay, grows another variety of forest, called by me the open forests. Those growing on the first named strata are especially interesting and are generally known to the Burmans as the eng or ein-forests, so named after the prevailing tree, *Dipterocarpus tuberculatus;* here the botanical rarities of Burma are scattered, and catch the eye the more readily that the surrounding forest is open and the soil-clothing rather scanty; higher up in the hill-eng forests, (which grow on laterite formed by decomposition of older rocks or on debris of them) the eng-tree is often replaced by other kinds of wood-oil trees (chiefly *Dipterocarpus costatus* and *obtusifolius*) ; while those open forests that occupy the stiff clay at the base of the hills are characterized by the absence of eng.

The last variety of deciduous forests are the mixed forests (as they are called by the forester), in which teak is chiefly found almost always accompanied by pyenkadu (*Xylia*). The upper ones grow either on permeable siliceous argillaceous sandstone, as is the case on the Pegu Yomah, and the trees are then usually very lofty, or on metamorphic and other older strata in Martaban, and in this case they are richer in species but lower in growth, often accompanied by trees which are very rare in the Yomah, such as *Pterocarpus*, *Ternstroemiaceae*, etc. The lower mixed forests occupy the alluvial lands of the greater rivers and gradually pass into the savannah-forests and the true savannahs. Along the larger choungs in the hills where alluvial deposits spread out to a larger extent, similar savannah-forests recur on a smaller scale, but much better grown, and, especially by favourable exposure, much mixed up with trees that are missed in the plains, such as *Erythrina lithosperma*, *Bischoffia Javanica*, etc.

Such is a bird's-eye view of the Burmese forests, of which I have given a more detailed description in my report on the Pegu-forests, and I hope that these cursory notes may in the mean time aid in the understanding of the habitats of the species given in the following pages.

The area comprised by me under the general denomination of Burma is not the political one but includes Ava, Chittagong as far as the Fenny river, Arracan, Pegu, Martaban (all the country between the Sittang and Salween is thus named by me), Tenasserim and the Andaman islands.

The collections which were at my disposal when working up the Burmese plants are as follows:

1. The large collections of Dr. Wallich and Dr. Brandis. Many of Wallich's Numbers are not contained in the Herbarium of the Botanical Gardens Calcutta, of others only fragments. The latter often proved very useful in the identification of plants collected by myself or others, but were only too often unfit for description in the absence of corresponding specimens collected by others. I experienced therefore much difficulty in dealing with such, especially as the greater part of Wallich's plants are not included in the earlier parts of DeCandolle's Prodromus, etc.

2. Drs. Griffith's and Helfer's sets of Burmese plants sent out from Kew. Of the former's collection a set retained by Dr. McClelland to aid in the editing of Griffith's posthumous papers, is still in the Herbarium here and served partially to supplement the incompleteness of the material.

3. Dr. Falconer's Tenasserim collections in the Calcutta herbarium.

4. Mr. Robert Scott's, the Rev. C. Parish's and Rev. Dr. F. Mason's plants, in the Calcutta herbarium, which, especially those of the latter two gentlemen, abound in novelties.

5. Drs. Hooker's and Thomson's Chittagong plants, and also a few plants of the same regions collected by Mr. C. B. Clarke. Only a small collection was made by myself during a very brief stay in 1869.

6. Dr. John Anderson's collections. Of these only the Burmese plants and those collected in the Kakhyen Hills are included here.

7. The collections I myself made in 1867-68, and again in 1870-71, all over Pegu, Prome and part of Martaban.

8. Arracan-plants, chiefly collected by myself and Dr. Schlich. A small collection by Captain Margrave from the same province is contained in the Calcutta herbarium.

9. Dr. Stoliczka and Mr. Theobald, of the Geological Survey of India, both presented to me small collections of Tenasserim plants, containing several new or interesting forms. To this must be added a collection of grasses and other plants, collected in the Prome district by Mr. Eug. Oates, C. E., and a few plants which Mrs. Mason brought home from the Red Karen country.

10. Smaller collections and single plants from various parts of Burma are contained in the Calcutta herbarium, collected by Mrs. Burney, Col. Eyre, Th. Lobb, Dr. McClelland, Belanger, Reynoud, Dr. Cleghorn, O'Riley, Th. Phillippi and others.

11. Dr. Roxburgh's Flora contains numerous contributions to the

Burmese Flora and some of them are still under cultivation in the Botanical garden here.

12. The collections made by myself in 1866 on the Andamans. Dr. Helfer's collections from the same islands were unfortunately mixed up with his Tenasserim plants. In order to avoid as much as possible the introduction of such doubtful stations, I have preferred to look upon such plants invariably as derived from Tenasserim or from the Andamans respectively, in all cases where specimens of the one or other regions already existed in the herbarium here.

13. A collection of plants made by the garden-collectors on various islands of the Andaman and Nicobar islands during Mr. A. O. Hume's ornithological cruise in 1873.

I. DICOTYLEDONS.

RANUNCULACEÆ.

Conspectus of genera.

I. *CLEMATIDEÆ.* Sepals valvate. Carpels indehiscent, with a solitary ovule or seed in each. Leaves opposite. Usually woody climbers.

1. CLEMATIS. No petals, or if any, these gradually pass into stamens Leaves without tendrils.

2. NARAVELIA. Petals terete, abruptly divided from the stamens. Leaves 2-foliolate.

II. *RANUNCULEÆ.* Sepals imbricate. Carpels with a solitary ascending ovule or seed in each. Achens indehiscent. Herbs or perennials.

3. RANUNCULUS. Sepals deciduous. Petals 3 or more.

III. *HELLEBOREÆ.* Sepals imbricate. Petals small, deformed, or sometimes none. Carpels many-seeded, dehiscent. Usually herbs.

4. NIGELLA. Petals small, or clawed, never spurred. Carpels more or less connate.

Clematis, L.

Conspectus of species.

Sect. 1 *Viticella:* Achens simply beaked, without plumose tails. ... *C. bracteata.*
Sect. 2. *Flammula:* Achens terminating in a plumose tail.
Leaves simple, ... *C. smilacifolia.*
Leaves divided.
Anthers terminating in a subulate appendage,............ *C. hedysarifolia.*
Anthers blunt, retuse or acute.
× Filaments glabrous.
Leaflets serrate, glabrous, shining; flowers small, ... *C. Gouriana.*
Leaflets entire, tomentose; flowers small,............ *C. subumbellata.*
× × Filaments hairy (at least towards the base).
Leaflets shining, glabrous; flowers small,............ *C. acuminata.*
Leaflets tomentose or pubescent; flowers large, ... *C. Buchananiana.*

1. C. BRACTEATA (*Thalictrum bracteatum*, Roxb., Fl. Ind., II, 671; *C. Cadmia*, Ham. ap. Hf. Fl. Ind. I, 5.)

Hab. Ava, Bhamo. Fl. Jan.*

2. C. smilacifolia, Wall. in Asiat. Res., XIII, 414; Hf. Ind. Fl. I. 3; Bot. Mag. t. 4259.— (*C. subpeltata*, Wall. Pl. Asiat. rar. t. 20; *C. Munroana*, Wight Ill. t. 1; *C. inversa*, Griff. Not. Dicot. 700 t. 645, f. 7?)

Hab. Ava, on Taong-dong; Tenasserim, Mergui.

3. C. hedysarifolia, DC. Syst. I, 148; Hf. Ind. Fl. I. 4.

Hab. Pegu (Hore).

4. C. Gouriana, Roxb. Fl. Ind. II. 670; Wight Ic. t. 933 and 934; Hf. Ind. Fl. I. 4.

Hab. Ava, on Taong-dong (Wall.); Tenasserim, (C. Parish).

5. C. subumbellata, Kurz in Journ. As. Soc. Bengal, XXXIX, 61.— (*C. floribunda*, Kurz in Seem. Journ. Bot. V. 540, non Pl. et Trian).

Hab. Martaban, Karen hills (O'Riley).

6. C. acuminata, DC. Syst. I. 148; Hf. Ind. Fl. I. 5.

Hab. Martaban, in the damp hill-forests E. of Toungoo, at 3000 to 4000 ft. elevation. Fr. March.

7. C. Buchananiana, DC. Syst. I. 140; Hf. Ind. Fl. I. 6. var. *rugosa*, Hf. and Th. l. c.

Hab. Martaban, Karen hills (Rev. F. Mason, O'Riley).

Doubtful species.

1. C. grossa, Wall. Cat. 4671; Hf. and Th. Fl. Ind. I. 12.—Ava. Tong-dong (Wall.)

Naravelia, DC.

Conspectus of species.

Leaflets tomentose or pubescent beneath, ... *N. Zeylanica.*
Leaflets quite glabrous, ... *N. laurifolia.*

1. N. Zeylanica, DC. Syst. I. 167; Hf. Ind. Fl. I. 7.—(*Atragene Zeylanica*, L. Amoen, I. 405; Roxb. Corom. Pl. II. t. 188, and Fl. Ind. II. 670; *N. dasyoneura*, Korth. in Ned. Kruidk. Arch. I. 208; Miq. Fl. Ind. I/2. 2).

Hab. Frequent in the mixed and dry forests all over Pegu and Prome; also in Ava. Fl. H. S. Fr. C. S,

2. N. laurifolia, Wall. Cat. 4685; Hf. Ind. Fl. I. 7.

Hab. Not unfrequent in the tropical forests of Martaban; also Tenasserim, Mergui (Griff.) Fl. Fr. Febr. March.

Ranunculus, L.

Conspectus of species.

A spreading creeping pubescent perennial, ... *R. diffusus.*
An erect glabrous somewhat succulent annual, ... *R. sceleratus.*

1. R. DIFFUSUS, DC. Prod. I. 38; Hf. Ind. Fl. I. 19. (*R. subpinnatus* W. A.; Wight Jc. t. 49; *R. vestitus*, Wall. Cat. 4707).

HAB. Ava, Taong dong (Wall.), Khakyen hills, E. of Bhamo (J. Anderson). Fl. Fr. March.

2. R. SCELERATUS, L. sp. pl. 776; Engl. Bot. t. 681; Hf. Ind. Fl. I. 19. (*R. Indicus*, Roxb. Fl. Ind. II. 671).

HAB. On moist mud-banks of the Irrawaddi from Prome District down to Pegu (at Henzadah.) Fl. Fr. Febr.-Apr.

Nigella, L.

* NIGELLA SATIVA, L. sp. pl. 753; DC. Prod. I. 49; Walp. Rep. II. 742. var. INDICA, DC. l. c. (*N. Indica*, Roxb. Fl. Ind. II. 646).

HAB. Burmah, cult. according to Dr. Mason (never seen by me).

DILLENIACEÆ.

Conspectus of genera.

I. *DELIMEÆ.* Filaments more or less dilated at apex; anthers short, the cells diverging, or rarely parallel. Woody climbers.

1. DELIMA. Carpels solitary: ovules 2-3, basilar.

2. TETRACERA. Carpels 3-5, ovules many, in 2 series.

II. *DILLENIEÆ.* Filaments equal; anther-cells parallel. Trees or herbs.

3. DILLENIA. Carpels 5-20. Seeds without arillus. Trees.

4. ACROTREMA. Carpels 3. Stemless herbs with radical leaves.

Delima, L.

1. D. SARMENTOSA. L. sp. pl. 736; Bot. Mag. t. 3058; Hf. Ind. Fl. I. 31.—(*Tetracera sarmentosa*, Vahl Symb. III. 70, Roxb. Fl. Ind. II. 645). Var. HEBECARPA, Hf. and Th. Fl. Ind. I. 61.

HAB. Not unfrequent in the mixed forests all over Burma, from Chittagong and Ava down to Aracan and the Andamans.

Tetracera, L

1. T. ASSA, DC. Syst. I. 402; Hf. Ind. Fl. I. 31. (*T. trigyna*, Roxb. Fl. Ind. II. 645).

HAB. Chittagong (Hf. and Th.).

Another species with large leaves of a thin texture, when fullgrown quite glabrous, is not unfrequent in the swamp-forests of the Irrawaddi alluvium in Pegu. It is no doubt a new species but, unfortunately, I could obtain neither flowers nor fruits.

Acrotrema, Jack.

1. A. COSTATUM, Jack in Mal. Misc. ex Hook. Bot. Misc. II. 82; Hf. Ind. Fl. I. 32. (*A. Wightianum*, WA; Wight Jc. t. 9).

HAB. Tenasserim, Moulmein.

Dillenia, L.

Conspectus of species.

Sect. 1. *Eudillenia.* Petals white. Seeds with hairy borders, flowers very large, *D. Indica.*
Sect. 2. *Colbertia.* Seeds smooth. Flowers yellow.

* Calyx tomentose or pubescent.

O Flowers very large (petals about 2 in. long).

Peduncles 1½ to 2 in. long, straight; styles 12; petioles about 1 in. long. *D. pulcherrima.*
Peduncles 4-8 lin. long, thick and nodding; styles 10; petioles up to ½ in. long, *D. aurea.*
Peduncles very long and slender; styles 6; petioles only 2 to 1 lin. long, ... *D. pilosa.*

O O Flowers small (petals less than an in. long).

Peduncles 1 or 2-bracted, like the calyx densely tomentose; styles 5-7, ... *D. parviflora.*

* * Calyx and peduncles perfectly smooth or pruinous. Flowers small.

Peduncles bracted,.. *D. scabrella.*
Peduncles without bracts, ... *D. pentagyna.*

1. D. Indica, L. sp. pl. 745; Hf. Ind. Fl. I. 200. (*D. speciosa,* Thbg. in Linn. Trans. I. 200; Wight Jc. t. 823; Roxb. Fl. Ind. II. 650; Bot. Mag. t. 5016; *D. elongata,* Miq. Suppl. Fl. Sumatr ...)

Hab. Not unfrequent along choungs in moister upper mixed forests of the Pegu Yomah on sandstone; also in Martaban, Tenasserim and Chittagong, on metamorphic rocks. Fl. Fr. Febr. March.

2. D. aurea, Sm. Exot. Bot. II. t. 92 93?; Ham. in Linn. Trans. xv. 101. *D. ornata,* Wall. Pl. As. rar. I, 20, t. 23; *D. speciosa,* Griff. Not. Dicot. 703, t. 649, f. 3.).

Hab. Frequent in the drier hill-forests of Martaban and entering the pine-forests up to 4000′ ft. elevation; also in tropical forests of Tenasserim, up to 3000 ft. elevation. Fl. March, Apr.

3. D. pulcherrima, Kurz in Journ. As. Soc. Bengal, 1871, 46; Hf. Ind. Fl. I. 37.

Hab. Common in the open forests, chiefly in the Eng-forests of Pegu and Martaban. Fl. H. S.; Fr. Begin of R. S.

4. D. parviflora, Griff. Not. Diot. 70; Hf. Ind. Fl. I. 38.

Hab. Frequent in the mixed forests of Pegu, Martaban and Tenasserim Fl. H. S.; Fr. Begin of R. S.

5. D. pilosa, Roxb. Fl. Ind. II. 652, non Ham.; Kurz in Journ. As. Soc. Bengal 1872, 292.

Hab. Frequent in the upper mixed forests of the Andamans. Fl. H. S.; Fr. Begin of R. S.

6. D. scabrella, Roxb. Fl. Ind. II. 643; Wall. Pl. as. rar. I. 20, t. 22; Hf. Ind. Fl. I. 38.

Hab. Chittagong (Roxb.). Fl. H. S., Fr. Begin of R. S.

7. D. pentagyna, Roxb. Corom. Pl. I, t. 20, and Fl. Ind. II. 652; Hf. Ind. Fl. I. 38. Var. β. augusta (*D. augusta,* Roxb. Fl. Ind. II. 652; *D. floribunda,* Hf. and Th. Fl. Ind. I. 71).

HAB. Frequent in the mixed forests, especially the upper ones of Pegu and Martaban down to Tenasserim. Fl. H. S.; Fr. Begin of R. S.

The smaller leaved and longer petioled var. *a.*, frequent in India, seems not to occur in Burmah.

MAGNOLIACEÆ.

Conspectus of genera.

I. *WINTEREÆ.* Stipules none. Perianth double. Carpels in a single whorl.

1. ILLICIUM. Only genus. Trees or shrubs.

II. *MAGNOLIEÆ.* Stipules conspicuous, convolute and sheathing the young foliage, deciduous.

* Ovary sessile.

2. TALAUMA. Carpels of fruit indehiscent, deciduous.
3. MAGNOLIA. Carpels of fruit dorsally dehiscing. Ovules 2.
4. MANGLIETIA. Carpels of fruit dorsally dehiscing. Ovules 6 or more.

* * Ovary stalked.

5. MICHELIA. Only genus.

Illicium. L.

1. J. MAJUS, Hf. et Th. Ind. Fl. I. 40.

HAB. Tenasserim, Thounggyeen range, at 5500 ft. elevation (Lobb).

Talauma, Juss.

Conspectus of species.

Leaves glabrous; fruits 4-6 in. long,.. *T. liliifera.*
Leaves usually pilose or downy beneath; fruits 2 in. long,...................*T. Candollei.*

1. T. LILIIFERA, (*Liriodendron liliiflora*, Roxb. Fl. Ind. II. 654; *T. Rabaniana*, Hf. and Th. Fl. Ind. I. 75, and Ind. Fl. I, 40).

HAB. Tenasserim, Mergui (Griff.). (According to Hf. and Th. first ed. of Fl. Ind.)

2. T. CANDOLLEI, Bl. Verh. Bat. Genotsch. I. 147; Miq. Fl. Ind. Bat. I/2 14. *T. mutabilis*, Bl. Fl. Jav. Magnol. 35. t. 10-12 B.; Hf. Ind. Fl. I. 40).

HAB. Tenasserim, Moulmein (Lobb).

Magnolia, L.

1. M. SPHENOCARPA, Roxb. Corom. Pl III. t. 266; Hf. Ind. Fl. I. 41. (*Liriodendron grandiflorum*, Roxb. Fl. Ind. II. 65).

HAB. Chittagong; Pegu (Brandis).

Manglietia, Bl.

1. M. INSIGNIS, Bl. Fl. Jav. Magnol. 23; Hf. Ind. Fl. I. 42. (*Magnolia insignis*, Wall. Tent. Fl. Nap. t. 1, and Pl. as. rar. II. t. 182).

HAB. Pegu (Brandis).

Michelia, L.

1. M. Champaca, L. sp. pl. 756; Roxb. Fl. Ind. II. 656; Bl. Fl. Jav. Magn. 9, t. 1; Griff. Not. Dicot. 715; Hf. Ind. Fl. I, 42. (*Michelia aurantiaca*, Wall. Pl. as. rar. II. t. 147).

Hab. Rather rare in the tropical forests of Martaban and Tenasserim also Pegu, above Rangoon (on laterite); Ava, Bhamo; Prome hills (Wall.). Fl. Fr. R. S.

ANONACEÆ.

Conspectus of genera.

I. *UVARIEÆ.* Petals in 2 rows, one or both rows imbricate in the bud. Stamens many, closely packed.

1. Bocagea. Sepals small, imbricated in the bud. Torus flat. Carpels 3 to 6.

2. Uvaria. Sepals valvate. Flowers bisexual; ovules 1 or 2 or many; torus almost flat. Climbers.

II. *UNONIEÆ.* Petals valvate in the bud, more or less spreading, somewhat unequal, or those of the inner row small or wanting, not or little narrowed at base.

* Petals spreading from the base.

× Ovules many, ventral.

3. Alphonsea. Petals nearly equal. Stamens 6 or more, loosely imbricated, with dorsal anthers.

4. Cananga. Petals open, elongate. Stamens indefinite, closely packed, ovate-acute at the top. Ovules in 2 rows.

5. Cyathostemma. Petals broad-ovate. Stamens indefinite, the connective obliquely incurved. Ovules many, in 2 rows.

6. Unona. Petals open, usually elongated. Stamens indefinite closely packed, capitate or truncate at the top. Ovules in a single row. Ripe carpels usually moniliform.

× × Ovules 1 or 2, erect.

7. Polyalthia. Petals opened, rather thick. Berries indehiscent.

8. Anaxagorea. Petals opened, rather thick. Carpels follicle-like, dehiscent.

* * Petals enclosing the sexual organs with a concave or connivent base, free towards the summit.

9. Cyathocalyx. Calyx 3-toothed. Petals connivent at base. Carpels solitary. Ovules many.

III. *XYLOPIEÆ.* Petals valvate, connivent or hardly open, those of the outer row usually thick, not narrowed at base, and enclosing the 3 inner, smaller or minute ones, or the latter wanting.

* Ovules solitary.

10. Anona. Outer petals concave, often broad. Berries united into a many-celled syncarp.

* * Ovules 2 or more.

11. Xylopia. Petals triquetrous, connivent, narrowed. Anthers truncate. Torus hollow. Stigmas elongate.

12. Artabotrys. Petals terete, triquetrous or flat, concave at the base and enclosing the sexual organs, the tips spreading. Anthers truncate. Torus hollow. Peduncles usually hooked.

Trib. IV. MITREPHOREÆ. Petals valvate, the outer ones open, the inner ones erect, connivent or connate at their tips and often claw-like narrowed at the base.

* Petals of the inner row shorter or equally long.

× Petals not narrowed at the base, or the claw-like base broad.

13. OXYMITRA. Inner petals connivent, not or almost not narrowed at base. Ovules 2, erect. Seeds not angular.

14. GONIOTHALAMUS. Inner petals connivent, narrowed in a broad claw. Ovules 2, erect.

15. MELODORUM. Petals thick coriaceous, the inner ones shorter, triquetrous at summit and hollowed at base on the inner side.

× × Petals narrowed into curved not angular free slender claws, the laminæ cohering in a sort of mitre.

16. MITREPHORA. Stamens numerous. Ovules many, in 2 rows. Flowers usually rather conspicuous, sometimes dioecious.

17. OROPHEA. Stamens definite, 6, 9, or 12. Ovules 2-4. Flowers usually very small.

* * Sepals and the 3 outer petals usually conform or nearly so, minute, resembling a calyx. Inner petals large, erect-connivent, often saccate or concave at base.

18. PHÆANTHUS. Inner petals flat, rather thick. Ovules 1 or 2. Anther-cells concealed by the overlapping connectives.

19. MILIUSA. Inner petals flat. Ovules 2 or more. Anther-cells not concealed.

Bocagea, St. Hil.

1. B. ELLIPTICA, Hf. and Th. in Ind. Fl. I. 92.

HAB. Tenasserim, Tavoy (Wall.).

Uvaria, L.

Conspectus of species.

Subg. 1. *Ellipeia.* Ovules solitary or by pairs. Usually erect shrubs.

A little erect shrub; berries elliptical or nearly so, very small, glabrous, sessile, *U. ferruginea.*

Subg. 2. *Eu-uvaria.* Ovules usually numerous, rarely few. Climbing shrubs.

§ Flowers large or middling sized, the connective terminating in a large almost leafy appendage.

O Carpels on long stalks.

Flowers solitary; carpels and all other parts shortly tomentose, ... *U. purpurea.*

All parts hirsute; usually solitary; carpels tawny hirsute, ... *U. hirsuta.*

Flowers by 2 or 3 on a peduncle; carpels tubercled and stellately hispid-tomentose; all parts puberulous, ... *U. ptychocalyx.*

O O Carpels sessile or very shortly stalked.

Peduncles 3-to 6-flowered; carpels glabrous,.................................. *U. macrophylla.*

Peduncles 1-to 2-flowered; carpels tomentose, ... *U. bracteata.*

§ § Flowers minute. Stamens truncate, the connective hardly produced beyond the anther-cells.

Berries on long slender stalks, glabrous,.. *U. micrantha,*

1. U. FERRUGINEA, Ham. ap. Hf. and Th. Fl. Ind. I. 96. (*Ellipeia ferruginea*, Hf. and Th. Ind. Fl. I, 52.)

HAB. Not uncommon in the Eng forests of Prome and Pegu, on laterite; also Tenasserim, Thoungyeen (Dr. Brandis). Fl. Apr.; Fr. Jan. Febr.

In this species the ovules vary in number (1 or 2). Hooker gives *Uv. dulcis*, Dun., as a Burmese plant, but I suspect it is referable to this species.

2. U. PURPUREA, Bl. Bydr. 11 and Fl. Jav. Anon. 13, t. 1 and 13 f. A; Hf. Ind. Fl. I. 47. (*Uvaria grandiflora* Roxb. Fl. Ind. II. 665, Wall. Pl. As. rar. III. t. 121).

HAB. Not uncommon in the tropical forests of Martaban; also Tenasserim.

3. U. HIRSUTA, Jack Mal. Misc.; Bl. Fl. Jav. Anon. 22, t. 5; Hf. Ind. Fl. I. 48. (*U. pilosa*, Roxb. Fl. Ind. II. 665; *U. trichomalla*, Bl. l. c. 42, t. 18).

HAB. Rare in the tropical forests of the E. slopes of the Pegu Yoma (Khaboung, Choungmenah valley).

I have only leaf-branches, but I can hardly be mistaken in identifying my specimens with Jack's Malayan species.

4. U. PTYCHOCALYX, Miq. Ann. Mus. Lugd. Bat. II. 4; Hf. Ind. Fl. I. 49.

HAB. Not uncommon in tropical forests of the southern slopes of the Pegu Yomah; Tenasserim, Moulmein (Theobald). Fr. Dec. Jan.

5. U. MACROPHYLLA, Roxb. Fl. Ind. II. 663; Wall. Pl. As. rar. II. t. 122; Hf. Ind. Fl. I. 49 pp.; Bedd. Icon. Pl. Ind. or. t. 81.

HAB. Frequent in the mixed forests all over Burma from Chittagong and Ava down to Tenasserim. Fl. R. S.; Fr. Nov. Dec.

6. U. BRACTEATA, Roxb. Fl. Ind. II. 660; Hf. Ind. Fl. I. 49.

HAB. Tenasserim (Wall.) Fl. May; Fr. Sept.

7. U. MICRANTHA, Hf. and Th. Fl. Ind. I. 103 and Ind. Fl. I. 51. (*U. Sumatrana*, Kurz And. Rep. App. B. 1; Hf. Ind. Fl. I. 51).

HAB. Rather frequent in tropical forests of the Andamans; also Pegu (Brandis) and Upper-Tenasserim (Falconer). Fl. June.

Alphonsea, Hf. and Th.

Conspectus of species.

The stalk nearly as long as the carpel,... ... ...*A. ventricosa.*
The stalk of the carpels very short, ...*A. lutea.*

1. A. VENTRICOSA, Hf. and Th. Fl. Ind. I. 152 and Ind. Fl. I. 89. (*Uvaria ventricosa*, Roxb. Fl. Ind. II. 658).

HAB. In the forests of Chittagong; Andamans.

2. A. LUTEA, Hf. and Th. Fl. Ind. I. 153, and Ind. Fl. I. 89 Bedd.

Jc. Pl. Ind. or. t. 91. (*Uvaria lutea*, Roxb. Corom. Pl. I. t. 36 and Fl. Ind. II. 666).

HAB. Ava, Segain (Wall.); Pegu (teste Hf. and Th.).

Cananga, Rumph.

1. C. ODORATA, Hf. and Th. Fl. Ind. I. 130 and Ind. Fl. I. 56. (*Uvaria odorata*, Lam. Ill. t. 495, f. 1; Roxb. Fl. Ind. II. 661; Griff. Not. Dicot. 712; *Uvaria axillaris*, Roxb. l. c. 667).

HAB. Ava (Wall. cult.?); Tenasserim, apparently frequent.

Cyathostemma, Griff.

1. C. VIRIDIFLORUM, Griff. Not. Dicot. 707, Ic. t. 650; Hf. Ind. Fl. I. 57.

HAB. South Andaman, in the tropical forests north of Port Mouat.

This species is inserted here on the authority of Hf. and Th.

Unona, L.

Conspectus of species.

Sect. 1. *Desmos.* Petals 6. Berries necklace-like constricted between the seeds.

× Petals glabrous.

Leaves glabrous, pale coloured beneath; peduncles only ½ to 1½ in. long, axillary and occasionally terminal, ... *U. Dunalii.*

× × Petals appressed pubescent or puberulous.

Leaves glabrous beneath; peduncle 1-2 in. long; petals 2 in. by 1 in. ... *U. discolor.*

Leaves glaucous and usually pubescent beneath; peduncle 4-8 in. long; petals 2½ by 1 in., ... *U. desmos.*

Leaves while young greyish tomentose; peduncle 4 to 8 lin. long; petals 1-1½ in. long. oblong, ... *U. latifolia.*

Leaves pale coloured and pubescent beneath along the nerves; peduncle ¼-½ in. long; petals 2 to 3 in. long, very narrow linear, ... *U. stenopetala.*

Sect. 2. *Dasymaschalon.* Outer petals 3, large, the 3 inner ones quite suppressed.

Petioles rather long; petals 4 to 6 in. long, ... *U. longiflora.*

Leaves almost sessile, cordate at base; petals nearly 3 in. long, ... *U. dasymaschala.*

1. U. DUNALII, Wall. ap. Hf. and Th. Fl. Ind. I. 131, and Ind. Fl. I. 53.

HAB. Forests of Chittagong on the Seetakoond hill (Hf. and Th.).

2. U. DISCOLOR, Vahl. Symb. II. 63, t. 36; Roxb. Fl. Ind. II. 669; Hf. Ind. Fl. I. 59; Bedd. Icon. Pl. Ind. or. t. 51.

Var. α. PUBIFLORA, Hf. and Th. l. c.

Var. β. PUBESCENS, Hf. and Th. l. c.

Var. γ. LATIFOLIA, Hf. and Th. l. c.

HAB. Tropical forests and moister upper mixed forests from Chittagong and Ava down to Tenasserim. Fr. Jan.

3. U. DESMOS, Dun. Anon. 112; Hf. Ind. Fl. I. 52.

HAB. Frequent in tropical and low forests all over Pegu and Martaban; also Tenasserim. Fl. June; Fr. October.

It is difficult to distinguish some states of this species from the former, for the peduncles vary very much in length, as do also the petals with regard to size and shape.

4. U. LATIFOLIA, Hf. and Th. Ind. Fl. I. 60.

HAB. Martaban, in dry hill-forests on limestone rocks along the Ngachoung of the Salween (Brandis). Fl. May.

5. U. STENOPETALA, Hf. and Th. Fl. Ind. I. 163, and Ind. Fl. I. 60.

HAB. Tenasserim, Moulmein (Lobb).

6. U. LONGIFLORA, Roxb. Fl. Ind. II. 668; Hf. Ind. Fl. I. 61.

HAB. Chittagong.

7. U. DASYMASCHALA, Bl. Fl. Jav. Avon. 55. t. 27; Hf. and Th. Fl. Ind. I. 135, and Ind. Fl. I. 61. (*Pelticalyx argentea*, Griff. Not. Dicot. 706?).

Var. α. BLUMEI, Hf. and Th. l. c.

Var. β. WALLICHII, Hf. and Th. l. c. (*U. coelophloea*, Scheff. Obs. phyt. 6?).

HAB. Frequent in the tropical forests of Martaban and Tenasserim to the Andamans; also Ava. Fl. Febr. to May.

Polyalthia, Bl.

Conspectus of species.

Sect. 1. *Monoon*, Miq. Fl. hermaphrodite. Petals flat. Ovules solitary, erect.

§ Flowers usually rather large; carpels oblong or elongate and cylindrical.

× Petals linear to linear-lanceolate or spathulate-linear.

Leaves glabrous, one-coloured, apiculate or shortly acuminate; carpels obversely ovoid, ...*P. lateriflora.*

Leaves glabrous, glaucous or whitish beneath, shortly acuminate, ...*P. Sumatrana,*

× × Petals ovate to ovate-lanceolate and elliptical.

Carpels almost globular, glabrous?, leaves glabrous,... ... ... *P. nitida.*

Carpels velvety; leaves along the nerves beneath puberulous, ...*P. membranacea.*

Carpels elongate-oblong, glabrous; leaves along the nerves pubescent, ...*P. Jenkinsii.*

§ § Flowers small, on slender pedicels; carpels globular, pea-shaped.

Leaves along the nerves beneath pubescent, blunt or nearly so ... ...*P. suberosa.*

Leaves pubescent beneath, acuminate, ...*P. cerasoides.*

Sect. 2. *Eupolyalthia.* Flowers hermaphrodite. Petals flat. Ovules 2, superposed, ascending.

Fowers small, sessile or nearly so, sometimes clustered, ...*P. dubia.*

1. P. LATERIFLORA, (*Guatteria lateriflora*, Bl. Bydr. 20 and Fl. Jav. Anon. 100, t. 50 and 52 D.; *Guatteria spathulata*, T. et B. in Tydschr. Nat. Ver. Ned. Ind. XXIV, petalis latioribus; *P. simiarum*, Bth. and Hf. Ind. Fl. I. 63.)

HAB. Not uncommon in the tropical forests of the eastern slopes of the Pegu Yomah and Martaban; also Tenasserim. Fr. May, June.

2. P. SUMATRANA (*Guatteria Sumatrana,* Miq. Suppl. Fl. Sumatr. 380; *Monoon Sumatranum,* Miq. in Ann. Mus. Lugd. Bat II. 19).

HAB. Tenasserim (or Andamans?) (Helf.).

3. P. NITIDA, Bth. and Hf. Ind. Fl. I. 64. (*Guatteria nitida,* A. DC. Mem. Anon. 41.

HAB. Tenasserim, Tavoy (Wall.).

Guatteria membranacea, A. DC. Mem. Anon. 41. Hf. Ind. Fl. I. 68. is hardly different from the above.

4. P. JENKINSII, Bth. and Hf. Ind. Fl. I. 64. (*Guatteria Jenkinsii,* Hf. and Th. Fl. Ind. I. 141; *P. Andamanica,* Kurz and And. Rep. 2 ed.29).

HAB. Frequent in the tropical forests of South Andaman and the adjacent islands. Fl. begin of R. S.

5. P. SUBEROSA, Bth and Hf. Ind. Fl. I. 65; Bedd. Icon. Pl. Ind. or. t. 56. (*Uvaria suberosa,* Roxb. Corom. Pl. I. t. 34 and Fl. Ind. II. 667).

HAB. Tenasserim. Fr. Febr.

6. P. CERASOIDES, Bth. and Hf. Ind. Fl. I. 63. (*Uvaria cerasoides* Roxb. Corom. Pl. I. t. 33, and Fl. Ind. II. 666; *Guatteria cerasoides,* Dun. Mem. Anon. 28; *P. bifaria,* Bth. and Hf. Ind. Fl. I. 62).

HAB. Prome (Wall.) Fr. Sept. Oct.

Wallich's specimens in HBC. are in fruit, and, therefore, it is very improbable that the flowers (which appear during H. S.) should belong to the same specimens in Kew Herb. referred to *P. bifaria.*

7. P.? DUBIA, Kurz in And. Rep. 2nd ed. 29 (*P. macrophylla,* Hf. and Th. Ind. Fl. I. 66, excl. syn.) var. *α* GLABRIUSCULA, petals broader, leaves and branchlets glabrescent, var. *β*. FALCONERI, branchlets and leaves beneath pubescent, petals less imbricate in bud.

HAB. Var. *α*. Frequent in the tropical forests on the Andamans; var. *β*. Moulmein (Falc. 545). Fl. May, June.

I have only male flowers, and the imbrication of the petals (especially in the Andaman plant) indicates a different genus. Hf. and Th. identify the plant with Blume's *Guatteria macrophylla* (= *Trivalvaria macrophylla, Miq.*, *Guatteria brevipetala,* Miq.) which resembles especially the Andaman plant so much that I confounded it with it in my Andaman Report. This has, however, the inner petals thick and fleshy, narrowed at base and the broad triangular blades (see Bl. Fl. Jav. Anon. t. 52. B. f. 2,) connivent somewhat after the fashion of *Mitrephora.*

Doubtful species.

1. P. COSTATA, Hf. and Th. Ind. Fl. I. 67.

HAB. Tenasserim, along the Attaran river (Wall.)

Hf. and Th. refer this to the genus *Trivalvaria,* Miq.

Anaxagorea, St. Hil.

1. A. Luzonensis, A. Gray in Bot. U. S. Expl. Exp. 27; Hf. Ind. Fl. I. 68. (*A. Zeylanica*, Hf. and Th. Fl. Ind. I. 144; Bedd. Icon. Pl. Ind. or. t. 46.)

Hab. Not unfrequent in the tropical forests of Martaban and the southern slopes of the Pegu Yomah; also on the Andamans. Fl. May, June; Fr. Aug.

Popowia, Endl.

1. P. Helferi, Hf. and Th. Ind. Fl. I. 69.

Hab. Tenasserim, King's island (Helfer).

Cyathocalyx, Champ.

1. C. Martabanicus, Hf. and Th. Ind. Fl. I. 53,

Hab Not uncommon in the tropical forests of Martaban down to Tenasserim, rare in those of the eastern and southern slopes of the Pegu Yomah. Fr. March, Apr.

Anona, L.

Conspectus of species.

* Fruits areolate.

Leaves usually blunt; inner petals minute or almost none; fruit with prominent convex areoles, ...*A. squamosa.*

Leaves acuminate, larger; areoles of fruit not or hardly projecting, .. *A. reticulata.*

* * Fruits very large, muricate.

All parts glabrous. ... ... *A. muricata.*

1. A. squamosa, L. sp. pl. 757; Roxb. Fl. Ind. II. 657; Bot. Mag. t. 3095; Bl. Fl. Jav. Anon. 107. t. 53 B.; Hf. Ind. Fl. I. 78.

Hab. Cultivated all over Burmah, more especially and on a large scale in the Prome district. Fl. March.

2. A. reticulata, L. sp. pl. 757; Roxb. Fl. Ind. II. 657; Bot. Mag. t. 2911; Hf. Ind. Fl. I. 78.

Hab. Not much cultivated in Burmese gardens.

3. A. muricata, L. sp. pl. 756; Miq. Fl. Ind. Bat. I-2. 34.

Hab. Cultivated in gardens of Tenasserim, especially the southern parts.

Artabotrys, R. Br.

Conspectus of species.

§ Blade of petals flattened.

× Petals oblong-lanceolate, usually narrowed at base, with the borders reflexed.

O Flowers arising from hooked peduncles.

Young parts rusty tomentose; leaves firmly coriaceous, glabrous; petals densely tawny tomentose ... ...*A. crassifolius*

Quite glabrous; leaves thin coriaceous; petals glabrous or puberulous ... *A. odoratissimus.*

O O Flowers arising directly from the lateral branchlets, peduncle reduced or only indicated.

Small erect shrub, adult parts all glabrous. ... ... *A. Kurzii.*

× × Petals narrow, linear, elongate, ... *A. speciosus.*

§ § Petal-blade terete or triquetrous, fleshy, subulate or linear.

Petals triquetrous; branchlets and leaves beneath pubescent ... .. *A. Birmanicus.*

Petals terete; all parts glabrous .. .. *A. suaveolens.*

1. A. CRASSIFOLIUS, Hf. and Th. Ind. Fl. I. 54.

HAB. Martaban (Dr. Brandis).

2. A. ODORATISSIMUS, R. Br. in Bot. Reg. t. 423; Hf. Ind. Fl. I. 54. (*A. hamatus*, Bl. Fl. Jav. Anon. 60, t. 29 and 31, C; *Uvaria odoratissima* et *U. uncata*, Roxb. Fl. Ind. II. 666; *A. Blumei*, Hf. and Th. Fl. Ind. I. 128; *A. intermedius*, Hassk. Pl. Jav. rar. 173).

HAB. Tenasserim, banks of rivers, along the Attaran etc.; Ava, near Mandalay, probably cultivated. (Dr. J. Anderson.)

3. A. KURZII, Hf. and Th. Ind. Fl. I. 54.

HAB. Not unfrequent in the Eng forests of Pegu and Martaban, on laterite. Fl. Apr.

4. A. SPECIOSUS, Kurz in And. Rep. 1 ed. App. B. 1; Hf. Ind. Fl. I. 55.

HAB. In the tropical forests along Middle Straits, South Andaman. Fl. May.

5. A. BURMANICUS, A. DC. Mem. Anon. 36; Hf. Ind. Fl. I. 55. (*Rhopalopetalum uniflorum*, Griff. Not. Dicot. 717).

HAB. Not unfrequent in tropical forests of the eastern slopes of the Pegu Yomah; Tenasserim from Moulmein to Mergui; also Ava, on Taong dong (Wall.) Fl. Nov.; Fr. Febr.

6. A. SUAVEOLENS, Bl. Fl. Jav. Anon. 62, t. 30 and 31, D.; Hf. Ind. Fl. I. 55. (*Rhopalopetalum sp.* Griff. Not. Dicot. 716).

HAB. Chittagong (Hf. and Th.), Tenasserim, Mergui (Griff).

Oxymitra, Bl.

Conspectus of species.

* Sepals short, coriaceous, 2 to 3 lin. long.

Petals from a broad base narrowly linear, nearly 2 in. long, slightly pubescent *O. stenopetala.*

Petals oblong-lanceolate, blunt, very thick, tawny puberulous, ... *O. Macclellandii.*

Incompletely known. ... ... *O. unonæfolia.*

* * Sepals as in *Goniothalamus*, membranous and nerved, large about 7 to 8 lin. long.

Petals oblong-lanceolate, about 1½ in. long, acute, tawny pubescent, ... *O. fornicata.*

1. O. STENOPETALA, Hf. and Th. Ind. Fl. I. 71.

HAB. Tenasserim, Moulmein and Thoungyeen (Falc., Brandis). Fl Apr.

2. O. MACCLELLANDII, Hf. and Th. Ind. Fl. I. 70.

HAB. Not unfrequent in the tropical and low forest of the southern slopes of the Pegu Yomah, chiefly on permeable laterite. Fl. May to June.

3. O. FORNICATA, Hf. and Th. Fl. Ind. I. 146 and Ind. Fl. I. 71. (Uvaria fornicata, Roxb. Fl. Ind. II. 662).

HAB. Not unfrequent in the tropical forests of South Andaman; Tenasserim, Mergui (Griff.). Fl. May.

Doubtful species.

1. O. UNONÆFOLIA, Hf. and Th. Fl. Ind. I. 146 and Ind. Fl. I. 71.

HAB. Tenasserim, Tavoy (Wallich).

Goniothalamus, Bl.

Conspectus of species.

Flowers about 9 lin. long. ... ... *G. sesquipedalis.*
Flowers about 2 in. long ... ... *G. Griffithii.*

1. G. SESQUIPEDALIS, Hf. and Th. Fl. Ind. I. 108 and Ind. Fl. I. 73. (*Guatteria sesquipedalis,* Wall. Pl. As. rar. III. t. 266).

HAB. Tenasserim (teste Hf. and Th).

2. G. GRIFFITHII, Hf. and Th. Fl. Ind. I. 110 and Ind. Fl. I. 73.

HAB. Rather rare in the tropical forests of the eastern slopes of the Pegu Yomah (headwaters of Swachoung); Martaban (Brandis); Tenasserim, Mergui (Griff).

Melodorum, Dun.

Conspectus of species.

Sect. 1. *Pyramidanthe,* Miq. Calyx cyathiform, 3-lobed. Flowers large, 2-5 in. long.
Flowers 4-5 in. long, white; leaves membranous, quite glabrous, ... *M. macranthum.*
Flowers 2-3 in. long, yellow; leaves beneath densely puberulous, glabrescent coriaceous, ... *M. prismaticum.*
Sect. 2. *Eu-Melodorum.* Calyx deeply 3-cleft; flowers small, 1 in. or less long.
Flowers about an in. long or a little longer; carpels simply tomentose, ... *M. rubiginosum.*
Flowers about ½ in. long, ... *M. Griffithii.*
Flowers nearly ¾ in. long; carpels densely verrucose, pubescent, ... *M. verrucosum.*
Flowers 1 in. long; carpels almost glabrous, ... *M. bicolor.*

1. M. MACRANTHUM Kurz in Journ. As. Soc. Beng., 1872, 291. (*Unona macrantha,* Kurz in And. Rep. ed. 1. App. B. 1; *Pyramidanthe macrantha,* Kurz, l. c., ed. 2, p. 29).

HAB. Rather rare in the tropical forests about Port Mouat, South Andaman. Fl. June.

The large flowers resemble much those of *Unona longiflora,* the leaves those of *Goniothalamus cardiopetalus.*

2. M. RUBIGINOSUM, Hf. and Th. Fl. Ind. I. 116 and Ind. Fl. I. 79.

HAB. Rare in the tropical forests of Martaban (E. of Tounghoo); Tenasserim; Chittagong.

3. M. GRIFFITHII, Hf. and Th. Fl. Ind. I. 120 and Ind. Fl. I. 80. (*Fissistigma scandens*, Griff. Not. Dicot. 706).

HAB. Tenasserim, Mergui (Griff.) Fl. Decb.

4. M. VERRUCOSUM, Hf. and Th. Fl. Ind. I. 119 and Ind. Fl. I. 80.

HAB. Ava, Khakyen hills, Ponsee (J. And.). Fl. Apr.

5. M. BICOLOR, Hf. and Th. Fl. Ind. I. 119 and Ind. Fl. I. 80. (*Uvaria bicolor*, Roxb. Fl. Ind. II. 662).

HAB. Tropical forests of the western slopes of Pegu, along the head-waters of the Panyo-gyee choung (feeder of Toungnyo choung); Ava (accord. Hf. and Th.).

Mitrephora, Bl.

Conspectus of species.

* Flowers dioecious, small (about 3 lin. long).

Leaves (except nerves beneath) glabrous; inflorescence and petals tomentose, *M. reticulata.*

* * Flowers conspicuous, 1 to 2 in. in diameter.

Leaves softly tomentose beneath; flowers 2 in. across, on short and thick pedicels, ...*M. tomentosa.*

Leaves minutely puberulous or almost glabrous, chartaceous; flowers about an in. across, on long slender pedicels, ...*M. vandæflora.*

1. M. RETICULATA, Hf. and Th. Ind. Fl. I. 77. (*U. reticulata*, Bl. Fl. Jav. Anon. 50. t. 24; *M. aperta*, T. et B. in Nat. Tydsch. Ned. Ind.).

HAB. Tenasserim (Helf.).

2. M. TOMENTOSA, Hf. and Th. Fl. Ind. I. 113, and Ind. Fl. I. 76.

HAB. Chittagong.

3. M. VANDÆFLORA, Kurz, MS.

HAB. Not unfrequent in the tropical forests of the Pegu Yomah and Martaban. Fl. Febr.—March.

This should be compared with *M. Maingayi*, Hf. and Th., a species which I cannot recognize from the description alone. There are two varieties differing in the texture and pubescence of the leaves, but the flowers are alike in both.

Orophea, Bl.

Conspectus of species.

* Flowers very small (hardly 2 to 3 lin. in diameter).

Leaves glabrous; sepals minutely hispid, ciliate; carpels globular, stalked, ... *O. polycarpa.*

Leaves along the nerves pubescent; sepals densely pubescent; carpels elongated, oblong, sessile, ... *O. hexandra.*

* * Flowers rather large (about an in. in diameter).

Leaves rather large, pubescent beneath, ... *O. Brandisii.*

1. O. POLYCARPA, A. DC. Mém. Soc. Gen. V. 39; Hf. Ind. Fl. I. 91. (*Anonacea* Griff. Dicot. Ic. t. 654?, *Melodorum monospermum*, Kurz in And. Rep. App. B. p. 1.)

Hab. Rather frequent in the tropical forests of the Andamans; Martaban, Meeplay (Brandis); Tenasserim, along the Salween (Wll.). Fl. March; Fr. June.

2. O. hexandra, Bl. Bydr. 18; Miq. Fl. Ind. Bat. I-2, 29. (*Bocagea hexandra*, Bl. Fl. Jav. Anon. 13, t. 40; *O. acuminata*, A. DC. Mém. Soc. Gen. V. 39; Hf. Ind. Fl. I. 91).

Hab. Tenasserim, Tavoy (Wall.).

3. O. Brandisii, Hf. and Th. Ind. Fl. I. 92.

Hab. Not uncommon along choungs in the tropical forests of Martaban (Toukyeghat); Tenasserim, Thounggyeen (Brandis). Fl. Apr. May.

Miliusa, Lesch.

Conspectus of species.

* Pedicels 2 to 4 in. long, without or with a rudimentary bractlet.

Tomentose; berries tomentose, shortly stalked, ...*M. velutina.*

* * Pedicels short, only 6 to 10 lin. long.

Branchlets and leaves beneath rusty pubescent; flowers about ½ in. long; pedicels bracteoled, ...*M. Roxburghiana.*

Leaves glabrous; flowers nearly an in. long; pedicels bracteoled,... ...*M. tristis.*

Almost glabrous; pedicels without bractlet, ...*M. sclerocarpa.*

1. M. velutina, Hf. and Th. Fl. Ind. I. 151 and Ind. Fl. I. 87; Bedd. Ic. Pl. Ind. or. t. 87. (*Uvaria villosa*, Roxb. Fl. Ind. II. 664).

Hab. In the lower mixed, the low and moist forests, entering also the savannah forests; Ava; common in Pegu, but rare in Martaban, also in Tenasserim. Fl. H. S.; Fr. Begin. of R. S.

2. M. Roxburghiana, Hf. and Th. Fl. Ind. I. 150 and Ind. Fl. I. 87. (*Uvaria dioica*, Roxb. Fl. Ind. II. 659; *Hyalostemma Roxburghiana*, Wall. Cat. 6434; Griff. Dicot. Icon. t. 653; *Phæanthus dioicus*, Kurz in Journ. As. Soc. 1870, 62).

Hab. Chittagong; Tenasserim.

3. M. tristis, Kurz, MS.

Hab. Ava, Khakyen hills, at Ponsee (Dr. J. Anderson). Fl. March.

4. M. sclerocarpa, Kurz in Journ. As. Soc. Beng. 1872, 291. (*Saccopetalum sclerocarpum*, Hf. and Th. Ind. Fl. I. 88).

Hab. Not unfrequent in the upper mixed forests of the Martaban hills, E. of Tounghoo, at 2000 to 3000 ft. elevation; Tenasserim, Moulmein (Wall.) Fl. March.

The difference between *Phæanthus* and *Miliusa* is restricted to the nature of the connective, a character which in *Uvaria* has met with no consideration.

N. B. Nephrostigma, sp. Griff. Not. Dicot. 717 from Mergui I cannot identify. Griffith says that the genus is easily recognizable by the sepals and outer petals being conform. Now if "sepala exteriora *majora*" be a misprint for *minora*, we might compare it with *Miliusa* or *Phæanthus.*

MENISPERMACEÆ.

Conspectus of genera.

Trib. I. TINOSPOREÆ. Carpels 3, rarely 6. Style-scar almost terminal, rarely ventral or almost basal. Seeds meniscoid or rarely oblong, albuminous. Cotyledons leafy, usually spreading laterally.

* Petals 6, shorter than the inner sepals. Style-scar almost terminal.

1. PARABÆNA. Sepals 6. Filaments connate, the anthers in heads. Seeds meniscoid.

2. ASPIDOCARYA. Sepals 12. Filaments connate, the anthers sessile round the peltate end of the column. Seeds oblong.

3. TINOSPORA. Sepals 6. Stamens 5; anther-cells lateral, distinct. Seeds meniscoid. Albumen ruminate.

* * Petals none.

4. FIBRAUREA. Sepals 9. Stamens 6, free. Style-scar almost terminal. Albumen horny.

5. ANAMIRTA. Sepals 6, in 2 rows. Filaments connate, anthers sessile at the end of the column. Style-scar almost basal. Albumen ruminate.

Trib. II. COCCULEÆ. Flowers 3-merous. Ovaries usually 3. Style-scar almost basal, rarely almost terminal. Seeds horseshoe-shaped. Albumen copious. Embryo slender, the cotyledons linear or only slightly dilated.

× Albumen ruminate.

6. TILIACORA. Petals 6, minute. Carpels 6-12.

× × Albumen homogeneous.

7. LIMACIA. Petals 5—8. Styles short, compressed.

8. COCCULUS. Petals 6. Carpels 3—6. Styles subulate, simple or 2-cleft.

Trib. III. CISSAMPELIDEÆ. Flowers 3—5-merous. Ovaries usually solitary. Style-scar usually almost basal. Endocarp dorsally muricate or echinate. Seeds horseshoe-shaped. Albumen scanty. Embryo linear, the cotyledons appressed.

9. STEPHANIA. Petals 3 to 5, shorter than the sepals, rather thick. Staminal column peltate at summit. Flowers umbellate.

10. CISSAMPELOS. Male fl.: sepals 4; petals united in a cup. Female fl: sepals and petals 1—2, the latter entire 2-cleft or -parted; styles simple. Flowers cymose or racemose.

11. CYCLEA. Male fl.: Sepals connate; petals more or less connate. Female fl: sepals 2, lateral, free; petals none; styles 2-parted Flowers panicled.

Trib. IV. PACHYGONEÆ. Flowers usually 3-merous. Ovaries and carpels usually 3, rarely 9—12. Style-scar almost basal or ventral. Seed curved hooked or inflexed, without albumen. Cotyledons thick and fleshy.

12. PACHYGONE. Sepals, petals and stamens, 6 each. Anthers blunt. Styles thick, Drupes reniform.

Parabæna, Miers.

1. P. SAGITTATA, Miers in Tayl. Ann. ser. 2-VII. 39 and Contr. Bot. III. 57 and 391, t. 98; Hf. Ind. Fl. I. 96.

HAB. Not unfrequent in the tropical forests along the eastern slopes of the Pegu Yomah and Martaban; also Ava and Chittagong. Fl. March, Apr.—Fr. May, June.

Aspidocarya, Hf. and Th.

1. A. UVIFERA, Hf. and Th. Fl Ind. I. 180 and Ind. Fl. I. 95. Miers contrib. III. 58. t. 99. var. *β*, MOLLIS, all parts softly pubescent.

HAB. Ava, Khakyen hills, Ponsee (J. Anderson). Fl. Apr.

Tinospora, Miers.

Conspectus of species.

* Drupes the size of a pea, the putamen tuberculate.

Young parts and the orbicular-ovate blunt leaves beneath tomentose, ...*T. tomentosa.*
Young parts and the cordate-ovate acuminate leaves beneath pubescent, ...*T. Malabarica.*
All parts glabrous, ...*T. crispa.*

* * Putamen smooth.

All parts glabrous; drupes the size of a pea, ...*T. cordifolia.*
Young leaves and shoots pubescent or tomentose; drupes the size of a cherry, *T. nudiflora.*

1. T. TOMENTOSA, Miers in Tayl. Ann. ser. 2 VII. 38 and Contr. Bot. III. 33; Hf. Ind. Fl. I. 96. (*Menispermum tomentosum*, Roxb. Fl. Ind. III. 813).

HAB. Ava (Wall.)

2. T. MALABARICA, Miers in Tayl. Ann. ser. 2. VII. 38 and Contr. Bot. III. 32; Hf. Ind. Fl. I. 96.

HAB. Chittagong (Hf. and Th.)

3. T. CRISPA, Miers in Tayl. Ann. ser. 2, VII. 38 and Contr. Bot. III. 34 Scheff. Obs. Phyt. III. 71. t. 1. (*Menispermum verrucosum*, Roxb. Fl.; Ind. III. 808).

HAB. Pegu (teste Hf. and Th.); Arracan, Sandoway (teste Miers).

4. T. CORDIFOLIA, Miers in Tayl. Ann. ser. 2. VII. 38 and Contr. Bot. III. 31; Hf. Ind. Fl. I. 97; Scheff. Obs. Phyt. III. 71, t. 2. (*Menispermum cordifolium*, Willd. IV. 826; Roxb. Fl. Ind. III. 811? *Cocculus cordifolius* DC. Syst. I. 518; Wight Ic. t. 485-486).

HAB. Not unfrequent in the forests of the Andaman islands; Ava (Wall.); Chittagong.

Roxburgh figures the stems of his plant as 5- (or 6 ?) angular, and the angles as produced into membranous waved wings; it can, therefore, hardly be the same as Miers's.

5. T. NUDIFLORA, Kurz in Journ. As. Soc. Bengal, 1872, 292. (*Cocculus nudiflorus*, Griff. Not. Dicot. 307).

HAB. Rather frequent in the tropical forests of the E. slopes of the Pegu Yomah and Martaban; also Tenasserim.—Fl. March, Apr.; Fr. Begin. of R. S.

Fibraurea, Lour.

1. F. TINCTORIA, Lour. Fl. Coch. II. 769; Miers Contr. Bot. III. 41; Hf. Ind. Fl. I. 98; Scheff. Obs. Phyt. III. 73, t. 4.

HAB. Tenasserim, Tavoy (Griff.).

HAB. Not unfrequent in the tropical forests along the eastern slopes of the Pegu Yomah and Martaban down to Tenasserim (Moulmein); also Chittagong.

2. C. LINNÆANUS, (*Menispermum hirsutum* L. sp. pl. 1469 Roxb. Fl. Ind. III. 814; *Menispermum myosotoides*, L. l. c.; *Cocculus villosus*, DC. Syst. I. 525; Hf. and Th. Ind. Fl. I. 101).

HAB. Frequent in hedges, shrubberies, etc. around villages all over Pegu and Prome; also Ava. Fl. Jan. Febr.

3. C. INCANUS, Colebr. in Linn. Trans. XVII. 57; Scheff. Obs. Phyt. III. 76, t. 10. (*Pericampylus incanus*, Miers in Tayl. Ann. ser. 2. VII. 40 and Contr. Bot. III. 118; Hf. and Th. Ind. Fl. I. 102; *Menispermum villosum* Roxb. Fl. Ind. III. 812).

HAB. Frequent in savannahs, mixed and other deciduous forests all over Burmah from Chittagong, Ava, Pegu and Martaban down to Tenasserim, up to 3000 ft. elevation. Fl. March.

Stephania, Lour.

Conspectus of species.

Leaves glabrous or pubescent; flowers very shortly pedicelled, in head-like umbellets, .. *St. hernandifolia.*

Leaves glabrous; flowers slenderly pedicelled forming loose cymose umbellets, *St. rotunda.*

1. ST. HERNANDIFOLIA, Walp. Rep. I. 96; Hf. and Th. Fl. I. 196 and Ind. Fl. I. 103; Wight Jc. t. 939.

Var. α. GLABRESCENS, Hf. and Th. l. c.

Var. β DISCOLOR Hf. and Th. l. c. (*Cissampelos hernandifolia*, Willd., Roxb. Fl. Ind. III. 842; *Lissampelos hexandra*, Roxb. l. c. 840).

HAB. Frequent all over Burmah from Ava and Chittagong down to Tenasserim, in savannahs and mixed forests, etc. Fl. March to June; Fr. Apr. June.

2. ST. ROTUNDA, Lour. Fl. Coch. 747; Hf. and Th. Fl. Ind. I. 197 and Ind. Fl. I. 103; Scheff. Obs. Phytol. III. 79, t. 14. (*Cissampelos glabra* Roxb. Fl. Ind. III. 840, Wal-tiedde, Gaertn. Fruct. I. t. 180.).

HAB. Frequent in mixed forests and shrubberies round villages, etc. of Pegu; also Tenasserim, Moulmein; Andamans. Fl. May, June.

Cissampelos, L.

1. C. PAREIRA, L. sp. pl. 1473; Hf. and Th. Fl. Ind. I. 198 and Ind. Fl. I. 103; Scheff. Obs. Phyt. III. 79, t. 14. (*C. Caapa*, L. sp. pl. 1473; Roxb. Fl. Ind. III. 842; *C. convolvulacea*, Willd.; Roxb. l. c.)

HAB. Common all over Burma and adjacent provinces, in all leafshedding forests and in cultivated lands, but specially in the savannahs and savannah-forests, up to 3000 ft. elevation. Fl. H. S.

Anamirta, Colebr.

1. A. Cocculus, WA. Prod. I. 446; Hf. Ind. Fl. I. 98. (*A. paniculata*, Colebr. Linn. Trans. XIII. 66; Miers Contr. Bot. III. 51; *Menispermum Cocculus*, L. sp. pl. 1468; Roxb. Fl. Ind. III. 807; *Menispermum heteroclitum*, Roxb. l. c. 817).

Hab. Tenasserim, Moulmein (Falconer). Fl. Febr.

Tiliacora, Colebr.

1. T. racemosa, Colebr. in Lin. Trans. XIII. 67; Miers Contr. Bot. III. 76 t. 104; Hf. Ind. Fl. I 99. (*Menispermum polycarpum*, Roxb. Fl. Ind. III. 816; *Tiliacora acuminata*, Miers in Tayl. Ann. ser. 2. VII. 39; Scheff. Obs. Phytol. III. 74. t. 7) *Cocculus acuminatus*, DC. Prod. I. 99; Deless. Icon. Sel. I. t. 95).

Hab. Pegu (teste F. Mason.)

Limacia, Lour.

Conspectus of species.

Subg. 1. *Hypserpa*, Miers. Sepals 8—12, broad, of thin texture, the smaller ones imbricate. Older leaves glabrous; stamens 6 to 10, ...*L. cuspidata*.
Subg. 2. *Eu-Limacia*, Miers. Sepals 9, thick, valvate in bud.
Stamens 3; adult leaves glabrous, ...*L. triandra*.
Stamens 6; branches and leaves beneath velvety tomentose, ...*L. velutina*.

1. L. cuspidata, Hf. and Th. Fl. Ind. I. 189, and Ind. Fl. I. 100. Scheff. Obs. Phytogr. III. 75 t. 8.

Hab. Tenasserim, Mergui (Griff).

2. L. triandra, Miers in Tayl. Ann. ser. 2, VII. 43; Hf. Ind. Fl. I. 100.; (*Menispermum triandrum*, Roxb. Fl. Ind. III. 816; *L. Amherstiana*, Miers Contr. III. 112).

Hab. Prome (Wall.); Tenasserim, Kogun, Amherst (Wall. and Falc).

3. L. velutina, Miers in Tayl. Ann ser. 2, VII. 43; Hf. Ind. Fl. I. 100. (*Cocculus villosus*, Griff. Not. Dicot. 308 ?).

Hab. Tenasserim, Moulmein (Lobb. 335); Mergui (Griff).

Cocculus, DC.

Conspectus of species.

Subg. 1. *Cocculus.* Styles simple.
Leaves glabrous, on very long petioles, ...*C. glaucescens*.
Leaves more or less pubescent, especially beneath; petioles short,... ...*C. villosus*.
Subg. 2. *Pericampylus.* Styles 2-parted.
Leaves almost peltate, tomentose or pubescent beneath, ... *C. incanus*.

1. C. glaucescens, Bl. Bydr. 25; Miq. Ann. Mus. Lugd. Bat. IV. 84. (*C. macrocarpus*, WA. Prod. I. 13; Wight Ill. I. 22, t. 7; Hf. Ind. Fl. I. 101).

Cyclea, Arn.

1. C. PELTATA, Hf. and Th. Fl. Ind. I. 201 and Ind. Fl. I. 104; Scheff. Obs. Phyt. III. 79, t. 15.

HAB. Not unfrequent in the open, especially the hill Eng-forests, and in dry and drier upper mixed forests all over Burma from Chittagong and Ava down to Tenasserim. Fl. Fr. Oct. to March.

Pachygone, Miers.

Conspectus of species.

Inflorescence and drupes densely tomentose; leaves with prominent nervation, *P. dasycarpa.*
Inflorescence glabrous; leaves almost polished, ... *P. odorifera.*

1. P. DASYCARPA, Kurz in Journ. As. Soc. Beng. 1870. 62. (*Antitaxis ramiflora*, Miers Contr. III. 1871, 358).

HAB. Upper Tenasserim, Moulmein District, on limestone (Dr. Stoliczka). Fl. R. S.

2. P. ODORIFERA, Miers Contr. Bot. III. 333.

HAB. Common in the swamp forests of Prome, Pegu and Martaban; Tenasserim, Moulmein, on limestone rocks (Parish).

I have seen no authentic specimens of *P. odorifera*, and refer my plant here on the authority of Baker (*in lit.*). Unfortunately I did not succeed in finding either flower or fruit of this common climber, but it certainly is different from *P. ovata.*

One or two other large-leaved species occur on the Andamans and Nicobars, but they are only in leaves.

BERBERIDEÆ.

Conspectus of genera.

Trib. I. LARDIZABALEÆ. Flowers unisexual or polygamous. Carpels 3. Usually climbers.

1. PARVATIA. Leaves digitate. Stamens monadelphous. Climbers.

Trib. II. BERBERIDEÆ. Flowers hermaphrodite. Carpel solitary, erect or stemless.

2. BERBERIS. Ovules erect, basilar. Fruit a berry. Shrubs.

Berberis, L.

1. B. NEPALENSIS, Spreng. Syst. veg. II. 120; Hf. Ind. Fl. 1. 109 (*Mahonia Nepalensis*, DC. Prod. I. 109 Deless. Icon. sel. II. t. 4; *B. Leschenaultii*, Wall. Cat. 1479; Wight Jc. t. 940).

HAB. Tenasserim, Mergui (Griff.).

Hf. and Th. in the first edition of their Flora of India cite Mergui as a habitat for *Parvatia Brunoniana*; Dr. Brandis, however, informs me that no Burmese specimens of this species exist in the Kew Herbarium.

NYMPHÆACEÆ.

Conspectus of genera.

Subord. I. NYMPHÆÆ. Sepals 4—6. Petals and stamens numerous. Carpels confluent with one another or with the disk into one ovary; ovules many. Seeds albuminous.

I. Nymphæa. Sepals, petals and stamens half superior, inserted on the disk, the latter confluent with the carpels. Not armed.

2. Barclaya. Sepals inferior; petals superior; carpels immersed in the torus. Not armed.

3. Euryale. Sepals, petals and stamens superior. Carpels immersed in the torus. Armed with sharp thorns.

Subord. II. NELUMBONEÆ. Sepals 4 or 5. Petals and stamens numerous, hypogynous. Carpels sunk in pits without order in the flat turbinate torus.

4. Nelumbo. Only genus.

Nymphæa, L.

Conspectus of species.

Anthers without appendage, ...*N. Lotus.*
Anthers terminated with a long appendage, ...*N. stellata.*

1. N. Lotus, L. sp. pl. 729; Hf. and Th. Fl. Ind. I. 241 and Ind. Fl. I. 114.

Var. α. Lotus, Hf. and Th. l. c.; (*N. rubra*, Roxb. Fl. Ind. II. 576; Wight Ill. t. 10; Bot. Rep. t. 503; Bot. Mag. t. 1280, 1364 and 4665; *N. esculenta*, Roxb. l. c. 578).

Var. β. cordifolia, Hf. and Th. l. c.

Var. γ. pubescens, Hf. and Th. l. c. (*N. pubescens*, Willd. sp. pl. II. 1154?; *N. Lotus*, Roxb. Fl. Ind. II. 577).

Hab. In tanks, lakes and swamps, etc.; var. α. not unfrequent in Pegu; also Tenasserim; var. β. in Chittagong; var. γ. not unfrequent in lakes and stagnant waters of the lower parts of Pegu. Fl. R. S.

2. N. stellata, Willd. sp. pl. II. 1153; Hf. and Th. Ind. I. 243 and Ind. Fl. I. 114.

Var. α. cyanea, Hf. and Th. l. c. (*N. cyanea*, Roxb. Fl. Ind. II. 577; *N. stellata*, Bot. Mag. t. 2058).

Var. β. parviflora, Hf. and Th. l. c. (*N. stellata*, Willd. l. c.; Bot. Rep. t. 330; Roxb. Fl. Ind. II. 577.)

Var. γ. versicolor, Hf. and Th. l. c.

Hab. In stagnant waters and swamps; var. α. and β. frequent in Chittagong, Pegu and Arracan; var. γ. Chittagong. Fl. R. S.

Barclaya, Wall.

1. B. longifolia, Wall. in Linn. Trans. XV. 442, t. 18; Hook. Icon. Pl. t. 809-10; Griff. Not. Dicot. 218, t. 57; Hf. Ind. I. 115.

Hab. In running streams; Pegu, Rangoon; Tenasserim, Moulmein and southwards to Mergui, apparently frequent. Fl. R. S.

Euryale, Salisb.

1. E. FEROX, Salisb. Ann. Bot. II. 73; Roxb. Corom. Pl. III. t. 244; Bot. Mag. t. 1447; Griff. Dicot. t. 657; Hf. Ind. I. 115. (*Anneslea spinosa*, Roxb. Fl. Ind. II. 573; Bot. Reg. t. 618).

HAB. Chittagong, in swamps. Fl. R. S.

Nelumbo, Ad.

1. N. NUCIFERA, Gaertn. Fruct. I. 73; Casp. in Miq. Ann. Mus. Lugd. Bat. II. 242. (*Nelumbium speciosum*, Willd. sp. pl. II. 1258; Roxb. Fl. Ind. II. 647; Bot. Mag. t. 903; Wight Ill. I. t. 9; Hf. Ind. Fl. I. 116),

HAB. Not unfrequent in stagnant waters of the alluvial plains of Pegu; frequently cultivated in tanks, pagodas, etc. Fl. Apr. May.

PAPAVERACEÆ.

Conspectus of genera.

1. PAPAVER. Capsules opening by short valves or pores. Stigmas 4 or more, radiating on a sessile disk.

2. ARGEMONE. Capsules opening by short valves. Stigmas 4 to 6, radiating from the top of a depressed style.

Papaver, L.

*1. P. SOMNIFERUM, L. sp. pl. 726; Roxb. Fl. Ind. II. 571; Engl. Bot. t. 2145; Sibth. Fl. Græc. t. 491; Rohb. Fl. Germ. III. t. 17; Hf. and Th. Fl. Ind. I. 250.

HAB. Not much cultivated in Burmah, especially in Ava. Fl. Febr. March, Fr. Apr. May.

Argemone, L.

*1. ARG. MEXICANA, L. sp. pl. 727; Roxb. Fl. Ind. II. 571; Wight Ill. I. t. 11.; Bot. Mag. t. 243; Bot. Reg. t. 1343; Gray. Gen. t. 47; Hf. Ind. Fl. I 117.

HAB. Domesticated in lower Ava (J. Anderson); in cultivated lands near Rangoon, sporadically. Fl. Jan.

CRUCIFERÆ.

Conspectus of genera.

* Pods elongate or short, dehiscing along their whole length, not jointed, rarely indehiscent at the summit. Septa and valves equally broad and parallel.

O Cotyledons accumbent.

1. NASTURTIUM. Pods long or short, the valves turgid or not. Seeds small, in 2 rows. Flowers usually yellow.

2. CARDAMINE. Pods narrow, elongate linear, the valves flat and elastic. Seeds in 2 rows. Flowers usually white.

O O Cotyledons longitudinally conduplicate.

3. Brassica. Pods elongate. Stigma truncate or 2-lobed. Seeds in a single row.

** Pods short, dehiscing along their whole length, not articulate, the valves flat, at right angles to the septum.

4. Lepidium. Pods oblong, notched, 2- rarely 4-seeded. Flowers white.

*** Pods elongate, indehiscent, not jointed but contracted and pithy within between the seeds. Cotyledons incumbent.

5. Raphanus. Flowers pale lilac or white with coloured veins.

Nasturtium, L.

Conspectus of species.

Pods rather thick, 2 to 5 times longer than the pedicels, more or less curved, *N. Indicum.*
Pods very slender, straight or nearly so, 1 to 1½ in. long, ...*N. montanum.*

1. N. Indicum, L. Mant. 93; Hf. and Th. in Linn. Proc. V. 138. (*N. Madacasgariense*, WA. Prod. I. 19; Wight Ill. I. t. 13; *Sinapis divaricata*, Roxb. Fl. Ind. III. 123).

Var. β. Benghalense (*N. Benghalense* DC. Syst. II. 198; Hf. and Th. in Linn. Proc. V. 139).

Var. γ. glabrum, quite glabrous, the flowers thrice as large; pods larger and on longer pedicels; racemes bracted. Habit of *Sinapis.*

Hab. Var. β. very common on muddy banks of rivers, in rubbishy places round villages, all over Pegu and Martaban; also Chittagong and Tenasserim; var. γ. in the dried up bed of streamlets in the swamp-forests of the Irrawaddi alluvium. Fl. January to June; Fr. Febr. July.

Var. γ. is a very distinct form and will probably have to be separated, but unfortunately there are no ripe pods.

2. N. diffusum, DC. Prod. I. 139; Miq. Fl. Ind. Bat. I/2. 94 and Ill. Fl. Arch. Ind. 1870, 14. (*N. Montanum*, Wall. in Linn. Proc. V. 139; Bth. Fl. Hongk. 16.; *Sinapis pusilla*, Roxb. Fl. Ind. III. 125?).

Hab. Ava (Wall.).

Cardamine, L.

1. C. hirsuta, L. sp. pl. 915; Engl. Bot. t. 492, Hf. and Th. in Linn. Journ. V. 146.

Var. β. sylvatica, Hf. and T. And. Ind. Fl. I. 138.

Hab. Ava, Bhamo (J. Anderson); Martaban, Toukyeghat, in shady muddy places (only one specimen!). Fl. Febr. March.

Brassica, L.

Conspectus of species.

Stem-leaves at base stem-clasping with their auricles, ...*B. campestris.*
Stem-leaves often petioled, not stem-clasping,
Stem-leaves narrowed at base or petioled; flowers yellow, ... *B. juncea.*
Stem-leaves broad at base and sessile but not stem-clasping; petals white or yellowish white with violet veins,... ... ...*B. oleracea.*

1. B. CAMPESTRIS, L. sp. pl. 931; Engl. Bot. t. 2224; Hf. Ind. Fl. I. 156. (*B. rapa.* L. sp. pl. 931; Engl. Bot. t. 2176; *B. Napus*, L. sp. pl. 931; *Sinapis dichotoma*, Roxb. Fl. Ind. III. 117; *S. glauca*, Roxb. l. c. 118; *B. brassicata*, Roxb. l. c. 120).

HAB. Arracan, rare in fields near Akyab; Ava, Bhamo. Fl. Decb.

2. B. JUNCEA, Hf. and Th. in Linn. Proc. V. 170. and Ind. Fl. I. 157. (*Sinapis juncea*, L. sp. pl. 934; *Sinapis ramosa*, Roxb. Fl. Ind. III. 119; *Sinapis rugosa*, Roxb. l. c. 122; *Sinapis patens*, Roxb. l. c. 124; *Sinapis cuneifolia*, Roxb. l. c. 116).

HAB. Frequent in fields, along river-banks, etc., all over Pegu and Martaban; also much cultivated; Ava, Bhamo. Fl. Fr. C. S.

* 3. B. OLERACEA, L. sp. pl. 932; Engl. Bot. t. 637; Fl. Dan. XII. t. 2056: Roxb. Fl. Germ. 97: DC. Prod. I. 213.

HAB. Not much cultivated in several varieties like cabbage, cauliflower, Kohlrabbi, etc. Fl. Febr. March; Fr. Apr.

Lepidium, L.

* 1. L. SATIVUM, L. sp. pl. 899; Roxb. Fl. Ind. III. 116; Hf. Ind. Fl. I. 159; Fl. Dan. X. t. 1761; Sibth. Fl. Graec. t. 616; Roxb. Fl. Germ. II. t. 9; Wight Ill. I. t. 12; NE. Gen. Germ. X. t. 10.

HAB. Cultivated only. Fl. Fr. C. S.

Raphanus, L.

* 1. R. SATIVUS, L. sp. pl. 935 Roxb. Fl. Ind. III. 126; Rchb. Fl. Germ. II. t. 3.; NE. Gen. Germ. X. t. 10; Hf. Ind. Fl. I. 166.

HAB. Cultivated and often like wild on the banks of rivers, etc. Fl. Febr. March; Fr. Apr.

CAPPARIDEÆ.

Conspectus of genera.

Trib. I. CLEOMEÆ. Fruit capsular, 1-celled, usually pod-like, rarely short or didymous; capsules 4—8- or many-seeded. Herbs.

× Torus short, the stamens inserted immediately within the sepals and petals.

1. CLEOME. Torus often produced into an appendage. Stamens 4 to 6 or more, some of them often without anthers.

× × Torus elongated, bearing the stamens at the top under the ovary.

2. GYNANDROPSIS. Stamens 6, all perfect; filaments long.

Trib. II. CAPPAREÆ. Fruit berry-like or drupaceous. Shrubs or trees.

* Sepals united at the base in a funnel- or bell-shaped tube, or forming a spathaceous calyx.

3. NIEBUHRIA. Calyx-tube funnel- or bell-shaped, the limb 4-lobed, valvate in bud. Petals none. Berry ovoid. Leaves 1- to 3-foliolate.

* * Sepals free or connate only at the very base.

× Petals present.

4. CAPPARIS. Calyx various. Corolla imbricate. Petals 4. Stamens usually definite, inserted at the base of the short torus. Leaves simple.

5. CADABA. The 2 outer sepals valvate in bud. Torus elongated into a tube. Berry cylindrical, almost indehiscent. Leaves 1- to 3-foliolate.

6. CRATÆVA. Flowers polygamous. Corolla open in bud already. Sepals 3, all imbricate in bud. Petals 4, on long claws. Leaves 3- to 5-foliolate.

×× Petals none.

7. ROYDSIA. Sepals 6. Drupes 1—3-seeded. Leaves simple.

Cleome, L.

Conspectus of species.

Plant thinly appressed hispid. Petals white or pale rose-coloured, ... *C. Chelidonii.*
Glandular-pubescent; petals yellow, ... *C. viscosa.*

1. C. CHELIDONII, L. f. Suppl. 300; Roxb. Fl. Ind. III. 127; Hf. Ind. Fl. I. 170. (*Polanisia Chelidonii,* DC. Prod. I. 242; Wight Ic. t. 319).

HAB. Not unfrequent along the borders of the Prome road between Poungday and the Myitmakha choung. Fl. March, Apr.

I do not feel quite sure whether this plant is really indigenous. As it seems restricted to the locality given above, it may well have been introduced by the Madras people employed in the construction of the Prome road.

2. C. VISCOSA, L. sp. pl. 447; Roxb. Fl. Ind. III. 128; Hf. Ind. Fl. I. 170. (*Polanisia icosandra,* WA. Prod. I. 22; Wight Ic. t. 2.).

HAB. A weed all over Burma from Chittagong and Ava down to Tenasserim, in cultivated lands, along river banks, in rubbishy places, ruined pagodas, etc. Fl. Fr. R. S.

Gynandropsis, DC.

1. G. PENTAPHYLLA, DC. Prod I. 238; Hf. Ind. Fl. I. 171. (*Cleome pentaphylla,* L. sp. pl.; Roxb. Fl. Ind. III. 126; A. Gray, Gen. t. 78; Bot. Mag. t. 1681).

HAB. A weed all over Burma from Chittagong and Ava down to Tenasserim, in rubbishy places, etc., around villages. Fl. May, June; Fr. June, July.

Niebuhria, DC.

1. N.? VARIABILIS, (*Capparis? variabilis,* Wall. Cat. 7004; Hf. Ind. Fl. I. 180).

HAB. Ava, in the Irrawaddi valley along the banks of the river below Yenang choung, and on the Segain hills.

Capparis, L.

Conspectus of species.

* Pedicels arising from above the axils of the leaves in a line one above the other (supra-axillary); or rarely axillary and solitary.

O Gynophore and ovary glabrous or nearly so.

† Ovary almost sessile, the gynophore being only ½ to 1 lin. long.

Glabrous; leaves large, chartaceous; pedicels 2—3 lin. long, the upper flowers forming terminal racemes (by the reduction of leaves), ...*C. roydsiæfolia.*

† † Ovary on a long slender gynophore.

× All parts glabrous.

Leaves as in preceding, chartaceous, much veined with a callous point at the usually retuse apex, ...*C. micracantha.*

Leaves acuminate.

Unarmed; pedicels and sepals outside glabrous; stamens numerous, petals pilose, ...*C. membranifolia.*

Thorny; pedicels glabrous; sepals woolly along the borders; stamens 8, ...*C. disticha.*

Unarmed or nearly so; sepals with tomentose margins, ...*C. miniea.*

× × Young shoots and sepals rusty or greyish tomentose or pubescent.

Leaves chartaceous, ovate, green, while young tawny or rusty pilose beneath, flowers usually several together, ...*C. horrida.*

Leaves green, oboval, while young thinly appressed pubescent, soon quite glabrous and coriaceous; petioles ¼-⅓ in. long; flowers several, ... *C. crassifolia.*

Leaves glaucous, rhomboid-ovate to rhomboid-linear, acute, while young minutely greyish puberulous beneath; petioles only ¼ to ⅓ in. long; berries verrucose; flowers solitary, ...*C. polymorpha.*

O O Gynophore and ovary densely tomentose.

All younger parts and leaves tomentose or pubescent; pedicels and sepals densely tomentose, ...*C. flavicans.*

* * Pedicels in umbels or corymbs in the axils of the leaves or on shortened axillary branchlets, sometimes collected into terminal or lateral panicles.

× Calyx and pedicels densely tomentose Ovary glabrous.

All parts tomentose or shortly and densely yellowish pubescent, the hairs not papillose; peduncle naked, ...*C. grandis.*

Apparently as preceding, but upperside of leaves papillose; peduncle 1-leaved at tip, ...*C. orbiculata.*

Branches brown-tomentose; leaves glabrous, 3-plinerved, ...*C. trinervia.*

× × Calyx and pedicels glabrous. Berry 1-seeded.

O Gynophore very short (in fruit not above ½ in.); umbels or corymb peduncled.

Branchlets pubescent; leaves thick coriaceous, glaucous, retuse or blunt; umbels axillary, berries 1—2 seeded, ...*C. glauca.*

Glabrous; leaves purplish beneath, acuminate; umbels in terminal panicles, berries 1-seeded, ...*C. Hasseltiana.*

O O Gynophore long and slender.

† Umbels or corymbs peduncled.

Glabrous; leaves green, retuse; flowers ½ in. in diameter, the umbels arranged in terminal panicles; berries several-seeded, ...*C. floribunda.*

Glabrous; petiole puberulous; flowers 2 in. in diameter, ...*C. versicolor.*

† † Umbels sessile or nearly so.

Leaves green, retuse; corymbs usually terminal on the branchlets, many-flowered, ...*C. sepiaria.*

1. C. MICRACANTHA, DC. Prod. I. 247; Hf. Ind. Fl. I. 179. (*C. callosa*, Bl. Bydr. 53; Miq. Ill. Fl. Arch. Ind. I. 29. t. 16.)

HAB. Pegu, Rangoon (R. Scott); Upper Tenasserim, Weingo valley, Moulmein (Wall., Falc.)

2. C. MEMBRANIFOLIA, Kurz MS.

HAB. Not unfrequent in the tropical forests of the eastern slopes of the Pegu Yomah and Martaban. Fl. Apr. May.

3. C. VIMINEA, Hf. and Th. Ind. Fl. I. 179.

HAB. Tenasserim (teste Hf. and Th.).

4. C. DISTICHA, Kurz MS. (*C. oxyphylla*, Wall Cat. 6997, non Miq.).

HAB. Frequent in the swamp-forests and inundated localities of the Irrawaddi and Sittang alluvium and Martaban. Fl. Apr. May.

5. C. HORRIDA, L. f. Suppl. 264; Wight Ic. t. 173; Griff. Not. Dicot. 579. t. 608; Hf. Ind. Fl. I. 178 pp. (*C. Zeylanica*, Roxb. Fl. Ind. II. 567.)

HAB. Frequent in mixed forests and savannahs, but more especially in the dry forests of Prome and Pegu; also Martaban. Fl. Apr. May.

6. C. CRASSIFOLIA, Kurz in Journ. As. Soc. Beng., 1873.

HAB. Frequent in the dry forests of Prome District. Fl. March.

7. C. POLYMORPHA, Kurz in Journ. As. Soc. Beng., 1873.

HAB. Frequent in the dry and Eng forests of Prome district. Fl. March; Fr. Apr. May.

8. C. FLAVICANS, Wall. Cat. 7003; Kurz in Journ. As. Soc. Bengal 1870, 62; Hf. Ind. Pl. I. 180.

HAB. Ava, Irrawaddi valley at Yenangchoung and Segain (Wall.) Fr. Sept.

9. C. GRANDIS, L. f. Mant. 263; Hf. Ind. Fl. I. 176. (*C. bisperma*, Roxb. Fl. Ind. II. 568 teste Hf. Th.) var. β. AURICANS, the nerves beneath more prominent; flowers only ⅓ to ½ in. in diameter (*C. auricans*, Kurz MS).

HAB. Frequent in the dry forests of the Prome District. Fl. Apr.

The Burmese plant will most probably have to form a distinct species, if it should not turn out to be identical with the following, of which the description in Hook. Ind. Fl. is too imperfect for recognition.

10. C. ORBICULATA, Wall. ap. Hf. Ind. Fl. I. 176.

HAB. Ava, Segain hills.

11. C. TRINERVIA, Hf. and Th. Ind. Fl. I. 175.

HAB. Tenasserim (Helf.); Tavoy (Parish).

12. C. GLAUCA, Wall. Cat. 7005; Hf. Ind. Fl. I. 180.

HAB. Ava, common near pagodas at Pagha myo (Wall.).

13. C. HASSELTIANA, Miq. Ill. Fl. Arch. Ind. I. 24. t. 13. (*C. ambigua*, Kurz in And. Rep. ed. 2. 30.)

HAB. In the tropical forests of South Andaman. Fr. Apr. May.

14. C. FLORIBUNDA, Wight Ill. I. 33. t. 14.; Hf. Ind. Fl. I. 177. (*C. oligandra*, Griff. Not. Dicot. 577. teste Hf. and Th.).

HAB. Tenasserim, Mergui (Griff.).

15. C. VERSICOLOR, Griff. Not. Dicot. 577; Hf. Ind. Fl. I 175.

HAB. Tenasserim, Mergui, in forests (Griff.). Fl. Jan.

I have not seen specimens, but it cannot be compared with *C. Salaccensis*, Bl., which has small flowers, (cf. Miq. Illustr. Fl. Arch. Ind. I. t. 12).

16. C. SEPIARIA, L. sp. pl. 720; Roxb. Fl. Ind. II. 568; Jacquem. Voy. Ind. or. t. 22.; Hf. Ind. Fl. I. 177.

HAB. Common along the rocky coast of the Andamans; Pegu (teste Hf. and Th.). Fl. May.

Cratæva, L.

Conspectus of species.

Flowers corymbose; fruits globular; large tree; ovary globular, ... *C. Roxburghii.*
Flowers corymbose; fruits ovoid-oblong; ovary oblong, ... *C. narvala.*
Flowers solitary, axillary; fruits oblong; meagre shrub, ... *C. hygrophila.*

1. C. ROXBURGHII, Br. in Denh. and Clapp. Trav. Append. 224; Hook. Icon. Pl. t. 178; Kurz in Trim. Journ. Bot., 1874, 195, t. 148, f. 1—5. (*Capparis trifoliata*, Roxb. Fl. Ind. II. 571.).

HAB. Not unfrequent in the dry forests of the Prome District; Upper Tenasserim. Fl. H. S.; Fr. Close of R. S.

2. C. NARVALA, Ham. in Linn. Trans. XV; Kurz in Trim. Journ. Bot., 1874, 195.

HAB. Tenasserim, Moulmein District. Fl. Febr. March.

3. C. HYGROPHILA, Kurz in Journ. As. Soc. Beng., 1872, 292 and in Trim. Journ. Bot., 1874, 196, t. 148, f. 6—7.

HAB. Not uncommon in the swamp forests of the Irrawaddi alluvium. Fl. (Decb. or Nov.?); Fr. C. S.

Roydsia, Roxb.

Conspectus of species.

Subg. 1. *Eu-Roydsia.* Styles 3, short, sessile.
Sepals a line long, 4 of them free, the 2 others coherent, ... *R. obtusifolia.*
Subg. 2. *Alytostylis*, Hf. Style long, terminated by 3 minute stigmas. Sepals ligulate. blunt, ... *R. parviflora.*

1. R. OBTUSIFOLIA, Hf. and Th. Ind. Fl. I. 180 and 409.

HAB. Frequent in the swamp forests and along inundated river banks of the alluvial lands of the Irrawaddi and Sittang rivers; also Tenasserim. Fl. March; Fr. May, June.

2. R. PARVIFLORA, Griff. Not. Dicot. 578. t. 607. f. 1.; Hf. Ind. Fl. I. 409.

HAB. Ava, in woods near the serpentine mines at Hookum (Griff.).

MORINGACEÆ.

Moringa, Juss.

1. M. PTERYGOSPERMA, Gaertn. Fruct. II. 314. t. 147; Wight Ill. I. t. 77; Miq. Fl. Ind. Bot. I. 350. (*Hyperanthera Moringa*, Vhl. Symb. I. 30; Griff. Not. Dicot. 572. t. 609. f. 1—2).

HAB. Cultivated in and around villages all over Burma and the adjacent islands. Fl. Febr. March; Fr. H. S.

A most perplexing genus to systematists. It appears to me nearest allied to *Violaceæ*.

VIOLACEÆ.

Conspectus of genera.

Trib. I. VIOLEÆ. Corolla irregular, the lower petal much larger. Herbs or perennials.

1. VIOLA. Sepals produced at base. Lower petal spurred or saccate.

2. JONIDIUM. Sepals not produced at base. Petals clawed, the lower one gibbous or saccate at base.

Trib. II. ALSODEIEÆ. Corolla regular or nearly so. Shrubs or trees.

3. ALSODEIA Petals 5, free. Connective produced beyond the anther. Capsule loculicidal.

Viola, L.

Conspectus of species.

× Stigma 3-lobed, terminal.

Without stolons; stigma 3-lobed; stipules entire, ...*V. Patrinii.*

Stoloniferous; stigma 2-lobed; stipules toothed, ...*V. diffusa.*

× × Stigma very oblique or quite lateral.

Stoloniferous; stipules toothed or fimbriate, ...*V. serpens.*

1. V. PATRINII, DC. Prod. I. 293; Hf. Fl. Ind. I. 183. (*V. primulifolia*, L. sp. pl. p. p.; Roxb. Fl. Ind. I. 650; *V. Walkerii*, Wight Ill. I. 42. t. 18).

HAB. Ava, Khakyen hills, Ponsee (J. Anderson). Fl. March.

2. V. DIFFUSA, Ging in DC. Prod. I. 298; Hf. Ind. Fl. I. 183.

HAB. Ava, Khakyen hills, Ponsee (J. Anderson). Fl. Fr. March.

3. V. SERPENS, Wall. in Roxb. Fl. Ind. II. 449; Oudem. in Miq. Ann. Mus. Lugd. Bot. III. 76; Hf. Ind. Fl. I. 184; Royle Ill. Him. Pl. 74. t. 18. f. 1.

HAB. Ava, Khakyen hills (J. Anderson); not unfrequent in the damp hill-forests along rocky rivulets in Martaban at 3000 to 6000 ft. elevation; Tenasserim, Moulmein (Parish). Fl. Fr. March.

Jonidium, Vent.

1. J. SUFFRUTICOSUM, Ging in DC. Prod. I. 311; Wight Ill. t. 19 and Ic. t. 308; Hf. Ind. Fl. I. 185. (*Viola suffruticosa*, L.; Roxb. Fl. Ind. I. 649).

HAB. I have observed only a few sterile plants along a road in Rangoon.

Alsodeia, Thouars.

Conspectus of species.

Subg. 1. *Dioryctandra,* Hassk. Stamens exserted, anthers cohering in a cone.
Leaves small; capsules very small, almost sessile, ...*A. Roxburghii.*
Subg. 2. *Alsodeia.* Stamens included; anthers free.
× Ovary and style glabrous.
O Flowers in long racemes.
Racemes and calyx puberulous, ...*A. longiracemosa.*
O O Flowers fascicled.
Pedicels and calyx glabrous, ...*A. Bengalensis.*
× × Ovary and style pubescent or tomentose.
Leaves rather large, glabrous or nearly so, ...*A. Griffithii.*
Leaves pubescent; capsule densely pubescent, ...*A. mollis.*

1. A. ROXBURGHII, Wall. Cat. 7189; Hf. Ind. Fl. I. 186. (*Vareca heteroclita*, Roxb. Fl. Ind. I. 648).

HAB. Not unfrequent in the tropical forests of the Andamans. Fl. May, June.

2. A. LONGIRACEMOSA, Kurz in Journ. As. Soc. Beng. 1870, 63. (*A. racemosa*, Hf. and Th. Ind. Fl. I. 186. non Mart.).

HAB. Rather frequent in the tropical forests of Martaban up to 1500 ft. elevation. Fl. March, Apr.; Fr. May, June.

3. A. BENGALENSIS, Wall. Act. Med. and Phys. Soc. Calc. VII. 224; Hf. Ind. Fl. I. 186.

HAB. Not unfrequent in the tropical forests of the eastern slopes of the Pegu Yomah and Martaban, entering here also the drier hill forests up to 4000 ft. elevation; common on the Andamans. Fl. H. S.

4. A. GRIFFITHII, Hf. and Th. Ind. Fl. I. 187.

HAB. Ava, near the serpentine mines in the Hookum valley (Griff.).

5. A. MOLLIS, Hf. and Th. Ind. Fl. I. 188.

HAB. Tenasserim, Mergui (Griff.).

BIXINEÆ.

Conspectus of genera.

Trib. I. BIXEÆ. Petals broad, twisted in bud, without a scale or basal appendage. Anthers opening by pores or short slits.

1. COCHLOSPERMUM. Capsule 3-valved. Seeds cochleate, pilose or woolly. Leaves palmately-lobed or digitate.

2. Bixa. Capsule 2-valved. Seeds straight, glabrous, with a pulpy testa. Leaves simple.

Trib. II. FLACOURTIEÆ. Petals none, or if present only small, imbricate in the bud, without scales. Anthers opening by valves.

* Petals present.

3. Scolopia. Flowers bisexual. Petals 4 to 6. Stamens indefinite.

* * Petals none.

4. Flacourtia. Flowers usually dioecious. Ovary 2- to 8-celled.

5. Xylosma. Flowers dioecious. Ovary 1-celled. Seeds glabrous.

Trib. III. PANGIEÆ. Flowers dioecious. Petals with an adnate scale or basal appendage.

* Calyx at first entire, afterwards splitting variously.

6. Gynocardia. Calyx cup-shaped. Stamens numerous, free. Styles 3 with cordate stigmas.

7. Ryparia. Calyx globose, rupturing into 3 to 4 deciduous segments. Stamens 4 or 5, united in a tubular column.

× × Sepals distinct already in bud, much imbricated.

8. Hydnocarpus. Sepals 4 or 5. Petals 5—9. Stamens 5 or indefinite.

Cochlospermum, Kth.

1. C. Gossypium, DC. Prod. I. 527; Wight Ill. Ind. Bot. Suppl. 36. t. 18; Hf. Ind. Bot. I. 190. (*Bombax gossypium*, L.; Roxb. Fl. Ind. III. 169.

Hab. In the dry forests on the hills opposite Prome. Fl. March.

Bixa, L.

*1. B. Orellana, L. sp. pl. 730; Roxb. Fl. Ind. II. 581; Wight Ill. I. t. 17; Bot. Mag. t. 1456; Griff. Not. Dicot. 610; Hf. Ind. Fl. I. 190.

Hab. Frequently cultivated in and around villages all over Burma, and occasionally seen half wild along the courses of mountain streams in the Pegu Yomah.—Fl. RS; Fr. CS.

Scolopia, Schreb.

1. S. Roxburghii, Clos in Ann. d. sc. nat. ser. 4. VIII. 250 excl. syn.; Hf. Ind. Fl. I. 190. (*Ludia spinosa*, Roxb. Fl. Ind II. 507.)

Hab. Tenasserim, Mergui (Griff. Helf. 211.)

Roxburgh's plant is described as having lucid leaves, but his figure as well as the plant cultivated in the HBC. have them opaque when dried.

Flacourtia, Comm.

Conspectus of species.

* Stigma simple, subulate (not thickened at apex).

Berries the size of a pepper-kernel; pyrenes smooth, convex on back, ...*F. Sumatrana.*

* * Styles short or almost wanting, thickened and truncate at the apex or more or less bluntish 2-lobed.

O Pyrenes compressed and quite flat.

Branchlets and leaves glabrous or nearly so, armed with spines; flowers dioecious, ...*F. cataphracta.*

As preceding but not armed; flowers hermaphrodite, ...*F. inermis.*

O O Pyrenes obovoid-3-angular with rounded back.

× Leaves acuminate.

Branchlets and leaves tawny-pubescent, ... *F mollis.*

× × Leaves blunt or nearly so. Berries the size of a pea.

Leaves coriaceous, 3 to 5 in. long, ...*F. sapida.*

Leaves small (1—1½ in. long), membranous.

Armed with numerous long spines, ...*F. sepiaria.*

Unarmed, or only with a few short axillary spines, ...*F. rotundifolia.*

1. F. SUMATRANA, Planch. ap. Hf. Ind. Fl. I. 192.

HAB. Tenasserim (Helf. 203-1).

N. B. *Ludia foetida*, Roxb., doubtfully referred by Hf. to this species, is *Homalium foetidum*, Bth.

2. F. CATAPHRACTA, Roxb. Corom. Pl. III. t. 222 and Fl. Ind. III. 834; Hf. Ind. Fl. I. 193.

HAB. Frequent in the upper mixed forests of the Pegu Yomah and Martaban. Fl. Jan. Febr.; Fr. May.

3. F. INERMIS, Roxb. Corom. Pl. III. 16 t. 222 and Fl. Ind. III. 833; Hf. Ind. Fl. I. 192.

HAB. Martaban, along the bank of the Toukyeghat river at the 7-Pagodas. Fr. May.

4. F. MOLLIS, Hf. and Th. Ind. I. 192.

HAB. Tenasserim (Helf. 215; Griff.).

5. F. SAPIDA, Roxb. Corom. Pl. I. t. 69 and Fl. Ind. III. 835; WA. Prod. I. 29.

Var. α. GENUINA, young shoots and leaves beneath and the inflorescences more or less greyish tomentose; stigmas in fruit remote.

Var. β. PUBERULA, leaves and young shoots glabrous; inflorescence puberulous; stigmas star-like cohering, sessile.

Var. γ. GLABERRIMA, all parts quite glabrous, stigmas only cohering during flowering.

HAB. Var. α. Ava (Griff.); var. β. and γ. common in the dry and Eng forests of the Prome District. Fl. Febr. March; Fr. Apr. May.

6. F. SEPIARIA, Roxb. Corom. Pl. I. t. 68 and Fl. Ind. III. 835; Hf. Ind. Fl. I. 194. (F. *obcordata*, Roxb. Fl. Ind. III. 835 teste Hf. and Th.).

HAB. Chittagong.

7. F. ROTUNDIFOLIA, Clos in Ann. sc. nat. Bot. ser. 4. VIII. 218.

HAB. Rather frequent in the coast jungles of the Andamans. Fl. May.

Gynocardia, R. Br.

1. G. ODORATA, Roxb. Corom. Pl. III. 95. t. 299; Hf. Ind. Fl. I. 195. (*Choulmoogra odorata*, Roxb. Fl. Ind. III. 836).

HAB. Not unfrequent in the tropical forests of the Martaban hills, up to 3000 ft. elevation; also Chittagong (accord. Hf. and Th. also Rangoon and Tenasserim). Fr. March.

Ryparia, Bl.

1. R. CÆSIA, Bl. Fl. Jav. Praef. 8; Miq. Fl. Ind. Bot. I-2. 361; Kurz in Trim. Journ. Bot., 1873, 233.

HAB. In the tropical forests of South Andaman.

Hydnocarpus Gærtn.

Conspectus of species.

Sepals 4; petals and staminods 9—5 each, the latter free or united, ...*H. heterophyllus.*
Sepals 5; petals and staminods 5 each, ...*H. castaneus.*

1. H. HETEROPHYLLUS, Bl. Rumph. IV. 22. t. 178. B. f. 1. (*Taractogenos Blumei*, Hassk. Retz. I. 127; Miq. Fl. Ind. Bat. I/2. 110).

HAB. Very frequent in the tropical forests of Martaban, less so along the eastern and southern slopes of the Pegu Yomah; also Tenasserim. Fl. Apr.; Fr. Febr. March

The number of sepals appears constant, but that of stamens, petals, and scales varies exceedingly; the last are found free and more or less connate in flowers from the same tree.

2. H. CASTANEUS, Hf. and Th. Ind. Fl. I. 197.

HAB. King's Island, by the sides of torrents, (Andamans according to Hf. and Th. but more probably Mergui Archipelago where such an island exists).

PITTOSPOREÆ.

Pittosporum, Banks.

1. P. FERRUGINEUM, Ait. Hort. Kew. ed. 2. II. 27; Bot. Mag. t. 2074; Hf. Ind. Fl. I. 199.

HAB. Tenasserim, Moulmein.

POLYGALEÆ.

Conspectus of genera.

Trib. I. POLYGALEÆ. Seeds albuminous. Petals more or less united into a gamopetalous corolla.

O Erect herbs or perennials, rarely parasites.

1. POLYGALA. Stamens 8, united. The 2 inner sepals wing-like
2. SALOMONIA. Stamens 4 or 5. Sepals almost equal, petal-like.

O O Scandent shrubs.

3. SECURIDACA. Stamens 8, united; fruit an 1-celled indehiscent samara.

Trib. II. XANTHOPHYLLEÆ. Albumen none. Petals and stamens free. Fruit globular, indehiscent.

4. XANTHOPHYLLUM. Petals 5. Stamens 8. Ovary almost 1-celled, with several ovules.

Polygala, L.

Conspectus of species.

Subg. 1. *Blepharidium.* The 2 inner sepals (wings) persistent, petaloid or herbaceous.

* Wings herbaceous or green, sepal-like, not or with a narrow hyaline margin, acute or acuminate.

Erect, stout, 1 to 2 ft. high; bracts fallen before flowering. Flowers small, white with purple tips; capsule ciliate, ...*P. glomerata.*

Small, a few in. high; flowers and bracts as in preceding; capsule glabrous, not ciliate, ...*P. telephioides.*

Small; flowers yellow or orange-yellow with dull orange tips; bracts persistent during flowering, ...*P. Chinensis.*

* * Wings petal-like and coloured, blunt and often mucronate.

O Stems terete.

Wings about a lin. long, usually puberulous; capsules oblong, puberulous, not margined, ...*P. erioptera.*

Wings about 3 lin. long, puberulous; capsules almost orbicular with narrow ciliate margin, ...*P. crotalarioides.*

O O Stems sharply angular.

Erect, glabrous; leaves linear; flowers small, in terminal and lateral racemes, *P. leptalea.*

Subg. 2. *Semeiocardium,* Zoll. Calyx deciduous after flowering. Keel not crested. Seeds albuminous. Flowers small.

Capsules not nerved, almost rotundate, not winged, ...*P. glaucescens.*

Capsules strongly nerved, oblong, the membranous borders produced wing-like at the summit, ...*P. cardiocarpa.*

Subg. 3. *Chamæbuxus,* Tournef. Calyx deciduous. Keel crested. Albumen none. Flowers rather large. Perennials or shrubs.

Flowers pale-lilac; keel-crest 2-lobed, the lobes entire, ...*S. venenosa.*

Flowers pale-lilac; keel-crest 2-lobed, the lobes many-cleft: capsules membranous; strophiole minute, ...*P. Karensium.*

Flowers yellow; keel-crest 2-lobed, the lobes many-cleft; capsule coriaceous; strophiole very large, ...*P. arillata.*

1. P. GLOMERATA, Lour. Fl. Coch. II. 518; Miq. Fl. Ind. Bot. I/2. 125; Hf. Ind. Fl. I. 206.

HAB. Frequent in deserted hill-toungyas and pastures of the Martaban hills, up to 4000 ft. elevation. Fl. Febr. March; Fr. March.

2. P. TELEPHIOIDES, Willd. sp. pl. III. 876; Hf. Ind. Fl. I. 205.

HAB. Rare in the Eng forests of the western slopes of the Pegu Yoma as for instance about Myodweng. Fl. Jan.

Hardly more than a stunted variety of the former.

3. P. CHINENSIS, L. sp. pl. 989; DC. Prod. I. 331; Hf. Ind. Fl. I. 204. (*P. arvensis,* Willd. sp. pl. III. 876; Roxb. Fl. Ind. III. 218).

HAB. Pegu (teste Bennet). Fl. R. S.

4. P. ERIOPTERA, DC. Prod. I. 326; Deless. Ic. sel. III. t. 15; Hf. Ind. Fl. I. 203.

HAB. Apparently frequent in Ava (Yenangchoung, Paghan, Melloon, etc.); Prome hills. Fl. Fr. Sept. Decb.

5. P. CROTALARIOIDES, Ham. in Don. Prod. Nep. 199; Wall. Pl. As. rar. II. t. 185; Royle Ill. Him. Pl. t. 19, fig. c.; Hf. Ind. Fl. I. 201.

HAB. Rather frequent in the Eng and dry forests of the Prome district. Fl. Fr. March.

6. P. LEPTALEA, DC. Prod. I. 325; Bth. Fl. Austr. I. 139; Hf. Ind. Fl. I. 202. (P. sp. 1 and 2, Griff. Not. Dicot. 536-537. t. 597).

HAB. Not unfrequent in the open, especially the Eng forests of Pegu, Prome, and Ava. Fl. Nov. Decb.

7. P. GLAUCESCENS, Wall. Cat. 4182; Walp. Rep. I. 234. (*P. furcata*, Royle Ill. Him. Pl. 76. t. 19, fig. B.; *Semeiocardium glaucescens*, Hassk. in Miq. Ann. Lugd. Bat. I. 151; *P. triphylla β. glaucescens*, Bennet in Hf. Ind. Fl. I. 201).

HAB. Ava, Meaong and Taong dong; Prome District; Tenasserim, Attaran. Fl. Fr. July—Sept.

8. P. CARDIOCARPA. Kurz in Journ. As. Soc. Beng. 1872, 293.

HAB. Tenasserim, Wakabin (Rev. C. Parish No. 307). Fl. Octob.

9. P. KARENSIUM, Kurz in Journ. As. Soc. Beng. 1872, 292.

HAB. Frequent in the drier hill-forests of the Martaban hills at 4000 to 6000 ft. elevation. Fl. Fr. March.

10. P. ARILLATA, Ham. in Don. Prod. Nep. 199; Wall. Pl. As. rar. I. t. 100; Griff. Not Dicot. 5352; Hf. Ind. Fl. I. 200).

HAB. Ava (teste Bennet).

Salomonia, Lour.

Conspectus of species.

Subg. 1. *Salomonia*, DC. Stems leafy; not parasitic.

O Leaves on short petioles, cordate or ovate.

Glabrous; leaves acute; capsules crested, ...*S. Cantoniensis*.
Blunt leaves and stems along the wings fringed; capsules crested, ...*S. longiciliata*.
Glabrous; leaves acute; capsules minute, not crested, ...*S. edentula*.

O O Leaves sessile.

Glabrous or nearly so, leaves oblong to oblong-lanceolate, ...*S. oblongifolia*.
Subg. 2. *Epirhizanthes*, Bl. Parasitic, leafless or scaly, ...*S. cylindrica*.

1. S. CANTONIENSIS, Lour. Fl. Coch. 18; Hf. Ind. Fl. I. 206. (*S. sp.* Griff. Not. Dicot. 539).

HAB. Pegu, Rangoon (R. Scott); Tenasserim, Tavoy (Wall). Fl. Fr. Aug.

2. S. LONGICILIATA, Kurz in Journ. As. Soc. Bengal, 1872, 292.

HAB. Sporadic in the Eng forests along the western slopes of the Pegu Yomah, for inst. between Pansuay and Myodweng. Fl. Fr. Decbr. Jan.

3. S. OBLONGIFOLIA, DC. Prod. I. 334; Deless. Ic. sel. III. t. 19; Hf. Ind. Fl. I. 207. (*S. obovata*, Wight Ill. I. t. 22.; *S. angulata*, Griff. Not. Dicot. 539. t. 585. A. f. 16?).

HAB. Tenasserim, Tavoy (Wall).

4. S. CYLINDRICA, (*Epirhizanthes cylindrica*, Bl. Regensb Flor. 1825. 134; Miq. Fl. Ind. Bat. I/2. 128 t. 15; *S. aphylla*, Griff. in Linn. Trans. XIX. 342; Hf. Ind. Fl. I. 207; *S. parasitica*, Griff. Not. Dicot. 538. t. 598. f. 5).

HAB. Tenasserim, on bamboo-trunks between decayed wood rather frequent about Mergui, Palar. (Griff.). Fl. Octob.

Securidaca, L.

1. S. INAPPENDICULATA, Hassk in Pl. Jav. rar. 295, (*S. Tavoyana*, Wall. Cat. 4196, nomen nudum; Hf. Ind. Fl. I. 208. *S. scandens* Ham. in Wall. Cat. 4195, non Jacq. *S. paniculata*, Roxb. Fl. Ind. III. 219, non Lamk).

HAB. Chittagong; Arracan (Capt. Marcgrave); Tenasserim, Tavoy (Wall). Fl. Aug.

Xanthophyllum, Roxb.

Conspectus of species.

* Ovary sessile (*i. e.* the stalk not exserted from the annular disk).

O Panicle remotely supra-axillary (and terminal).

Leaves glaucous and rather opaque beneath; panicles diffuse, glabrous; calyx and slender pedicels glabrous; ovary minutely pubescent, the stigma broadly 2-lobed, ...*X. virens.*

O O Panicles or racemes truly axillary (and terminal).

× Ovary and style villous. (Leaves glaucescent beneath).

Panicles tawny puberulous; pedicels thick, 1½-2 lin. long, puberulous, ...*X. eglandulosum.*

Racemes slender, in lax tomentose panicles; pedicels slender, ...*X. glaucum.*

× × Ovary glabrous, the style slender pubescent.

Panicle diffuse, greyish velvety; fruit glabrous; leaves glossy, drying yellowish like *Symplocos*, ...*X. flavescens.*

* * Ovary shortly stalked.

Leaves rather large; racemes simple or in short robust axillary panicles, greyish velvety; ovary glabrous with a very thick villous style, ...*X. affine.*

1. X. VIRENS, Roxb. Corom. Pl. III. t. 284 and Fl. Ind. II. 221.

HAB. Not unfrequent in the evergreen tropical forests of the Pegu Yomah and Martaban, up to 3000 ft. elevation. Fl. Febr. March.

2. X. FLAVESCENS, Roxb. Fl. Ind. II. 222. (*X. paniculatum*, Miq. Suppl Fl. Sum. I. 393).

HAB. Frequent in the swamp-forests of Martaban; Tenasserim, Moulmein down to Tavoy; also Chittagong. Fl. Febr. May; Fr. May.

X. flavescens as revised in Hf. Ind. Fl. is a mixture of species, but it is impossible to clear up the synonymy so long as the numbers of distributed collections are not given. No one would wish the numbers of all collections extant or references to common and well-known species, but in the case of new or critical species such might reasonably be looked for. *X. angustifolium*, Wight Ill. 50 t. 23, with simple or almost simple subaxillary racemes and a villous stalked ovary, is certainly not identical with Roxburgh's plant; besides, it is a small tree or rather shrub, while the latter is a timber-tree.

3. X. EGLANDULOSUM, Griff. Not. Dicot. 537 t. 598 f. 4. (*X. Griffithii*, Hf. Ind. Fl. I. 210.)

HAB. Tenasserim, Mergui (Griff.; Helf).

The leaves are described as very coriaceous just as those of *X. insignis* (to which I doubtfully refer Maingay's plant No. 348 distributed as *Carapa* sp.); if this be really so, I fear that I have not seen the true species, for in my specimens they are hardly more coriaceous than those of *X. flavescens*. The Andaman specimens in leaf only, wrongly named by me *X. glaucum*, would probably come here or be referable to *X. virens*.

4. X. GLAUCUM, Wall. Cat. 4199; Hf. Ind. Fl. I. 209.

HAB. Common in the swamp-forests and around inundated jungle-swamps of the alluvial plains and base of hills of Pegu and Martaban; also Tenasserim. Fl. March, Apr.

5. X. AFFINE, Bennet in Hf. Ind. Fl. I. 209, vix Korth.

HAB. Tenasserim, Mergui.

Wall. Cat. 4198 is cited for this species, but the specimens B from Tenasserim as far as seen by me have a sessile ovary and are referred by me to *X. flavescens*, while A. from Penang is here understood to be the above plant.

CARYOPHYLLEÆ.

Conspectus of genera.

Trib. I SILENEÆ. Calyx gamosepalous, 4- to 5-lobed. Petals and stamens hypogynous, often raised on a stalk-like torus. Styles distinct from the base. Stipules none.

1. GYPSOPHILA. Calyx turbinate-tubular or bell-shaped, broadly and almost wingedly 5-nerved. Capsule deeply 4-valved. Styles usually 2.

Trib. II. ALSINEÆ. Sepals free. Stamens inserted on an annular disk, rarely perigynous. Styles free.

2. BRACHYSTEMMA. Petals entire. Capsules depressed, 1-seeded. Styles 2. Stipules none.

Trib. III. POLYCARPEÆ. Sepals free. Stamens inserted on an annular disk. Styles united Stipules scarious.

3. DRYMARIA. Petals lobed. Sepals not keeled. Style very short.

4. POLYCARPON. Sepals keeled. Petals entire. Style short.

5. POLYCARPÆA. Sepals not keeled, scarious. Petals entire or notched. Style elongate.

Gypsophila, L.

1. G. Vaccaria, Smith in Sibth. Fl. Græc. t. 380; WA. Prod. I. 42. (*Saponaria Vaccaria*, L. sp. pl. 583; Bot. Mag. t. 2290 Hf. Ind. Fl. I. 217; *Saponaria perfoliata*, Roxb. Fl. Ind. II. 445.)

Hab. South Andaman, in a cultivated field near Aberdeen, introduced. Fl. May.

Brachystemma, Don.

1. B. calycinum, Don Prod. Nep. 646; Fenzl. Atakt. t. 16; Hf. Ind. Fl. I. 937.

Hab. Ava, Khakyen hills, near Ponline (J. Anderson). Fl. March.

Drymaria, Willd.

1. D. cordata, Willd. ap. Roem. and Schult. syst. veg. V. 406; Hf. Ind. Fl. I. 244. (*Cerastium cordifolium*, Roxb. Fl. Ind. II. 458).

Hab. Rather frequent in hill-toungyas and betel-nut gardens of Martaban, at 2000 to 5000 ft. elevation; also Ava, Bhamo. Fl. Febr. March.

Polycarpon, L.

1. P. Lœflingiæ, Bth. and Hf. Gen. Pl. I. 153; Hf. Ind. Fl. I. 245. (*Pharnaceum depressum*, L. Mant. 564; *Læflingia Indica*, Retz. Obs. 48; Roxb. Fl. Ind. I. 165).

Hab. Very frequent in agrarian lands, banks of rivers, etc., of Pegu and Martaban; also Tenasserim, Chittagong and Arracan. Fl. May, June.

Polycarpæa, Lour.

1. P. corymbosa, Lamk. Ill. No. 2798; Wight Ic. t. 712 and Ill. II. t. 110; Hf. Ind, Fl. I. 245. (*Celosia corymbosa*, Roxb. Fl. Ind. I. 681; *P. marginata*, Prsl. Bot. Bemerk. 141; Walp. Ann. I. 83).

Hab. Ava, on limestone near Segain and Pagha myo; Prome; Tenasserim, Moulmein. Fl. Dec. Jan.

PORTULACACEÆ.

Conspectus of genera.

1. Portulaca. Ovary half-inferior, with the petals and stamens perigynous.
2. Talinum. Ovary free. Sepals usually deciduous. Seeds caruncled.

Portulaca, L.

Conspectus of species.

Joints glabrous; flowers clustered by 3 to 5, ...*C. oleracea.*
Joints pilose; flowers solitary, ... *C. quadrifida.*

1. P. oleracea, L. sp. pl. 638; Roxb. Fl. Ind. II. 463; Hf. Ind. Fl. I. 246; Sibth. Fl. Græc. t. 457; DC. Pl. grass. t. 123; Gray Gen. t. 99.

Hab. Common all over Burma in cultivated lands, waste places, on roads, etc. Fl. ∞.

2. P. quadrifida, L. Mant. 78; Roxb. Fl. Ind. II. 464; Wight Ill. II. t. 102; Hf. Ind. Fl. I. 247. (*C. meridiana*, L Suppl. 248; Roxb. l. c. 463).

Hab. Pegu, in waste places, on roads, etc.; Ava. Fl. C. & R. S.

Talinum, Adans.

1. T. cuneifolium, Willd. sp. pl. II. 864; Roxb. Fl. Ind. II. 465; Hf. Ind. Fl. I. 247.

Hab. Ava, on the Pagodas at Pagha myo (Wall. 6846).

TAMARISCINEÆ.

Tamarix, L.

Conspectus of species.

Leaves appressed to the terete almost simple branchlets and branches; flowers sessile, rose-coloured, in dense short spikes, ...*T. dioica.*

Leaves somewhat spreading on the very short thin and branched branchlets; flowers pedicelled, white, in loose slender terminal or variously lateral racemes, ...*T. gallica.*

1. T. dioica, Roxb. Fl. Ind. II. 101; Griff. Not. Dicot. 465, t. 577. f. 2.; Hf. Ind. Fl. I. 249.

Hab. Ava, in the hills opposite Pagha Myo. Fl. C. S.; Fr. R. S.

2. T. Gallica, L. sp. pl. 386; Wight Ill. t. 24 f. 1.; Hf. Ind. Fl. I. 248. (*T. Indica*, Willd. in Act. Not. Cur. Berol, IV. 214; Roxb. Fl. Ind. II. 100).

Hab. Rather frequent in the tidal savannahs and tidal forests of Lower Pegu. Fl. R. S.; Fr. C. S.

ELATINEÆ.

Conspectus of genera.

Trib. I BERGIEÆ. Ovary-cells with several ovules. Albumen none. Perianth complete. Fruit a capsule.

1. Bergia. Sepals acute. Flowers usually 5-merous. Capsule almost crustaceous, septicidal or septifragal.

Trib. II. HIPPURIDEÆ. (incl. *Callitricheæ ?*). Ovary-cells with a solitary ovule. Perianth complete or incomplete. Seeds albuminous. Fruit a drupe.

2. Myriophyllum. Calyx truncate or 4-toothed. Petals 2—4 or none. Stamens 2—3. Ovary deeply 2- or 4-sulcate; stigmas 2 or 4, blunt or feathery. Drupe separable into 2 or 4 nut-like carpels.

Trib. III. CERATOPHYLLEÆ. Flowers unisexual. Perianth 12-phyllous. Ovary 1-celled, with a solitary ovule. Fruit a nut.

3. Ceratophyllum. Stamens several. Styles 2. Fruit a nut.

Bergia, L.

Conspectus of species.

Glabrous; flowers white, sessile, ...*B. verticillata.*

Pubescent or hirsute; flowers rose-coloured, shortly pedicelled, ...*B. ammannioides.*

1. B. VERTICILLATA, Willd. sp. pl. II. 770; Roxb. Fl. Ind. II. 456; Hf. Ind. Fl. I. 252. (*B. aquatica*, Roxb. Corom. Pl. II. t. 142).

HAB. Ava (Wall.); Pegu, Rangoon. Fl. R. S.; Fr. C. S.

2. B. AMMANNIOIDES, Roxb. Fl. Ind. II. 457; Hf. Ind. Fl. I. 251. (*Elatine ammannioides*, WA. Prod. I. 41; Wight Ill. t. 25. A. and Suppl. 48. t. 28.).

HAB. Frequent all over Pegu in rice-fields, along river-banks, etc.; Tenasserim, Tavoy (Wall.). Fl. R. S.; Fr. C. S.

Myriophyllum, L.

Conspectus of species.

Carpels almost smooth, about ½ lin. long, only at base connate, the back obtuse, ...*M. tetrandrum.*

Carpels tubercled and muricate, sometimes almost echinate, wholly connate, about a line long, the back sharply angled, ...*M. tuberculatum.*

1. M. TETRANDRUM, Roxb. Fl. Ind. I. 451; DC. Prod. III. 69; W. A. Prod. I. 339; Miq. Fl. Ind. Bat. I. 634; Griff. Not. Dicot. 686. t. 644. f. 5.

HAB. Frequent in swamps and stagnant waters of the alluvial lands of Pegu; Chittagong, in ponds. Fl. Fr. Oct. to Jan.

2. M. TUBERCULATUM, Roxb. Fl. Ind. I. 471; DC. Prod. III. 69; Miq. Fl. Ind. I. 635. (*M. Indicum*, Griff. Not. Dicot. 687.)

HAB. Chittagong, in ponds. Fl. Fr. Oct.—Decb.

Ceratophyllum, L.

1. C. DEMERSUM, L. sp. pl. 1409; DC. Prod. III. 73; Bth. Fl. Austr. II. 491.

Var. *α.* DEMERSUM, (*C. demersum*, L. l. c), nuts smooth.

Var. *β.* TUBERCULATUM, (*C. tuberculatum;* Cham. in Linnæa IV. 504. t. 5. f. 6. d.; WA. Prod. I. 309; Miq. Fl. Ind. Bat. I. 799; Wight Ic. t. 1948. f. 3.; *C. verticillatum*, Roxb. Fl. Ind. III. 624).

HAB. Only var. *β.* not uncommon in ponds and stagnant waters of Chittagong; also in choungs and lakes of Pegu. Fr. Decb. Jan.

HYPERICINEÆ.

Conspectus of genera.

Trib. I. HYPERICEÆ. Capsules dehiscing septicidally. Seeds not winged.

1. HYPERICUM. Flowers 5-merous. Herbs or shrubs.

Trib. II. CRATOXYLEÆ. Capsules dehiscing loculicidally or sometimes both loculicidally and septicidally. Seeds winged.

2. CRATOXYLON. Flowers 5-merous. Stamens 3-adelphous. Ovules 4 or more to the cell.

Hypericum, L.

Conspectus of species.

* Shrubs with large flowers. Ovary 5-celled. Capsules 5-valved.

Stems terete or nearly so; styles 5, free, shorter than the ovary, . *H. Leschenaultii.*

* * Herbs with small flowers. Ovary 3-celled. Capsules 3-valved.

Stems terete; sepals glandular-ciliate, ...*H. elodeoides.*

* * * Herbs. Ovary 1-celled. Flowers small.

Stems 4-angular; sepals entire, ...*H. Japonicum.*

1. H. LESCHENAULTII, Chois in DC. Prod. I. 542; Deless. Icon. Select. III. 17. t. 27. (*H. triflorum*, Bl. Bydr. 142; *H. oblongifolium*, Hook. Bot. Mag. t. 4949; *H. Hookerianum*, WA. Prod. I. 99; Wight Ic. t. 949; Hf. Ind. Fl. I. 254).

HAB. Martaban, on and near the top of Nattoung, along the borders of the stunted hill forests, at 7000-7200 ft. elevation. Fr. March.

2. H. ELODEOIDES, Chois in DC. Prod. I. 551; Hf. Ind. Fl. I. 255. (*H. sp*. Griff. Not. Dicot. 569. t. 605. f. 1.)

HAB. Ava, (Griff.) Khakyen hills, Ponsee (J. Anderson). Fl. Aug. and March.

3. H. JAPONICUM, Thbg. Fl. Jap. 195. t. 31; Royle Ill. Him. Pl. t. 24. f. 2; Hf. Ind. Fl. I. 256.

HAB. Ava, Khakyen hills (J. Anderson); Martaban, Yoonzeleen, at 2500 ft. elevation (Brandis); Tenasserim (Helf. 837). Fl. March.

Cratoxylon, Bl.

Conspectus of species.

Subg. 1. *Tridesmis*, Spach. Petals furnished at base with a scale.

All parts glabrous, ... *C. formosum.*

Leaves beneath, pedicels and sepals pubescent, ... *C. pruniflorum.*

Subg. 2. *Ancistrolobus*, Spach. Petals without a basal scale.

* Flowers in axillary poor cymes or solitary.

Leaves thin chartaceous, acute or blunt; hypogynous glands present or absent, ...*C. polyanthum.*

* * Flowers in terminal panicles.

Leaves linear-oblong, usually almost sagittate-produced at base, chartaceous,*C. nervifolium.*

Leaves more or less obovate-oblong, coriaceous, ...*C. arborescens.*

1. C. FORMOSUM, Bth. and Hf. Gen. Pl. I. 166; Hf. Ind. Fl. I. 258. (*Tridesmis formosa*, Korth. in Verh. Nat Gesch. Bot. 179. t. 37.)

HAB. Rare in the tropical forests of South Andaman. Fl. May.

2. C. PRUNIFLORUM, Kurz MS. in Journ. As. Soc. Beng. 1872. 293. (*Tridesmis pruniflora*, Kurz l. c.; *Elodea pruniflora* (errore *prunifolia*) Wall. Cat. 7276; *C. prunifolium*, Dyer in Hf. Ind. Fl. 258).

HAB. Not unfrequent in the Eng forests of Martaban; Ava, on Taong dong; Tenasserim, Moulmein. Fl. Apr. May.

Dyer has changed my name into "*prunifolium*," which was a *calami lapsus* on the part of Wallich who autographically corrected it on the label of the plant in H. B. C. into "*pruniflora*," a name at once more suggestive and appropriate, for the full-grown leaves are all but *Prunus*-like.

3. C. POLYANTHUM, Korth. Verh. Nat. Gesch. Bot. 175. t. 36; Miq. Fl. Ind. Bot. I/2. 516; Hf. Ind. Fl. I. 257.

Var. *α*. GENUINUM, (var. *α*. and *β*. Dyer in Hf. Ind. Fl. l. c.) hypogynous glands present.

Var. *β*. CARNEUM (*C. carneum*, Kurz in Pegu Report; *Ancistrolobus carneus*, Wall. ap. Voigt Hort. Calc. 89) hypogynous glands entirely absent.

HAB. Var. *β*. Rather frequent in the hill Eng and drier upper mixed forests of Martaban, up to 3000 ft. elevation; also Tenasserim (Helf. 843); var. *α*. in Tenasserim and the Andamans. Fl. March, Apr. Fr. C. S.

The varieties of this species require re-examination. I believe there are at least two species, the one a tree, the other a shrub.

4. C. NERIIFOLIUM, Kurz in Journ. As. Soc. Beng. 1872. 293; Hf. Ind. Fl. I. 257.

HAB. Common in the dry and drier upper mixed forests of Prome and Pegu; also in Martaban and Tenasserim; Chittagong. Fr. C. S.

5. C. ARBORESCENS, Bl. Mus. Bot. II. 17; Hf. Ind. Fl. I. 258. (*Hypericum arborescens*, Vhl. Symb. II. 86. t. 43; *C. cuneatum*, Miq. Fl. Ind. Bot. I/2. 517 ?)

HAB. Tenasserim, Moulmein (Lobb).

GUTTIFERÆ.

Conspectus of genera.

Trib. I GARCINIEÆ. Stigma sessile or on a very short and thick style, peltate or radiately-lobed. Seeds often arillate.

1. GARCINIA. Flowers 4- or 5-merous. Sepals often decussate. Stamens united into a fleshy mass or into bundles, or free.

2 OCHROCARPUS. Calyx closed in bud, bursting into 2 valves.

Trib. II. CALOPHYLLEÆ. Style elongate, the stigma peltate or 4-cleft. Seeds without arillus.

3. CALOPHYLLUM. Ovary 1-celled, with a solitary ovule; style single, with peltate stigma.

4. KAYEA. Ovary 1-celled, with 4 ovules; style single, with a 4-cleft stigma.

5. MESUA. Ovary 2-celled, with 2 ovules in each cell; style single with a peltate stigma.

Garcinia, L.

Conspectus of species.

Subg. 1. *Garcinia,* L. Flowers 4-merous.

* Anthers oblong or ovate, opening by longitudinal slits or pores.

* Stamens of male flowers in 4 bundles under the rudimentary ovary. Berries 4- to 10-celled, the stigma radiating-lobed, smooth or nearly so.

Female flowers with staminods round the ovary; berries on a short peduncle; stigma radiately-lobed and adnate, ... *G. Mangostana.*

Female flowers without staminods; berries sessile; stigma large, peltate, slightly lobed, sessile, ... *G. cornea.*

Flowers on rather long pedicels, nearly 2 in. in diameter; stigma in male flowers large, peltate, entire, ... *G. speciosa.*

* * Stamens in 4 polyandrous bundles in a ring round the rudimentary ovary; stigma peltate, discoid, more or less rough from wrinkles or radiating veins. Ovary 2-celled.

Peduncle rather long, bearing 2 or rarely 1 leafy bract, ... *G. anomala.*

Peduncle short or wanting, without bracts, ... *G. Merguensis.*

* * * Anthers almost sessile on a column or 4-sided fleshy mass seldom dividing into 4 somewhat distinct lobes. Stamens in female flowers in a single complete or interrupted ring. Stigmas tubercled or tubercled-wrinkled. Ovary 4—12-celled.

O Stigma in fruit raised on a short thick style.

Berry convex at top, the style not on a separate nipple, ... *G. cowa.*

Berry terminated by a nipple-shaped protuberance, ... *G. Kydia.*

O O Stigma in fruit quite sessile.

Leaves acuminate or cuspidate, leathery; flowers sessile, ... *G. lanceæfolia.*

Leaves blunt, succulent when dry thin herbaceous; flowers pedicelled, ... *G. succifolia.*

* * Anthers peltate, opening by a circular slit.

Leaves large, coriaceous; female flowers almost sessile, the stigma small, verrucose ... ... *G. elliptica.*

Subg. 2. *Xanthochymus*, Roxb. Flowers 5-merous.

Pedicels about an in. long; flowers expanded, ... *G. Xanthochymus.*

Pedicels 3 to 4 lin. long; flowers almost closed, doubly smaller, ... *G. dulcis.*

*1. G. Mangostana, L. sp. pl. 635; Roxb. Fl. Ind. II. 618; Hook. Bot. Mag. t. 4847: Hf. Ind. Fl. I. 260.

Hab. Only cultivated, Tenasserim. Fr. May, June.

2. G. speciosa, Wall. Pl. As. rar. III. t. 258; Hf. Ind. Fl. I. 260.

Hab. Frequent in the tropical forests of the Andamans; also Tenasserim, Moulmein district. Fl. Febr. Apr.

Wallich's figure above cited very much resembles *G. cornea.* My plants resemble in foliage much more *G. Mangostana*, from which they are readily distinguished by the entire but not lobed stigma of the male flowers. The flowers are very much larger than Wallich figures them, agreeing in size more with the analysed flower on the plate.

3. G. cornea, L. sp. pl. 561; Roxb. Fl. Ind. II. 629; Wight Ic. t. 105; Hf. Ind. Fl. I. 260.

Hab. Not uncommon in the tropical forests of Martaban and the southern slopes of the Pegu Yomah above Rangoon; also Tenasserim. Fr. Begin of R. S.

The Burmese plants differ, as it seems constantly, in having the stigma 6-lobed and the ovaries 6-celled.

4. G. ANOMALA, Pl. and Trian. in Ann. d. sc. nat. Bot. ser. 4. XIV. 329; Hf. Ind. Fl. I. 266.

HAB. Not uncommon in the damp and dry hill-forests of Martaban E. of Tounghoo, at elevations from 4000 to 6000 ft. Fl. probably Apr. (buds in March).

5. G. MERGUENSIS, Wight Ill. 122. and Ic. t. 116; Hf. Ind. Fl. I. 267.

HAB. Tenasserim, Mergui (Griff.)

6. G. COWA, Roxb. Fl. Ind. II. 622. (*G. Roxburghii*, Wight Ic. t. 104).

HAB. Chittagong (Roxb.)

7. G. KYDIA, Roxb. Fl. Ind. II. 623; Wight Ic. t. 118. (*G. sp.* Griff. Not. Dicot. 609. t. 585. A. f. 12 ?).

HAB. Frequent in the moister upper mixed and in the tropical forests all over Burmah, from Chittagong, Pegu and Martaban down to Tenasserim and the Andamans. Fl. March to May; Fr. May June.

G. lobulosa, Wall. Cat. 4868 from Amherst is *G. Kydia*, the Singapore specimen is quite different but too incomplete for identification.

The Andamanese specimens called in my And. Report *G. purpurea*, will probably turn out to be the same as the Singapore plant, but they are too badly preserved to enable me to give a definite opinion.

8. G. LANCEÆFOLIA, Roxb. Fl. Ind. II. 623; Wight Ic. 163; Hf. Ind. Fl. I. 263.

HAB. Chittagong hills.

9. G. SUCCIFOLIA, Kurz in Journ. As. Soc. Beng. 1872. 293. (*G. loniceroides*, T. And. in Hf. Ind. Fl. I. 264).

HAB. Frequent in the swamp forests of the alluvial lands of the Sittang and Irrawaddi rivers. Fl. Apr.

10. G. ELLIPTICA, Wall. Cat. 4869; Wight Ill. I. 126 and Icon. t. 120. (*Garcinia heterandra*, Wall. Cat. 4856; Hf. Ind. Fl. I. 265).

HAB. Frequent in the tropical forests of the eastern slopes of the Pegu Yomah and Martaban down to Tenasserim, up to 3000 ft. elevation. Fr. Febr. March.

I consider *G. elliptica*, Wall. Cat. 4869 from Silhet identical with the *G. heterandra* of the same author, but other specimens distributed from the Kew Herbarium look different; in any case it cannot go into *G. Morella.* From the contradictory statements of authors with regard to Wallich's species, one is tempted to believe that much confusion must have occurred in the distribution. We have in the H. B. C. at least two *Morellas*, the Hindustani one (*G. pictoria*, Roxb.) with a large conspicuous calyx under the fruit, and the Malacca one (Griff. 859) which has very minute sepals. *G. Choisyana*, Wall. ap. Hf. Ind. Fl. I. 268 from Tavoy, is known to me only from a wretched young leaf-branch and the description would agree so far with *G. elliptica* except in the sessile male flowers.

11. G. Xanthochymus, Hf. Ind. Fl. I. 269. (*G. Roxburghii*, Kurz in Pegu Report; *Xanthochymus pictorius*, Roxb. Corom. Pl. 51. t. 196 and Fl. Ind. II. 633).

Hab. Frequent in the tropical forests of Martaban and Pegu; also Chittagong, Arracan and Tenasserim; Ava. Fl. March Apr.; Fr. R. S.

12. G. dulcis (*Xanthochymus dulcis*, Roxb. Corom. Pl. III. t. 270 and Fl. Ind. II. 631; Bot. Mag. t. 3088; Wight Ic. t. 192).

Hab. Rather frequent in the tropical forests of South Andaman and adjacent islands. Fr. March-May; Fr. May, June.

Ochrocarpus, Thouars.

1. O. Siamensis, T. And. in Hf. Ind. Fl. I. 270. (*Calysaccion Siamense*, Miq. in Ann. Mus Lugd. Bat. I. 209).

Hab. Rather rare in the Eng forests of Martaban; Prome hills (Wall. Cat. 4148, quoad specimen e Prome). Fl. Sept. Oct.

Calophyllum, L.

Conspectus of species.

* Sepals 4, often the 2 inner ones or all petal-like; petals none.

Flowers about 8 lin. across, in peduncled or almost sessile umbel-like cymes...*C. spectabile.*
Flowers small; racemes short and strong, few-flowered, ...*C. amoenum.*

* * Sepals 4; petals 4 to 8.

Leaves at both ends acuminate, ...*C. polyanthum.*
Leaves rounded or retuse at the apex, ...*C. Inophyllum.*

1. C. spectabile, Willd. Mag. Berl. 1811.80; Hf. Ind. Fl. I. 271. (*C tetrapetalum*, Roxb. Fl. Ind. II. 608).

Hab. Not unfrequent in the tropical forests of the Andamans; also Tenasserim. (Falconer).

2. C. amœnum, Wall. Cat. 4849; Planch. & Trian. in Ann. d. sc. nat. ser. 4. XV. 263.

Hab. Tenasserim, from Moulmein down to Tavoy. Fr. Febr.

3. C. polyanthum, Wall. Cat. 4844; Pl. & Trian. in Ann. d. sc. nat. Bot. 4 ser. XV. 278; Hf. Ind. Fl. I. 274.

Hab. Not unfrequent in the damp hill forests of the Martaban hills, E. of Tounghoo, at 3000 to 4000 ft. elevation.

4. C. Inophyllum, L. sp. pl. 732; Wight Ic. t. 77, and Ill. Ind. Bot. Suppl. 35 t. 17; Roxb. Fl. Ind. II. 606; Hf. Ind. Fl. I. 273; Griff. Not. Dicot. 609. (*C. Bitangor*, Roxb. l. c. 607).

HAB. Frequent along the sandy sea-shores in the beach-forests of the Andamans and Tenasserim; also often cultivated in villages. Fr. Apr. May.

Kayea, Wall.

I. K. NERVOSA, T. And. in Hf. Ind. Fl. I. 277. (*Mesua nervosa*, Planch. & Trian. in Ann. d. sc. nat. Bot. ser. 4, xv. 307).

HAB. Tenasserim, Moulmein district (Falc.) down to Mergui (Griff.). Fr. Apr.

Mesua, L.

1. M. FERREA, L. sp. pl. 734; Wight Ic. t. 118; Roxb. Fl. Ind. II. 605; Hf. Ind. Fl. I. 277. (*M. speciosa*, Chois in DC. Prod. I. 562; Wight Spicil. 27. t 30 and 31; and Icon. t. 961; *M. pedunculata*, Wight Ic. t. 119).

HAB. Frequent in tropical forests of the Andaman islands and all over Tenasserim; Chittagong. Fl. March; Fr. May, June.

TERNSTRŒMIACEÆ.

Conspectus of genera.

Trib. I. TERNSTRŒMIACEÆ. Anthers basifix. Fruit indehiscent. Seeds usually few. Albumen fleshy, usually scanty. Embryo curved, the cotyledons shorter than the radicle and nearly as broad.

1. ANNESLEA. Ovary half-immersed in the torus. Fruit inferior.

2. TERNSTRŒMIA. Petals united at base. Anthers glabrous. Ovules 2 to 4 in each cell. Fruit superior. Seeds large.

3. ADINANDRA. As preceding, but anthers pilose. Seeds numerous, small.

4. CLEYERA. Petals free or hardly united. Anthers pilose. Ovules many. Fruit superior.

5. EURYA. Flowers diœcious. Petals united at base. Anthers glabrous. Ovules many. Fruit superior.

Trib. II. SAURAUJEÆ. Anthers versatile. Fruits usually pulpy, rarely almost dehiscent. Seeds numerous, small. Albumen copious. Embryo straight, the radicle longer than the cotyledons.

6 SAURAUJA. Flowers 5-merous, usually hermaphrodite. Styles 3—5.

Trib. III. GORDONIEÆ. Anthers versatile. Fruit indehiscent or loculicidal. Albumen scanty or none, rarely copious. Embryo curved or straight, the cotyledons large, the radicle short.

× Fruit a dehiscent capsule.

7. SCHIMA. Sepals somewhat unequal. Seeds flat, winged. Radicle inflexed. inferior.

8. GORDONIA. Sepals very unequal. Seeds winged. Radicle superior.

9. CAMELLIA. Sepals very unequal. Outer stamens monadelphous. Seeds few, large, not winged. Radicle superior.

× × Fruit an indehiscent drupe.

10. PYRENARIA. Sepals very unequal. Seeds large. Cotyledons folded or convolute. Radicle inferior.

Anneslea, Wall.

Conspectus of species.

Leaves less coriaceous, bluntish, the nerves distinct; peduncles slender, ...*C. fragrans.*
Leaves thick coriaceous, acute, nerves almost obsolete; peduncles very thick, *C. monticola.*

1. A. FRAGRANS, Wall. Pl. As. rar. I. 5. t. 5; Griff. Not. Dicot. 567. t. 585. A. f. 17; Hf. Ind. Fl. I. 280.

HAB. Not unfrequent in the Eng forests of Pegu and Prome, and more so in the hill Eng forests of Martaban up to 2000 ft. elevation; also Tenasserim, Moulmein. Fl. March, Apr.

2. A. MONTICOLA, Kurz in Journ. As. Soc. Beng. 1873, 59.

HAB. Not unfrequent in the drier hill forests of Martaban at 5000 to 7200 ft. elevation. Fl. Febr. March.

May possibly turn out to be a stunted hill-form of the preceding species.

Ternstrœmia, L. f.

Conspectus of species.

* Anthers apiculate.

Fruiting calyx smooth; berries about ½ in. thick, ...*T. Japonica.*

* * Anthers not apiculate.

Fruiting calyx thick and wrinkled; berries about 1—1½ in. thick, ...*T. Penangiana.*

1. T. JAPONICA, Thunbg. in Linn. Trans. II. 335; Hf. Ind. Fl. I. 280. (*Cleyera gymnanthera*, WA. Prod. I. 87; Wight Ic. t. 47; Bedd. Fl. Sylv. t. 91.; *Ternstrœmiacea*, Griff. Not. Dicot. 568. t. 604. f. 1 ?).

HAB. Common in the damp hill-forests of Martaban at elevations from 3000 to 7200 ft.; Tenasserim, Moulmein. Fl. Apr.

2. T. PENANGIANA, Chois. in Mem. Soc. Phys. Genév. XIV. 108; Hf. Ind. Fl. I. 281. (*Erythrochiton Wallichianum*, Griff. Not. Dicot. 565. t. 585. A. f. 7. *T. macrocarpa*, Scheff. Obs. Phyt. 15. & Tydschr. Ned. Ind. 1874. 60-61 in adn.).

HAB. Not unfrequent in the tropical forests of the Andamans; Tenasserim, from Moulmein to Mergui. Fr. Apr. May.

A more careful study of the *Ternstrœmias* will probably shew the validity of Griffith's genus *Erythrochiton*, a name already preoccupied. I am by no means sure that the Griffithian and Wallichian plants are the same. The Burmese specimens agree with the former. Dyer seems to have confounded two very marked species, *viz.*, the wrinkled-sepalled Choisyan plant and the smooth-sepalled *T. coriacea*, Scheff. (Hb. Maingay No. 183 from Malacca).

Adinandra, Jack.

1. A. VILLOSA, Chois Mém. Ternst. 24; Hf. Ind. Fl. I. 283.

HAB. Not unfrequent in the open especially the Eng forests of the Irrawaddi zone, Pegu; Tenasserim, Tavoy (Wall.).

Seems to differ from *A. dasyantha*, Korth., with which I confounded it in my Pegu Report, by the acute sepals.

Eurya, Thbg.

Conspectus of species.

* Leaves serrulate.

× Leaf-buds quite glabrous.

Branchlets marked by decurrent prominent lines, ...*E. Japonica.*

× × Leaf-buds pubescent or hirsute; branchlets terete.

A slender pine-like tree; leaves puberulous beneath, acuminate; styles united, *E. acuminata.*

A bushy round-headed tree; leaves membranous, glabrous or nearly so, bluntish caudate; styles free, ...*E. serrata.*

* * Leaves entire or serrulate at apex only.

Young shoots appressed-pilose; styles united, ...*E. symplocina.*

1. E. JAPONICA, Thbg. Fl. Jap. 191. t 25; Bedd. Fl. Sylv. t. 92; Hf. Ind. Fl. I. 284. (*E. Wightiana*, Wight Ill. I. t. 38, non Wall; *E. glabra*, Bl. Mus. II. 109; *E. virens*, Bl. l. c. 112; *E. obovata*, Bl. l. c. 107).

HAB. Frequent in the drier hill-forests of Martaban at 4000 to 7000 ft. elevation; Tenasserim, Moulmein hills. Fl. March.

2. E. ACUMINATA, DC. Mém. Ternstr. 26. (*E. Chinensis*, Hf. and Th. Herb. Ind. or, as far as to the specimens with united styles.)

HAB. Rather frequent in the drier hill-forests, especially the pine forests of Martaban at 6000 to 7000 ft. elevation. Fl. Febr.; Fr. Apr.

3. E. SERRATA, Bl. Mus. II. 115; Miq. Fl. Ind. Bat. I/2 474. (*E. lucida*, Wall. Cat. 1462; *E. Wallichiana*, Steud. ap. Miq. Fl. Ind. Bat. I/2. 474; *E. Roxburghii*, Wall. Cat. 1463).

HAB. Frequent in the tropical forests of Martaban up to 2000 ft. elevation; Tenasserim, as far South as Tavoy; Pegu, in the tropical forests on laterite above Rangoon. Fr. March.

4. E. SYMPLOCINA, Bl. Mus. Bot. II. 114; Hf. Ind. Fl. I. 284. (*E. Wallichiana*, Planch MS.).

HAB Martaban, in the damp and drier hill forests on the Nattoung mountains at about 7000 ft. elevation. Fl. March.

Saurauja, Willd.

Conspectus of species.

* Calyx densely setose or hispid. Ovary villous.

Flowers large, on short thick pedicels, clustered; leaves more or less spiny-serrate, ...*S. armata.*

* * Calyx smooth. Ovary glabrous.

Leaves pale or tawny mealy-puberous beneath; peduncles long and slender, scaly; styles 5, ...*S. Punduana.*

Adult leaves glabrous, except the puberulous midrib; peduncles short, scaly puberulous; stamens about 50; flowers lazuli-blue, ... *S Roxburghii.*

As preceding, but leaves finely setose-serrate; stamens about 20; flowers said to be white, ... *S. tristyla.*

All parts except upper side of leaves covered with long tawny or brown spreading hairs; peduncles short but slender, rusty-hirsute, ... *S. macrotricha.*

1. S. ARMATA, Kurz in Journ. As. Soc. Beng. 1873. 59. (*S. cerea*, Griff. ap. Dyer in Hf. Ind. Fl. I. 288 ?).

HAB. Ava, Khakyen-hills, Ponsee (J. Anderson). Fl. Apr.

2. S. PUNDUANA, Wall. Pl. As. rar. II. 50; Hf. Ind. Fl. I. 287.

HAB. Not unfrequent in the tropical forests of Martaban at 2000 to 3000 ft. elevation; Ava, Khakyen hills, Ponsee (J. Anderson). Fl. Apr.

3. S. ROXBURGHII, Wall. Pl. As. rar. II. 40; Hf. Ind. Fl. I. 287. (*Ternstrœmia serrata*, Roxb. Fl. Ind. II. 521).

HAB. Rather frequent in the tropical and damp hill forests along choungs of the Martaban hills, E. of Tounghoo, at 2000 to 6000 ft. elevation; also Chittagong. Fl. Apr May.

4. S. TRISTYLA, DC. Mém. Ternst. 31. t. 7.; Hf. Ind. Fl. I. 287. (*Ternstrœmia bilocularis*, Roxb. Fl. Ind. II. 522 ?).

HAB. Tenasserim (Helf.)

Included on the authority of Dyer. Specimens thus named in HBC. hardly differ from the preceding.

5. S. MACROTRICHA, Kurz in Journ. As. Soc. Beng. 1873. 60; Hf. Ind. Fl. I. 287.

HAB. Ava, Khakyen hills, Ponsee (J. Anderson); Durunga, at 1000 ft. elevation (Griff.). Fl. Apr.

Pyrenaria, Bl.

Conspectus of species.

* Bracts large, leafy, dissimilar to the sepals.

Leaves yellowish in a dried state, pubescent beneath, ...*P. diospyricarpa.*

* * Bracts small, much shorter than the sepals and similarly shaped.

Leaves glabrous, yellowish in a dried state, petioles hardly 2 lin. long, puberulous or glabrous; fruits obovate, waxy-yellow, ...*P. camelliæflora.*

Leaves glabrous, in a dried state liver-coloured; petioles glabrous, 6 to 8 lin. long; fruits globular or elliptical, green, ... *P. serrata.*

1. P. DIOSPYRICARPA, Kurz in Journ. As. Soc. Beng. 1873. 60.

HAB. Not unfrequent in the stunted and drier hill-forests of Martaban, E. of Toungoo, at 6000 to 7200 ft. elevation. Fl. Fr. March.

2. P. CAMELLIÆFLORA, Kurz in Journ. As. Soc. Beng. 1871. 46; Hf. Ind. Fl. I. 290.

HAB. Frequent in the drier hill-forests of Martaban at elevations from 3000 to 5000 ft., rarely lower down. Fl. March Apr.; Fr. Apr. May.

3. P. SERRATA, Bl. Bydr. 1120; Miq Fl. Ind. Bat. I/2. 493. (*P. attenuata*, Seem. in Bonpl. VII. 49; Linn. Trans. XXII. 340; Hf. Ind. Fl. I. 290.; *P. lanceolata*, T. and B. in Nat. Tydsch. Nat. Ver. Ned. Ind. XXV)

HAB. Tenasserim, Tavoy (Wall.)

Schima, Bwdt.

Conspectus of species.

× Peduncles usually very short and stout, usually not longer than the petioles.

Peduncles short and straight (rarely long in Wall. Cat. 1455 fr. Nepal), usually lenticellate, rather strong, the nerves beneath prominent, the reticulation distinct, leaves glabrous or slightly pubescent beneath, ...*Sch. Wallichii.*

Peduncles 1 in. long, lenticellate; leaves pubescent beneath; the nerves and net-venation prominent and distinct, ...*Sch. mollis.*

Peduncles thick, lenticellate; leaves very coriaceous, glossy above, crenate, on both sides green, the net-venation indistinct, immersed, ...*Sch. monticola.*

Peduncles short and straight, smooth; flowers larger than in *Sch. crenata;* leaves glaucescent beneath, often entire, the lateral nerves prominent, the net-venation obsolete, ... *Sch. Noronhæ.*

× × Peduncles elongate, and often slender, always much longer than the petioles, smooth.

Peduncles slender, usually more or less curved; leaves glaucous beneath, usually crenate-serrate, the nerves and net-venation beneath distinct, ... *Sch. oblata.*

Peduncles strong, but still slender, 1—1¼ in. long; leaves very coriaceous, on both sides impressed-reticulate and almost rugulose, entire or crenate, the lateral nerves entirely or nearly impressed; capsules smaller, ...*Sch. Bancana.*

1. SCH. WALLICHII, Chois. (in Zoll. Cat. 144 ?). *Gordonia Wallichii*, DC. Prod. I. 528; *Gordonia integrifolia*, Roxb. Fl. Ind. II. 572).

HAB. Chittagong; Ava, Khakyen-hills, Ponsee (J. Anderson). Fl. March.

2. SCH. MOLLIS, Dyer in Hf. Ind. Fl. I. 288.

HAB. Ava, Taong-dong (Wall. Cat. 1458); Dyer gives Tavoy as a habitat, but this is an error. I fear that it is hardly more than a pubescent variety of the preceding.

3. SCH. MONTICOLA, Kurz MS.

HAB. Martaban, on the highest crests af the Nattoung mountains, in the stunted hill forests, at 6000 to 7200 ft. elevation. Fr. March.

May possibly be a hill-form of *Sch. Noronhæ*, but looks very different even structurally. The leaves much resemble those of *Pygeum lucidum.*

4. SCH. NORONHÆ, Rwdt. in Bl. Bydr. 129; Korth. Verh. 144. t. 29. f. 21—27; Miq. Fl. Ind. Bat. I/2. 492. (*Gordonia integrifolia*, Roxb. Fl. Ind. II. 572; *Gordonia floribunda*, Wall. Cat. 1457, B only.)

HAB. Frequent in the drier hill-forests of the Martaban hills at 1500 to 4000 ft. elevation, entering also the hill Eng-forests; Tenasserim (Helf. 763). Fl. Febr. March; Fr. March, Apr.

Schima, Griff. No. 768 has the peduncles of the above, but the leaves very much resemble those of *Sch. oblata*, I think that they are abnormal and produced after an unusual fall of leaves.

5. SCH. OBLATA, Kurz in Journ. As. Soc. Beng. 1870. 65. (*Sch. crenata*, Korth. Verh. Nat. Gesch. 143. t. 29; Hf. Ind. Fl. I. 289; *Gordonia oblata*, Roxb. Fl. Ind. II. 572).

HAB. Pegu, Rangoon; Tenasserim (Helf. 763).

6. SCH. BANCANA, Miq. Ann. Mus. Lugd. Bat. IV. 413.

HAB. Tenasserim (Helf. 761); common in the Eng forests of the lower hills of Tenasserim and Martaban, also in the pine forests up to 3000 ft. elevation. (Dr. Brandis.)

The differences between the species of *Schima* are very slight, but the logical consequence of the reduction of any of the above forms would be such a combination as *Sch. Noronhæ* and *Sch. Wallichii.*

Camellia, L.

Conspectus of species.

Subg. 1. *Thea*, L. Stamens of inner series equal in number to the petals.
All parts quite glabrous; flowers large; leaves coriaceous, ... *C. Japonica.*
Subg. 2. *Camellia*, L. Stamens of inner series twice the number of the petals.
Young parts and midrib of the membranous leaves pilose; flowers nodding on a line-long scaly peduncle; filaments villous, ... *C. caudata.*
All parts glabrous; leaves coriaceous; peduncles not scaly; filaments glabrous,... *C. Thea.*
Glabrous; leaves coriaceous; flowers almost sessile, erect; filaments glabrous, *C. drupifera.*

*1. C. THEA, Lk. in Stend. Nomencl. Bot. (*Thea Chinensis*, L. sp. pl. ed. 1. 515; Sims. Bot. Mag. t. 998; Seem. in Linn. Trans. XII. 349. t. 61; *Thea Bohea* and *T. viridis*, L. sp. pl. ed. 2. 735; *Thea Cochinchinensis*, Lour. Fl. Coch. I. 338; *C. theifera*, Griff. Not. Dicot. IV. 558. t. 601. f. 1 and 3; Trans. Agr. Hort. Soc. Bengal V. t. C.; Hf. Ind. Fl. I. 292).

HAB. Cultivated in Chittagong and Arracan.

2. C. CAUDATA, Wall. Pl. As. Rar. III. 336; Griff. Not. Dicot. 559. t. 601. f. 2; Trans. Agri. Hort. Soc. Ind. V. 1838 t. A.; Hf. Ind. Fl. I. 293.

HAB. Not unfrequent in the drier hill-forests of the Martaban hills along choungs, as for instance near the Chinchona plantation on Shan toung gyee toung at about 3500 ft. elevation. Fl. March?

I fear that I am wrong in my identification and, unfortunately, the only two withered flowers met with by me have been lost by the glue-men. It has much larger and shorter acuminate leaves, and the habit of *C. assimilis* as figured by Seemann. It is a small tree with white wood. N. B. *C. Japonica*, L., is often met with in gardens of Europeans.

3. C. DRUPIFERA, Lour. Fl. Coch. I. 411; Seem. in Linn. Trans. XXII. 344; Hf. Ind. Fl. I. 293. (*C. Kissi*, Wall. in Asiat. Res. XIII.

429 and Journ. As. Soc. Beng. IV. 48. t. 2. and Fl. As. rar. III. 36. t. 256; *C. simplicifolia*, Griff. Not. Dicot. IV. 560. t. 604. f. 2).

HAB. Tenasserim (and Andaman islands ? ?) (Helf. teste Dyer).

DIPTEROCARPEÆ.

Conspectus of genera.

Subord. I. ANCISTROCLADEÆ. Ovary 2-celled, with a single erect ovule; fruit adnate to the enlarged calyx. Scandent shrubs.

1. ANCISTROCLADUS. All the 5 calyx lobes more or less enlarged.

Subord. II. DIPTEROCARPEÆ. Ovary 3- rarely 1-celled, with 2 pendulous ovules in each cell. Trees, rarely erect shrubs.

* Ovary inferior or nearly so, or with a broad base adnate to the calyx-tube: nuts therefore for ½ to ¾ of their length adnate to the enlarged calyx tube.

2. ANISOPTERA. Connective terminating in a bristle or acute gland; 2 of the 5 calyx-lobes enlarging into long wings.

* * Ovary free, superior; nuts free, either enclosed in the enlarged calyx-tube or exposed and the calyx tube hardly enlarged.

O Calyx-tube in fruit very enlarged, completely enclosing the nut.

3. DIPTEROCARPUS. Two of the calyx lobes enlarging into long wings.

O O Calyx-tube in fruit not or almost not enlarged, the nuts either quite exposed or closely surrounded by the enlarged calyx-wings.

† Calyx-lobes valvate in bud.

4. PARASHOREA. Stamens 12—15, the connective mucronulate; calyx-lobes all almost equally enlarging and wing-like, stellately spreading, the nut quite exposed.

† † Calyx-lobes imbricate and usually also twisted in the bud.

× The 3 outer calyx-lobes in fruit longer than the 2 inner ones.

6. SHOREA. Corolla-lobes spreading; stamens 35—50 or more; anther-cells blunt, the connective terminating in a bristle or penicellate sharp point.

6. PENTACME. Corolla-lobes infracted at middle and forming a hemispherical closed cup leaving only an opening for the protruding anthers and style; stamens 15; anthers 4-celled, the cells bristly, diverging from the subulate-pointed connective (anthers therefore 5-setose).

× × The outer calyx-lobes in fruit much longer than the 3 inner very small ones.

7. HOPEA. Stamens 15; anther-cells entire at top, adnate to the more or less prolonged connective.

× × × All the 5 calyx-lobes in fruit equally enlarged but not longer than the fruit itself.

8. VATICA. Stamens 15. Capsules by abortion 1- rarely 2-seeded.

Ancistrocladus, Wall.

Conspectus of species.

All the 5 lobes of the fruiting calyx equally enlarged, short and coriaceous, stellately spreading, leaves chartaceous, ...*C. Griffithii.*

Lobes of fruiting calyx unequal, chartaceous, 1—1½ in. long; leaves of a thicker texture, ...*C. Wallichii.*

1. A. GRIFFITHII, Planch. in Ann. d. sc. nat. ser. 3. XIII. 318; DC. Prod. XVI. 603; Hf. Ind. Fl. I. 300.

HAB. Common in the swamp-forests and along muddy river banks of Pegu and Martaban down to Tenasserim, chiefly in the alluvial plains. Fl. Fr. Apr. May.

2. A. WALLICHII, Planch. in Ann. d. sc. Nat. 3 ser. XIII. 319; Hf. Ind. Fl. I. 300. (*A. extensus*, Wall. Cat. 1052; DC. Prodr. XVI. 602; Hf. Ind. Fl. I. 299; *A. stelligerus*, Wall. ap. DC. Prod. l. c. 603 ?; *A.* sp. Griff. Nat. Dicot. 568.)

HAB. Frequent in the tropical forests of the Pegu Yomah and Martaban down to Tenasserim and the Andamans; also Chittagong. Fl. Febr. March; Fr. Apr. May.

The wings are described as subequal but all those that I saw were very unequal, and it is possible that *A. Wallichii* of Dyer is the same as *A. Griffithii.* At least several specimens of *A. stelligerus*, Wall. Cat. belong to the latter. Wallich's specimens 1052-2 in HBC. from Silhet, in very unripe fruit only, have the wings unequal. The plants are dimorphophyllous, having elongate leaves 1 to 1½ and 2 ft. long and others hardly 6 in. long on different branches of the same stock flowering at the same time. The panicles, too, vary from robust to slenderly-branched.

Doubtful species.

1. A. ATTENUATUS, Dyer in Hf. Ind. Fl. I. 300.

HAB. Tenasserim and Andaman islands (Helf. 724.)

The specimen in HBC. is in panicle less the flowers and fruits and has the habit of *A. Griffithii;* the fruits, however, as described by Dyer, agree with those ascribed by me to *A. extensus.*

Anisoptera, Korth.

Conspectus of species.

Subg. 1. *Synaptea.* Stamens only 15—18, the connective terminated in an acute gland; style filiform; nuts only to about ⅓ of their length adnate to the calyx-tube.

Young shoots covered by a mealy or scurvy tomentum, ...*A. odorata.*

Subg. 2. *Anisoptera.* Stamens numerous, the connective produced into a bristle, style thick and ovoid; nuts inferior or nearly so.

Apparently quite glabrous, ...*A. glabra.*

1. A. ODORATA (*Sunaptea odorata*, Griff. Not. Dicot. 516. t. 685. A. f. 5; *Hopea grandiflora*, Wall. nom. nud.; DC. Prod. XVI. 634; *Synaptea grandiflora*, Kurz in Journ. As. Soc. Beng. XXXIX. 65; *Vatica grandiflora*, Dyer in Hf. Ind. Fl. I. 301).

HAB. Tenasserim, from Moulmein southwards, not unfrequent.

N. B. *Vatica faginea* Dyer in Hf. Ind. Fl. I. 301 from Mergui seems not to differ from the above as far as the description goes. *Hopea faginea* or, as it is marked in HBC, *Shorea Penangiana*, Wall. Cat. 963, is from Penang and a true *Anisoptera* with quite inferior fruit.

2. A. GLABRA, Kurz in Journ. As. Soc. Beng. 1873. 61; Hf. Ind. Fl. I. 301.

HAB. Frequent in the tropical forests of the eastern slopes of the Pegu Yomah and Martaban, E. of Tounghoo. Fr. Apr. May.

3. A. OBLONGA, Dyer in Hf. Ind. Fl. I. 301.

HAB. Tenasserim, Mergui (Griff.). Unknown to me, said to differ from the preceding in the unequally prominent nerves of the calyx-wings.

Dipterocarpus, Gærtn. f.

Conspectus of species.

* Calyx-tube in fruit more or less globular, ovoid to turbinate, without any ribs or longitudinal wings on its belly.

O Calyx-tube in fruit towards the top produced into 5 compressed knobs each situated between 2 lobes.

Leaves glabrous or puberulous beneath; stipules puberulous, ...*D. tuberculatus.*

O O Calyx-tube in fruit perfectly terete.

× Leaves glabrous and glossy.

Stipules velvety; fruiting calyx smooth and more or less pruinous,... ...*D. lævis.*

Stipules glabrous; fruiting calyx sprinkled with minute stellate hairs, .. *D. Hasseltii.*

× × Leaves beneath or on both surfaces variously hairy.

Leaves acuminate, beneath along with the petioles pubescent, ...*D. turbinatus.*

All softer parts greyish pubescent, the leaves blunt, ...*D. obtusifolius.*

Leaves acuminate, often large; petioles, young branchlets and stipules strigose from short tawny brush-like fascicled hairs, ...*D. pilosus.*

* * Calyx-tube in fruit longitudinally marked by 5 ribs or as many wings.

† Wings of fruiting calyx-tube broad (about half as broad as the belly or broader).

Calyx greyish-tomentose, when in fruit sparingly stellate-puberulous; petioles long; leaves greyish pubescent,... ... ... *D. alatus.*

Calyx pruinous, quite glabrous; petioles only 2—2½ in. long,... ...*D. Griffithii.*

† † Wings of the fruiting calyx-tube narrow or reduced to ribs.

O Leaves blunt.

All softer parts greyish-villous, ...*D. incanus.*

O O Leaves acuminate.

Branchlets tomentose, the belly of the calyx narrowly 5-winged and sparingly hairy, ...*D. costatus.*

1. D. TUBERCULATUS, Roxb. Fl. Ind. II. 614 and Icon. ined. IX. t. 82; DC. Prod. XVI. 614; Hf. Ind. Fl. I. 297.

HAB. Forming the principal constituent of the Eng and hill Eng forests all over Ava, Prome, Pegu and Martaban down to Tenasserim; also Chittagong. Fl. Apr.; Fr. May.

2. D. LÆVIS, Ham. in Wern. Soc. Trans. VI. 299; DC. Prod. XVI. 607. (*D. turbinatus*, Roxb. Corom. Pl. III. 3. t. 213 and Fl. Ind. II. 612; *D. grandiflorus*, Griff. Not. Dicot. 515.)

HAB. Frequent all over Burma from Arracan, Pegu and Martaban down to Tenasserim. Fl. Apr.; Fr. May.

3. D. Hasseltii, Bl. Fl. Jav. Dipt. 22. t. 6; DC. Prod. XVI. 609.

Hab. In the tropical forests of the Andaman Islands and Tenasserim.

Differs from the preceding solely in the glabrous stipules and not-pruinous calyx-belly.

Maingay's Malayan plant No. 199 belongs here. Dyer (in Trim. Journ. Bot. 1874. p. 102) incorrectly refers the species to *D. trinervis*.

4. D. turbinatus, Gærtn. f. Fruct. III. 51. t. 588; DC. Prod. XVI. 607 quoad diagn. Ham; Dyer. in Trim Journ. Bot. 1874. t. 143. f. 13.

Hab. Frequent in the tropical forests of the eastern slopes of the Pegu and Arracan Yomah and Martaban down to Tenasserim; also Chittagong. Fl. Apr.; Fr. May.

Fruits resemble those of *D. Hasseltii*, leaves those of *D. alatus*. Gærtner's figure is very characteristic, representing a not full-grown fruit.

5. D. obtusifolius, Teysm. in Miq. Ann. Mus. Lugd. Bat. I. 214; DC. Prod. XVI. 608; Hf. Ind. Fl. I. 895.

Hab. Common in the hill Eng forests of Martaban and in the Eng forests of the Prome District up to 1500 ft. elevation. Fl. March, Apr.; Fr. Apr. May.

6. D. pilosus, Roxb. Fl. Ind. II. 615; DC. Prod. XVI. 614; Hf. Ind. Fl. I. 296.

Hab. In the damp hill and tropical forests of the Martaban hills, E. of Tounghoo down to Tenasserim, up to 3500 ft. elevation; also Chittagong, Mascal island (Roxb.).

7. D. alatus, Roxb. Fl. Ind. II. 614; DC. Prod. XVI. 611. (*D. incanus*, Dyer in Hf. Ind. Fl. I. 298, vix Roxb.).

Hab. Frequent in the tropical forests of Pegu and Martaban down to Tenasserim; also in Arracan. Fl. Apr. May; Fr. May.

8. D. Griffithii, Miq. in Ann. Mus. Lugd. Bat. I. 213; Hf. Ind. Fl. I. 299.

Hab. In the tropical and moister upper mixed forests of the Andamans; Tenasserim, Mergui (Griff.). Fr. May.

9. D. incanus, Roxb. Fl. Ind. II. 615; DC. Prod. XVI. 614.

Hab. Chittagong. Fl. Nov. Dec.; Fr. Apr.

A very doubtful species which indeed comes very near to *D alatus* according to the description, although it is not likely that Roxburgh should have named the same species twice over.

10. D. costatus, Gærtn. Fruct. III. 50. t. 187; Dc. Prod. XVI. 610. (*D. gonopterus*, Turcz. in Bull. Soc. Mosc. 1863. I. 576?; Dc. Prod. XVI. 612?).

Hab. Frequent in the hill Eng forests of the Martaban hills and in Upper Tenasserim; up to 2000 ft. elevation. Fr. Apr.

Dyer correctly remarks that *D. costatus* in Gærtn. Fruct. is a bad representation of *D. alatus;* but it is a faithful delineation of what I formerly identified (and I still believe correctly) with *D. gonopterus*, Turcz. I have not seen *D. scaber*, Ham. which is described as clothed with fascicled brown hairs.

Doubtful species.

1. D. VESTITUS, Wall. Cat. 954; Hf. Ind. Fl. I. 295.

HAB. Tenasserim, Tavoy (Gomez).

Not seen by me but seems allied to, if not identical with, *D. turbinatus*; apparently differing by the calyx-lobes all short broadly deltoid (not 2 elongate).

2. D. SCABER, Ham. in Mem. Wern. Soc. VI. 300; Hf. Ind. Fl. I. 297.

HAB. Hills of southern Tippera (Ham).

3. D. ANGUSTIFOLIUS, WA. Prod. I. 84. (*D. costatus*, Roxb. Fl. Ind. II. 613).

HAB. Chittagong Hills.

Parashorea, Kurz.

1. P. STELLATA, Kurz in Journ. As. Soc. Beng. 1870, 66. (*Shorea stellata*, Dyer in Hf. Ind. Fl. I. 304).

HAB. Frequent in the tropical forests of Martaban; rather rare along the eastern slopes of the Pegu Yomah, up to 1500 ft. elevation. Fl. March; Fr. Apr. May.

The generic distinctions of *Parashorea* do not consist in the development of the fruit-wings but in the æstivation of the calyx and the entirely exposed nut.

Shorea, Roxb.

Conspectus of species.

* Inflorescence tomentose or velvety-pubescent.

× Leaves chartaceous, when full-grown glabrous or nearly so.

Shorter calyx-lobes in fruit acuminate; stamens c. 20—25, ...*S. obtusa.*

Shorter calyx-lobes in fruit blunt; stamens about 50, ...*S. robusta.*

× × Leaves very coriaceous, appressed silvery beneath.

Incompletely known; leaves apparently persistent, ...*S. Helferi.*

* * Inflorescence quite glabrous.

Calyx quite glabrous, ...*S. floribunda.*

1. S. OBTUSA, Wall. Cat. 966; Bl. Mus. Lugd. Bat. II. 32. t. 8; Hf. Ind. Fl. I. 306.

HAB. Common in the Eng and hill Eng forests all over Burma from Ava, Prome and Martaban down to Tenasserim, up to 2000 ft. elevation. Fl. March; Fr. Apr. May.

2. S. ROBUSTA, Gærtn. Fr. III. 48 t. 186; Roxb. Corom. Pl. III. t. 212 and Fl. Ind. II. 615; Bedd. Fl. Sylv. Madr. t. 4.; Hf. Ind. Fl. I. 306.

HAB. Said to grow in Ava.

3. S. HELFERI (*Vatica Helferi*, Dyer in Hf. Ind. Fl. I. 302).

HAB. Tenasserim, Mergui (Griff. 716/1).

Referred here on account of habit.

There is another *Shorea*, in leaf only, very much resembling *Durio Oxleyanus* from Tenasserim, Moulmein (Falc. 438), which differs from *Sh. leprosula* in having the upper side of the leaves not scabrous and generally in the different clothing and nervation.

4. SH. FLORIBUNDA, Kurz in Journ. As. Soc. Beng. 1873. 60; Hf. Ind. Fl. I. 304.

HAB. Tenasserim, Tavoy. Fl. Decb.

Pentacme, DC.

1. P. SIAMENSIS, Kurz in Journ. As. Soc. Beng. 1870, 66. (*Shorea Siamensis*, Miq. Ann. Mus. Lugd. Bat. I. 214; Hf. Ind. Fl. I. 384).

HAB. Very frequent in the Eng and dry forests more especially in Ava and the Prome ditrict, less frequent from Pegu and Martaban down to Tenasserim. Fl. March; Fr. Apr. May.

The Siamese specimens have the young leaves beneath white-tomentose, but differ in no other respect.

Hopea, Roxb.

Conspectus of species.

* Connective terminated by a short point.

Calyx greyish tomentose; leaves bluntish acuminate, ...*H. odorata.*

Leaves oblong, blunt, ...*H. scaphula.*

* * Connective terminated by a bristle longer than the anther-cells.

Calyx greyish tomentose; flowers somewhat larger, ...*H. gratissima.*

Calyx almost glabrous; flowers very small, ...*H. Griffithii.*

1. H. ODORATA, Roxb. Corom. Pl. III. t. 210 and Fl. Ind. II. 609. Hf. Ind. Fl. I. 308. (*H. vasta*, Wall. ap. DC. Prod. XVI. 633).

HAB. Common in the tropical forests all over Burma from Chittagong and Martaban down to Tenasserim. Fl. March, Apr.; Fr. May, June.

NB. *Hopea eglandulosa*, Roxb. is a *Cyclostemon* and differs from the above by the white bark as indicated by Roxburgh himself.

2. H. SCAPHULA, Roxb. Fl. Ind. II. 611; DC. Prod. XVI. 635. (*Vatica scaphula*, Dyer in Hf. Ind. Fl. I. 301).

HAB. Chittagong, on Mascal Island (Roxb.). Fl. Jan.

3. H. GRATISSIMA, Wall. Cat. 960; Kurz in Journ. As. Soc. Beng. 1873. 61. (*H. oblongifolia*, Dyer in Hf. Ind. Fl. I. 309? ; *Shorea gratissima*, Dyer l. c. 307).

HAB. Tenasserim (Griff. 714/1).

4. H. GRIFFITHII, Kurz in Journ. As. Soc. Beng., 1873, 60; Hf. Ind. Fl. I. 310.

HAB. Tenasserim, Mergui (Griff.). 717/1).

Vatica, L.

1. V. LANCEÆFOLIA, Bl. Mus. Lugd. Bat. II. 31; DC. Prod. XVI. 618; Hf. Ind. Fl. I 302. (*Vateria lanceæfolia*, Roxb. Fl. Ind. II. 601).

HAB. Chittagong (Roxb.); Burma (Griff.). Fl. May; Fr. Jul. Aug.

Doubtful species.

1. V. TRIGYNA, Griff. Not. Dicot. 514.

HAB. Tenasserim, Mergui, on the summit of the hillock Pator, at 600—800 ft. elevation (Griff.).

Griffith's description is a very complete and good one, but still I cannot guess the plant. The ovary-like style would indicate *Anisoptera*, but the ovary itself is stated to be superior and free.

MALVACEÆ.

Conspectus of genera.

A. *Carpels whorled in a single row, not united into a capsule.*

Trib. I. MALVEÆ. Staminal column bearing the filaments at the summit. Style-branches as many as cells to the ovary. Mature carpels separating more or less from the axis.

* Ovules solitary, ascending.

× Stigmas linear.

1. ALTHÆA. Bracteoles 6—9, united at base; fruit-axis not longer than the carpels.

2. MALVA. Bracteoles 3, distinct. Carpels not beaked.

× × Stigmas capitate or clavate.

3. MALVASTRUM. Bracteoles 1 to 3, distinct, or none. Carpels usually beaked.

* * Ovules suspended, solitary.

4. ANODA. Bracteoles none. Carpels broadly stellate, not beaked.

5. SIDA. Carpels converging with their points or beaked. Bracteoles none, or very rarely 1 or 2 and bristle-like.

* * * Ovules 2 or more, ascending or pendulous or both.

6. ABUTILON. Bracteoles none. Carpels 5—20, without spurious partitions.

Trib. II. URENEÆ. Staminal column truncate or 5-toothed at apex bearing the anthers or filaments on the outside. Style-branches twice as many as ovary-cells. Carpels 1-seeded.

7. URENA. Bracteoles 5, connate at base. Carpels opposite the petals, muricate or glochidiate.

8. PAVONIA. Bracteoles 5 or more, usually free, herbaceous or bristle-like. Carpels opposite the sepals, variously armed or smooth.

B. *Fruit a capsule, dehiscent or rarely indehiscent.*

Trib. III. HIBISCEÆ. Staminal column truncate or 5-toothed at summit, bearing the anthers or filaments outside or also on the summit itself. Style-branches or stigmas as many as ovary-cells.

O Style branched at the summit, the branches spreading or radiating. Seeds usually reniform.

9. Kydia. Bracteoles 4—6, enlarging in fruit. Capsule 2- or 3-valved.

10. Decaschistia. Bracteoles 10. Ovary, 10-celled, with a solitary ovule in each cell.

11. Hibiscus. Bracteoles 5 or more, free or connate, rarely tooth-like or wanting. Ovary 5-celled, with 2 or more ovules in each cell.

O O Stigmas clavate, undivided or very shortly and erect-branched. Seeds obovoid or angled.

12. Thespesia. Bracteoles 3 to 5, usually small.

13. Gossypium. Bracteoles 3, leafy, large, cordate.

Trib. IV. BOMBACEÆ. Staminal column divided at summit, or rarely to the base, into numerous filaments or 5 to 8 staminal bundles, very rarely entire nearly to the summit. Anthers free or variously cohering. Stigmas free or connate.

* Leaves digitate. Bracteoles distinct or none.

14. Bombax. Calyx truncate or irregularly 3- to 5-lobed. Capsule 5-valved, copiously woolly within. Ultimate filaments with a single anther.

15. Eriodendron. Calyx and capsule as in preceding. Filaments with 2 or 3 anthers.

* * Leaves simple, penninerved, beneath more or less lepidote. Fruits muricate.

16. Durio. Calyx bell-shaped. Petals 5. Branches of the staminal bundles bearing several linear anthers with sinuous anther-cells.

Althæa, L.

1. A. rosea, Cav. Diss. t. 29. f. 3; Roxb. Fl. Ind. III. 180; DC. Prod. I. 437; Bot. Mag. t. 3189. (A. Coromandeliana, Cav. l. c. 293; WA. Prod. I. 45; A. flexuosa, Sims Bot. Mag. t. 892; A. Sinensis, Cav. l. c. t. 29. f. 3.; DC. l. c.).

Hab. In gardens both of natives and of Europeans, more especially in the drier districts, as Prome, also Ava, Khakyen hills, Ponsee (J. Anderson). Fl. March.

Malva, L.

1. M. verticillata, L. sp. pl. 970; Hf. Ind. Fl. I. 320; Engl. Bot. t. 2953; Hook. Journ. 1847. t. 7. (*M. Neilgherrensis*, Wight Ic. t. 950).

Hab. Ava, Khakyen hills, Ponsee (J. Anderson). Fr. May.

Malvastrum, A. Gray.

*1. M. tricuspidatum, A. Gray Bot. Amer. Exp. I. 148; Hf. Ind. Fl. I. 321. (*M. ruderale*, Miq. Fl. Ind. Bat. 1/2 138).

Hab. In rubbishy places near Chittagong; also one specimen seen in Rangoon. Fl. R. S.

Sida, L.

Conspectus of species.

* Leaves from lanceolate to oblong or obovate-oblong, on short 2 to 4 lin. long petioles.

Carpels usually 5, leaves more or less green on both sides; peduncles short, not or at the very base jointed, ...*S. carpinifolia.*

Carpels usually 10, seldom fewer, leaves minutely greyish tomentose beneath; peduncles usually elongate, jointed at about their middle,... ... ...*S. rhombifolia.*

* * Leaves cordate or nearly so, on 6 to 15 lin. long, usually slender petioles.

O Carpels terminating in 2 long awns.

Erect, glabrous or nearly so, ...*S. corylifolia.*

Erect, densely tomentose, ...*S. cordifolia.*

O O Carpels blunt or shortly 2-lobed,

Erect; hairs glandular or viscid; flowers solitary or several, on short and rather thick glandular peduncles, ...*S. glutinosa.*

Spreading or almost erect, weak; hairs spreading, not glandular; flowers solitary, on long filiform jointed simply hairy peduncles, ...*S. humilis.*

1. S. CARPINIFOLIA, L. sp. pl. 963; Hf. Ind. Fl. I. 323. (*S. acuta*, Burm. Fl. Ind. 147; Roxb. Fl. Ind. III. 171; Wight Ic. t. 95; *S. lanceolata*, Roxb. l. c. 175).

HAB. Very frequent, especially in rubbishy places, in cultivated grassy lands, shrubberies, etc., all over Burmah; Andamans, introduced only. Fl. R. and C. S.

2. S. RHOMBIFOLIA, L. sp. pl. 961; Roxb. Fl. Ind. III. 176; Hf. Ind. Fl. I. 323.

Var. α. LINNEANA, Griseb. Fl. West. Ind. 74.

Var. β. CANARIENSIS, Griseb. l. c. 74. (*S. rhomboidea*, Roxb. Fl. Ind. III. 176; *S. rhombifolia var.* 3 *rhomboidea*, Mast. in Hf. Fl. Ind. I. 324 pp.)

Var. γ. RETUSA, Griseb. l. c.; Mast. l. c. (*S. retusa* L. sp. pl. 961; Roxb. Fl. Ind. III. 175).

Var. δ. ACUTA; erect, branched; leaves oblong-lanceolate, acuminate, toothed; carpels 6—7, stellate pubescent, with 4 long awns.

Var. ε. ALNIFOLIA (*S. alnifolia*, Roxb. Fl. Ind. III. 174; WA. Prod. I. 58, an etiam L?; *S. Chinensis*, Roxb. l. c.; *S. microphylla*, Roxb. l. c. 170?; *S. Philippica*, DC. Prod. I. 462).

HAB. Very frequent in leaf-shedding forests and in cultivated lands all over Burma; var. δ. *Tenasserim.* Fl. Fr. C. and R. S.

3. S. CORYLIFOLIA, Wall. Cat. 1865; Hf. Ind. Fl. I. 324.

HAB. Ava, Segain (Wall.).

4. S. CORDIFOLIA, L. sp. pl. 961; Roxb. Fl. Ind. III. 177; Hf. Ind. Fl. I. 324; (*S. decagyna*, Schum. and Thon. Dansk. Vidensk. Selsk. Afh. IV. 12; Walp. Rep. I. 315).

Hab. Not unfrequent on sandy soil chiefly, as well in the leaf-shedding forests as in shrubberies of the lower lands of Pegu and Arracan. Fl. Fr. Oct. Decb.

5. S. glutinosa, Roxb. Fl. III. 172. (*S. Mysurensis*, WA. Prod. I. 59; Hf. Ind. Fl. I. 322).

Hab. Frequent in the mixed and open forests all over Pegu and Martaban; also Tenasserim and Ava, Khakyen hills. Fl. Fr. Febr., May.

6. S. humilis, Willd. sp. pl. III. 744; Roxb. Fl. Ind. Fl. I. 322.

Hab. Frequent all over Pegu, more especially in the Prome District, in leaf-shedding forests and rubbishy places; also Ava. Fl. Fr. Oct. March.

Albutilon, Gærtn.

Conspectus of species.

* Carpels more than 10, usually about 20.

Tomentum close and dense, without spreading hairs; capsule truncate, the carpel-points very short, ... *A. Indicum.*

Tomentum dense, intermixed with long spreading hairs; capsule at the top contracted and angular, the carpels not pointed, ...*A. graveolens.*

* * Carpels fewer than 10, usually 5 or 7.

Tomentum consisting of short glandular hairs, intermixed with long simple and spreading ones,... ... ...*A. polyandrum.*

1. A. Indicum, G. Don. Gen. Syst. I. 504; Wight Ic. t. 12; Hf. Ind. Fl. 325. non Miq. Fl. Ind. Bat. (*Sida Indica* L. sp. pl. 964; Roxb. Fl. Ind. III. 179; *Sida populifolia*, Roxb. Fl. Ind. III. 179; *Sida Asiatica*, L. sp. pl. 964; Roxb. Fl. Ind. III. 179; Hf. Ind. Fl. I. 326).

Hab. Frequent along road sides, around villages, along the banks of rivers, etc., all over Prome and Pegu; also Ava. Fr. Decb. Jan.

2. A. graveolens, WA. Prod. I. 56; Hook. Comp. Bot. Mag. I. t. 2; Hf. Ind. Fl. I. 327. (*Sida graveolens*, Roxb. Fl. Ind. II. 179; Bot. Mag. t. 4134).

Hab. In uncultivated places, amongst shrubbery etc., especially around villages in Pegu. Fl. CS.; Fr. H. S.

3. A. polyandrum, Schlecht. in Link En. Hort. Berol. II. 264; Hf. Ind. Fl. I. 325. (*Sida polyandra*, Roxb. Fl. Ind. III. 173; *Sida Persica*, Burm. Fl. Ind. t. 47. f. 1; Cav. Diss. I. t. 4. f. 1).

Hab. Pegu (Brandis).

The Burmese plant differs chiefly in the more glandular pubescence and in having the carpels constantly by 7, not by 5.

Doubtful species.

1. Sidæ, sp. Griff. Not. Dicot. 523.

Hab. Tenasserim, Moulmein, in jungles and along roads.

Urena, L.

Conspectus of species.

* Capsules longer than the sepals, glochidiate and bristly tomentose, ... *U. lobata.*

* * Carpels included in the calyx, smooth or net-veined.

O Petals 1½ to nearly 2 in. long, forming a large funnel-shaped corolla.

Leaves almost rotundate, very scabrous on both surfaces; flowers forming dense leafy terminal heads, ... *U. rigida.*

Leaves underneath softly tomentose, scabrous above, the lower ones usually lobed; flowers in loose spreading terminal racemes, ... *U. speciosa.*

O O Petals about 4 lin. long, forming a rotate corolla; involucre longer than the calyx.

Flowers sessile or nearly so in the axils of the leaves, or along axillary short leafy branchlets, ... *U. repanda.*

1. U. LOBATA, L. sp. pl. 974; Roxb. Fl. Ind. III. 182; Bot. Mag. t. 3043; Griff. Not. Dicot. 522; Hf. Ind. Fl. I. 329. (*U. reticulata*, Cav. Diss. VI. 335 t. 183. f. 1.; *U. viminea*, Cav. l. c. t. 184. f. 1; *U. microcarpa*, DC. Prod. I. 441; *U. ribesia*, Sm. in Rees. Cycl. 37. No. 5; DC. l. c.; *U. Swartzii*, DC. l. c.; *U. scabriuscula*, DC. l. c.).

Var. β. SINUATA (*U. sinuata*, L. sp. pl. 974; Roxb. Fl. Ind. III. 182; Hf. Ind. Fl. I. 329).

Var. γ. LANOSA, leaves larger, usually with shorter lobes and less scabrous, sometimes almost softly tomentose; involucre and calyx rather flaccid, densely tomentose.

HAB. All three forms common, especially in uncultivated places, in shrubberies, toungyas, etc., but also in leaf-shedding forests all over Burma from Chittagong and Ava down to Tenasserim up to 3000 ft. elevation; Var. α. rarer than β. and γ. Fl. Fr. ∞.

2. U. RIGIDA, Wall. Cat. 1929; Hf. Ind. Fl. I. 330.

HAB. Not uncommon in the open, especially the low, forests of Pegu and Martaban; also Tenasserim, chiefly on stiff clay and laterite. Fl. Oct. to Jan.

3. U. SPECIOSA, Wall. Pl. As. rar. I. t. 26.

HAB. Not unfrequent in the low and mixed forests all over Pegu; also Ava. Fl. Fr. C. S.

Pavonia, Cav.

Conspectus of species.

Sect. 1. *Lebretonia.* Bracteoles 5-6. Carpels indehiscent.

Flowers yellow; carpels muricate, ...*P. glechomifolia.*

Sect. 2. *Eupavonia.* Bracteoles 10 or more. Carpels dehiscent.

Flowers pink; carpels unarmed, the margins slightly but sharply produced, *P. zeylanica.*

1. P. GLECHOMIFOLIA, A. Rich. Fl. Abyss. I. 54.; Hf. Ind. Fl. I. 330. (*Lebretonia procumbens*, Wall. Cat. 1883; Wight Ic. t. 4).

HAB. Ava. Segain. (Wall.).

2. P. ZEYLANICA, Willd. sp. pl. III. 838; Roxb. Fl. Ind. III. 214; Hf. Ind. Fl. I. 331.

HAB. Banks of the Irrawaddi in Ava, apparently not unfrequent.—Fl. Fr. Sept.—Jan.

All the Burmese specimens seen by me (including *P. rosea*, Wall. Cat. 1887, with hairy carpels) belong to the above species, none to *P. odorata*, Willd., for which Masters gives Birma as a habitat.

Kydia, Roxb.

1. K. CALYCINA, Roxb. Corom. Pl. III. t. 215 and Fl. Ind. III. 188; Wight Ic. t. 879-880: Bedd. Fl. Sylv. t. 3.; Hf. Ind. Fl. I. 348. (*K. fraterna*, Roxb. Corom. Pl. III. t. 216 and Fl. Ind. III. 189).

HAB. Not uncommon in the mixed and open forests of Pegu and Prome; also Ava. Fl. Jan.; Fr. H. S.

There really may be two different species in India, the one with smaller smooth seeds, the other with larger furrowed seeds. The indument of the Burmese plants is much more floccose, the involucre-leaflets broader; seeds, unripe, appear smooth and smaller.

Decaschistia, WA.

Conspectus of species.

Leaves beneath shortly but densely whitish tomentose; involucre much shorter than the calyx, puberulous; petals about ½ in. long, ...*D. parviflora.*

All parts thickly tomentose; involucre nearly as long as the calyx, densely tomentose; petals nearly 2 in. long, ...*D. crassiuscula.*

D. PARVIFLORA, Kurz in Journ. As. Soc. Beng. 1870. 66.

HAB. Found in the adjoining Siamese province of Kanburi, most probably occurring also in Tenasserim. Fl. Fr. Apr. May.

1. D. CRASSIUSCULA, Kurz in Journ. As. Soc. Beng. 1873. 227.

HAB. Prome District (Col. Eyre).

Masters describes but does not name another large-flowered (flowers pink, 4 in. in diameter) species from Rangoon.

Hibiscus, L.

Conspectus of species.

A. *Leaflets of involucre free, sometimes adnate to the calyx but not connate with one another, or altogether wanting.*

Subg. 1. *Solandra.* Involucre wanting. Herbs with small flowers.

Flowers white, on long slender pedicels, usually forming terminal racemes,...*H. Solandra.*

Subg. 2. *Hibiscus.* Calyx regular, not spathaceous, 5-cleft, more or less persistent, surrounded by a more or less persistent involucre, the leaflets of which are either quite free or sometimes adnate to the calyx.

* Capsule rounded, obtuse or truncate.

O Capsules truncate, winged.

Velvety-pubescent; calyx and involucre tomentose; flowers large, yellow with a dark-purple eye, ...*H. vitifolius.*

O O Capsules rounded or obtuse, not winged.

Capsules glabrous; flowers white, hardly an in. in diameter, the petals reflexed; scabrous herb, ...*H. micranthus.*

Capsules hirsute; all parts, also calyx and involucre densely scurvy tomentose; involucre-leaflets 10; flowers large, white then rose-coloured; a large shrub, ...*H. mutabilis.*

As preceding, but all parts softly tomentose; involucre and calyx densely pubescent; involucre-leaflets in Burm. spec. 7, linear (in Malayan 5, ovate-lanceolate), ...*H. venustus.*

* * Capsules acuminate or acute, not winged.

× Calycine lobes 1-3-nerved, without thickened margins.

† Leaves densely and softly tomentose.

All parts, also calyx and involucre densely tomentose; pedicels shorter than the peduncles; seeds pubescent, ...*H. panduræformis.*

† † Leaves glabrous or roughish puberulous.

△ Annual herbs. Flowers yellow with dark-purple eye.

Seeds tubercled; leaves glabrous; stem and petioles prickly, ...*H. procerus.*

Seeds smooth; all parts and more especially the calyx and involucre very tubercled-hispid, ...*H. diversifolius.*

Seeds smooth; young parts densely and shortly hispid; involucre-leaflets puberulous or almost glabrous, ...*H. lunarifolius.*

△ △ Shrubs. Flowers from purple to rose-coloured and white. Leaves glabrous, longer than the petioles.

Pedicels shorter than the petioles, ...*H. Syriacus.*

Pedicels elongate, longer than the petioles, ...*H. Rosa Sinensis.*

× × Calycine lobes with a prominent midrib and (especially when in fruit) with thickened usually indurated borders.

O Involucre-leaflets bearing on the back an oblong or linear appendage.

△ Appendage of involucre-leaflets leafy, oblong; flowers pale sulphur with crimson eye.

Flowers about 2 in. in diameter, shortly peduncled; stipules lanceolate; stems stiff-hairy and usually prickly, ...*H. furcatus.*

Flowers about an in. in diameter, on long slender peduncles; stipules large, leafy, semilunar; stems prickly, ...*H. Surrattensis.*

△ △ Appendage of involucre-leaflets linear, rarely wanting.

Flowers white or pale-sulphur with a purple eye, or purple, the calyx-lobes without a gland on the midrib, ...*H. radiatus.*

O O Involucre-leaflets entire, without any appendage.

Calyx dry, horny in fruit, the lobes prickly ciliate, with a large gland on the midrib; seeds glabrous,... ... ... *H. cannabinus.*

Calyx fleshy, red, the lobes without prickles, usually a little hairy but soon glabrescent; seeds shortly hispid, ...*H. Sabdariffa.*

Subg. 3. *Abelmoschus.* Calyx spathaceous, 5- rarely 3-toothed, deciduous, surrounded by a 5- to 20-leaved free often very deciduous involucre. Seeds glabrous.

× Involucre-leaflets short and small, deciduous already before opening of the flowers.

Flowers rather small, uniform white, ...*H. ficulneus.*

× × Involucre-leaflets narrow linear, often numerous and long; flowers large, yellow with purple eye.

O Capsules short, 5-angled

† Involucre-leaflets about 10-12.

All parts minutely scabrous; peduncles about twice as long as the capsule, slender; flowers about 1½ in. in diameter, ...*H. sagittifolius.*

All parts spreadingly setose; peduncles as long or shorter than the capsule, strong; flowers 2 to 3 in. in diameter, ...*H. Abelmoschus.*

† † Involucre-leaflets 15 to 20.

Stems hirsute; leaves lobed, tomentose and sprinkled with stiff hairs; involucre-leaflets rather persistent, ... *H. cancellatus.*

O O Capsule elongate-conical, 7-angular.

Involucre-leaflets 10; all parts slightly hairy, ...*H. esculentus.*

× × × Involucre-leaflets broad and leafy, usually large, 4 to 6; flowers yellow with purple eye. Stems setose.

O Involucre-leaflets 4.

Leaves almost glabrous; involucre-leaflets glabrous, along the borders shortly tomentose, ...*H. Manihot.*

Leaves beneath sprinkled with 3-forked short hairs; involucre-leaflets appressed pubescent and setose-ciliate, ... *H. hostilis.*

O O Involucre-leaflets 6.

Leaves hirsute; involucre-leaflets sprinkled with long stiff hairs, ...*H. pungens.*

B. *Leaflets of the involucre united up to the middle or at least at the base, sometimes forming a cup-shaped involucre.*

Subg. 4. *Paritium.* Trees, shrubs or woody climbers.

* Trees or erect shrubs. Seeds glabrous. Flowers large, yellow with purple eye.

Leaves deeply 3-lobed, ...*H. hastatus.*

Leaves not divided, entire or crenulate,... ... . *H. tiliaceus.*

* * Seeds woolly or pubescent.

† Woody climbers.

All parts velvety tomentose, leaves glabrescent above; involucre-leaflets 4-7, velvety, .. *H. scandens.*

† † Trees.

All parts tawny setose; leaves entire, tawny tomentose; involucre-leaflets 10, hirsute, ...*H. macrophyllus.*

1. H. Solandra, L'Her. Stirp. I. 103. t. 49; Roxb. Fl. Ind. III. 197; Hf. Ind. Fl. I. 336.

Hab. Ava, Taong dong and Segain (Wall.)

2. H. vitifolius, L. Mant. 569; Roxb. Fl. Ind. III. 200; Hf. Ind. Fl. I. 338. (*H. truncatus*, Roxb. Fl. Ind. III. 200).

Hab. Not uncommon along borders of fields, in shrubberies, rubbishy places round villages, etc., also in the dry forests, all over Burma from Chittagong and Ava down to Pegu. Fl. R. and C. S.; Fr. H. S.

3. H. micranthus, L. f. Suppl. 308; Hf. Ind. Fl. I. 335. (*H. rigidus*, L. f. Suppl. 310; Roxb. Fl. Ind. III. 195.)

Hab. Ava, Pagha myo (Wall.).

*4. H. MUTABILIS, L. sp. pl. 977; Roxb. Fl. Ind. III. 201: Bot. Reg. t. 589; Hf. Ind. Fl. I. 344.

HAB. Only cultivated in gardens.

5. H. VENUSTUS, Bl. Bydr. 71; Miq. Fl. Ind. Bot. I/2. 155.

Var. β. BRANDISII, involucre-leaflets constantly 7, narrow linear.

HAB. Upper Tenasserim, Doyoo Kyee Pass (Brandis). Fl. Fr. March.

6. H. PANDURIFORMIS, Burm. Fl. Ind. 151. t. 47. f. 2; Hf. Ind. Fl. 338. (*H. tubulosus*, Cav. Diss. III. 161. t. 68. f. 2; Roxb. Fl. Ind. III. 196).

HAB. Ava (Wall.); Prome, Meaday (R. Scott). Fr. Apr.

7. H. PROCERUS, Wall. Cat. 2692; Hf. Ind. Fl. I. 339.

HAB. Ava (Wall.).

8. H. DIVERSIFOLIUS, Jacq. Ic. rar. t. 551; Roxb. Fl. Ind. III. 208; Bot. Reg. t. 381; Hf. Ind. Fl. I. 339.

HAB. Ava (Wall.).

9. H. LUNARIFOLIUS, Willd. sp. pl. III. 811; Wight Ic. t. 6; Hf. Ind. Fl. I. 338. (*H. pruriens*, Roxb. Fl. Ind. III. 196; *H. racemosus*, Ldl. Bot. Reg. t. 917).

HAB. Ava, Segain and towards the Taong dong (Wall.).

*10. H. SYRIACUS, L. sp. pl. 978; Roxb. Fl. Ind. III. 195; Bot. Mag. t. 83; Hf. Ind. Fl. I. 344. (*H. Storckii*, Seem. Flor. Vit. 17. t. 4.)

HAB. Occasionally cultivated by the Karens of Martaban.

*11. H. ROSA SINENSIS, L. sp. pl. 977; Roxb. Fl. Ind. III. 194; Bot. Mag. t. 158; Bot. Reg. t. 1826; Hf. Ind. Fl. I. 344.

HAB. Much cultivated in native gardens and villages and occasionally seen in neglected lands round villages. Fl. ∞.

12. H. FURCATUS, Roxb. Fl. Ind. III. 204; Hf. I. 345. (*H. aculeatus*, Roxb. l. c. 206 teste Masters).

HAB. Ava, Irrawadi (Wall.); Arracan, frequent on the lower hills of Koladyne District. Fl. Octob.

13. H. SURRATTENSIS, L. sp pl. 979; Roxb. Fl. Ind. III. 205; Bot. Mag. t. 1356; Wight Ic. t. 197; Hf. Ind. Fl. I. 334. (*H. heterophyllus*, Griff. Not. Dicot. 520.)

HAB. Frequent all over Burma and adjacent provinces, in the leaf-shedding forests, especially the low ones; also in savannahs and deserted tounggyas, etc. Fl. Fr. C. S.

H. aculeatus, Roxb. differs chiefly by the much smaller stipules which, however, pass into those of *H. Surrattensis*.

*14. H. RADIATUS, Cav. Diss. III. 150. t. 54. f. 2; Bot. Mag. t. 1911; Roxb. Fl. Ind. III. 209; Hf. Ind. Fl. I. 335. (*H. sp. Furcaria*, Griff. Not. Dicot. 521).

Var. *a*. corolla white or pale-sulphur with a purple eye.

Var. *β*. Lindleyi (*H. Lindleyi*, Wall. Pl. As. rar. I. t. 4; Bot. Reg. t. 1395; *H. radiatus*, Bot. Mag. t. 5098 ?)

Hab. Much cultivated all over Burma from Chittagong and Ava down to Tenasserim, and often like wild in deserted toungyas. Fl. Fr. C. S.

*15. H. cannabinus, L. sp. pl. 979; Roxb. Corom. Pl. II. t. 190 and Fl. Ind. III. 208; Hf. Ind. Fl. I. 339.

Hab. Cultivated in toungyas of Pegu and Martaban, and often as wild in deserted ones.

16. H. Sabdariffa, L. sp. pl. 978; Hf. Ind. Fl. I. 340.

Hab. Much cultivated all over Burma from Chittagong and Ava down to Pegu, sometimes as wild in deserted toungyas. Fl. Fr. C. S.

*17. H. ficulneus, L. sp. pl. 978; Hf. Ind. Fl. I. 340. (*H. prostratus*, Roxb. Fl. Ind. III. 208; *Abelmoschus ficulneus*, WA. Prod. I. 53; Wight Ic. t. 154; *H. strictus*, Roxb. l. c. 206).

Hab. Rarely cultivated in native gardens of Pegu.

18. H. sagittifolius, Kurz in Journ. As. Soc. Beng., 1871, 46. (*H. Abelmoschus*, var. *a. multiformis*, Mast. in Hf. Ind. Fl. I. 342; *H. hastatus*, Cav. Diss. III. 144. t. 50 f. 1 ? non Linn. f.).

Hab. Ava, Meaong (Wall.); Pegu (Brandis). Fl. Sept.

19. H. Abelmoschus, L. sp. pl. 980; Roxb. Fl. Ind. III. 202; Griff. Not. Dicot. 541 ?; Hf. Ind. Fl. I. 342. (*Abelmoschus moschatus*, Moench; Wight Ic. t. 399; *Abelmoschus pseudo-Abelmoschus*, Walp. Rep. I. 308).

Hab. Not unfrequent in the mixed, especially the upper-mixed, forests of Arracan and Pegu; also Tenasserim, Moulmein; Ava, Segain. Fl. Fr. Nov.—Jan.

20. H. cancellatus, L. f. Suppl. 311; Roxb. Fl. Ind. III. 201; Hf. Ind. Fl. I. 342. (*Abelmoschus crinitus*, Wall. Pl. As. rar. I. 39. t. 44).

Hab. Not unfrequent in the dry forests of Prome and Ava; also in the low forests of the Irrawadi zone, Pegu. Fr. January.

Only the form figured by Wallich occurs in Burma, the other with overlapping leaf-bases, more obtuse lobes, and different tomentum seems to be restricted to Hindustan.

*21. H. esculentus, L. sp. pl. 980; Cav. Diss. III. t. 61. f. 2; Hf. Ind. Fl. I. 343. (*Hibiscus longifolius*, Wild. sp. pl. III. 827; Roxb. Fl. Ind. III. 210).

Hab. Cultivated in Burma (accord. Revd. F. Mason).

*22. H. Manihot, L. sp. pl. 980; Bot. Mag. t. 1702 and t. 3152; Hf. Ind. Fl. I. 341. (*H. pentaphyllus*, Roxb. Fl. Ind. III. 212; *Abelmoschus Manihot*, Walp. Rep. I. 311).

HAB. Rarely cultivated by natives in Pegu.

23. H. HOSTILIS, Wall. ap. Mast. in Hf. Ind. Fl. I. 342.

HAB. Not uncommon in the upper mixed forests of the Pegu Yomah; also Ava (Wall.) Fl. Fr. C. S.

24. H. PUNGENS, Roxb. Fl. Ind. III. 213; Hf. Ind. Fl. I. 341.

HAB. Upper mixed forests of the northern parts of the Pegu Yomah at about 1200 to 2000 ft. elevation. Fr. C. S.

*25. H. HASTATUS, L. f. Suppl. 310 (non Cav.) (*H. tricuspis*, Cav. Diss. III. 152. t. 55. f. 2; Roxb. Fl. Ind. III. 202; Hf. Ind. Fl. I. 344).

HAB. Rarely cultivated in gardens. Fl. R. S.

26. H. TILIACEUS, L. sp pl. 976; Roxb. Fl. Ind. III. 192; Hf. Ind. Fl. I. 343. (*Paritium tiliaceum*, A. Juss. in St. Hil. Fl. Bras. I. 198; Wight Ic. t. 7; Griff. Not. Dicot. 523.)

Var. β. TORTUOSUS, Mast. in Hf. l. c. (*H. tortuosus*, Roxb. Fl. Ind. III. 192; Bot. Reg. t. 232).

HAB. Common in the beach and tidal forests all along the shores from Chittagong down to Tenasserim and the Andamans, ascending the rivers as far as the tidal waves. Fl. Fr. ∞.

27. H. MACROPHYLLUS, Roxb. Hort. Beng. 1814. 51; Wall. Pl. As. rar. I. 44. t. 51; Hf. Ind. Fl. I. 337. (*H. vulpinus*, Rwdt. Cat. Buitenz. 88; Miq. Fl. Ind. Bat. I/2. 157; *H. spathaceus*, Bl. Bydr. 72; *H. setosus*, Roxb. Fl. Ind. III. 193.)

HAB. Frequent in the tropical forests all over Burma from Chittagong and Martaban down to Tenasserim. Fl. Fr. R. S.

If the principle of the priority of the name first accompanied by a description be adhered to, Blume's name will have to be adopted. Unlike Wallich, Roxburgh described and figured the plants that he named, and unfortunate circumstances beyond his control and finally death prevented their publication: hence I consider that his *Hortus Benghalensis* claims priority.

28. H. SCANDENS, Roxb. Fl. Ind. III. 200; Hf. Ind. Fl. I. 337.

HAB. Frequent in the tropical forests of Martaban. Fl. Fr. March, Apr.

Thespesia, Corr.

Conspectus of species.

All younger parts and unripe capsules covered with rusty coloured scales; leaves glabrous; a tree, ...*T. populnea.*

All younger parts and usually the leaves beneath shortly stellate tomentose; unripe capsules densely hirsute, a meagre shrub, ...*T. Lampas.*

1. TH. POPULNEA, Corr. Ann. Mus. IX. 290; Wight Ic. t. 8; Hf. Ind. Fl. I. 345; Bedd. Fl. Sylv. t. 63. (*Hibiscus populneus*, Roxb. Fl.

Ind. III. 190; *Hibiscus populneoides*, Roxb. l. c. 191; *Thesp. macrophylla*, Bl. Bydr. 73; Miq. Fl. Ind. I/2. 151).

HAB. Common in the beach and tidal forests all along the shore from Chittagong down to Tenasserim and the Andamans; Ava, Bhamo and Sabado (J. Anderson). Fl. Sept. Fr. March, May.

The occurrence of this saltloving tree in Ava is unique and requires explanation. Brine springs are numerous in Prome and Ava, and may possibly account for such an exceptional re-appearance of a sea-shore plant in the interior of Burma.

2. TH. LAMPAS, Dalz. in Dalz. and Gibs. Bombay Fl. 19; Hf. Ind. Fl. I. 345. (*Hibiscus Lampas*, Cav. Diss. III. 154. t. 56. f. 2; Roxb. Fl. Ind. III. 197; Wight Ic. t. 5; *H. tetralocularis*, Roxb. l. c. 198?; *Azanza Zollingeri*, Alef. in Bot. Zeit. 1861. 298).

HAB. Frequent in all leaf-shedding forests, especially the mixed ones, also in savannahs; all over Burma. Fl. Fr. C. & H. S.

Gossypium, L.

Conspectus of species.

Annual; seeds free, clothed with firmly adhering silky down,... ... *G. herbaceum.*
Shrubby; perennial; seeds black, free or cohering, devoid of adhering pubescence, .. *G. Barbadense.*

*1. G. HERBACEUM, L. sp. pl. 975; Roxb. Fl. Ind. III. 184; Royle Ill. Him. Pl. 98. t. 23. f. 1; Wight Ic. t. 10; Hf. Ind. Fl. I. 346.

Var. α. HERBACEUM, (*G. herbaceum*, L. l. c.; *G. hirsutum*, Roxb. Fl. Ind. III. 187; *G. Barbadense*, Wight Ill. t. 28/c.) lobes of leaves acuminate. Var. β. *hirsutum*. Mast. in Hf. l c. (*G. hirsutum*, L. sp. pl. 975; DC. Prod. I. 456; *G. obtusifolium*, Roxb. Fl. Ind. III. 183; *G. herbaceum*, Wight Ic. t. 9.), leaves with usually blunt lobes, the upper ones often undivided, with or without a gland on the midrib beneath; involucre-leaflets entire or serrate; capsules when ripe green; cotton white.

HAB. Var. α. and β. much cultivated all over Burma, and often seen as wild in deserted toungyas and neglected lands. Fl. Fr. C. and H. S.

*2. G. BARBADENSE, L. sp. pl. 975; Roxb. Fl. Ind. III. 187; Hf. Ind. Fl. I. 347. p. p.

HAB. Rarely seen in gardens in Pegu.

Bombax, L.

Conspectus of species.

Leaflets on a 10 to 12 lin. long petiolule; staminal bundles consisting of 15 to 20 strong and thick filaments, ...*B. Malabaricum.*
Leaflets decurrent on the short 2 to 3 lin. long petiolule; staminal bundles consisting of 50 or more long filiform filaments, ...*B. insigne.*

1. B. MALABARICUM, DC. Prod. I. 479; Bedd. Fl. Sylv. Madr. t. 82; Hf. Ind. Fl. I. 249. (*Salmalia Malabarica*, Schott. Melet. 35; *B. heptaphylla*, Cav. Diss. V. 296; Roxb. Corom. Pl. III. t. 247 and Fl. Ind. III. 167; Wight Ill. t. 29. *a. b.*).

HAB. Frequent in all leaf-shedding forests, especially the mixed ones, all over Burma from Chittagong and Ava down to Tenasserim. Fl. H. S. Fr. C. S.

2. B. INSIGNE, Wall. Pl. As. rar. I. 71. t. 79 and 80; Hf. Ind. Fl. I. 349.

HAB. Frequent in the upper mixed forests of the Pegu Yomah and the Andamans; also Ava. Fl. H. S. Fr. C. S.

Eriodendron, DC.

1. E. PENTANDRUM (*Bombax pentandrum*, L. sp. pl. 989; Cav. Diss. V. 293. t. 151; Roxb. Fl. Ind. III. 165; *E. anfractuosum*, DC. Prod. I. 479; Wight Ic. t. 400; Griff. Not. Dicot. 533; Hf. Ind. Fl. I. 350).

HAB. Rare (one tree only seen) in the coast forests of South Andaman; here and there cultivated in Pegu and Tenasserim.

One of those trees that are stated to be very frequent in the Indian jungles, but I myself have never succeeded in seeing it in a truly wild state, although the loftiness of the tree and the decussate ternation of its branches would render it recognizable from a long distance.

Durio, L.

1. D. ZIBETHINUS, L. sp. pl. 698; Kœn. in Trans. Linn. Soc. VII. 266; t. 14—16; Roxb. Fl. Ind. III, 399; Griff. Not. Dicot. 528. t. 596; Hf. Ind. Fl I. 351.

HAB. Tenasserim. Fr. May, June.

Helfer writes in his second report on the resources of Tenasserim: "This tree does not grow so far north as Moulmein, some few trees excepted which are grown as a rarity on the island of Beloo. Its sphere begins at Tavoy; large plantations occur to the E. of Mount Burney, and very fine specimens in the valley of Taunbiaun. Lower down on the Tenasserim, the tree begins to grow almost spontaneously, and in lat. 14° it forms large forests."

The Burmese specimens in Dr. Brandis' herbarium, although destitute of corolla, do not differ from the Malayan durian, and the calyx is the same in size as well as in shape.

STERCULIACEÆ.

Conspectus of species.

Trib. I. STERCULIEÆ. Flowers unisexual or polygamous. Petals none, Anthers 5-15, sessile, surrounding the stalked ovary or in males the top of a shorter or longer column, or shortly polyadelphous. Mature carpels distinct, sessile or stalked.

* Anthers irregularly clustered, numerous. Fruit dehiscent.

1. STERCULIA. Ovules 2 or more in each cell. Carpels follicular.

* * Anthers 5, in a ring. Carpels indehiscent.

2. HERITIERA. Ovules solitary. Carpels often of a firm texture.

Trib. II. HELICTEREÆ. Flowers hermaphrodite. Petals deciduous. Anthers 5-15, sessile or on short filaments, situated on the margin of the cup-like dilated summit of the column and usually alternating with staminods.

3. HELICTERES. Anther-cells divaricate or confluent into one. Fruit a capsule, sometimes twisted. Seeds not winged.

4. PTEROSPERMUM. Anther-cells parallel. Capsule woody, terete or 5-angular. Seeds winged.

Trib. III. ERIOLÆNEÆ. Flowers hermaphrodite. Petals deciduous. Anthers numerous on the outside of the tubular or conical column from the middle to the top. Staminods none.

5. ERIOLÆNA. Capsules woody, 5-valved.

Trib. IV. DOMBEYEÆ. Flowers hermaphrodite. Petals usually persistent, flat. Anthers 10 to 20, rarely 5, united into a short cup at or near the top of the column, the cells parallel. Staminods 5 or none.

× Anthers 15, rarely 10.

6. PENTAPETES. Bracteoles caducous. Sepals herbaceous. Ovary-cells with several ovules. Style simple.

× × Anthers 5.

7. MELHANIA. Bracteoles 3, persistent. Stamens united into a cup, with 5 intervening elongate staminods.

Trib. V. HERMANNIEÆ. Flowers hermaphrodite. Petals marcescent, flat. Stamens 5, shortly united or rarely tubular at base only. Staminods usually none.

× Ovary 5-celled.

8. MELOCHIA. Capsules almost globular. Seeds wingless. Herbs or undershrubs.

9. VISENIA. Capsules deeply 5-lobed. Seeds winged at their extremities. Trees.

× × Ovary 1-celled

10. WALTHERIA. Calyx campanulate. Staminods none.

Trib. VI. BUETTNERIEÆ. Flowers hermaphrodite. Petals concave at base, usually appendaged at top. Anthers 5-15, rarely numerous, introrse, the filaments united into a shorter or longer tube, solitary or in groups alternating with the staminods.

O Anthers by 2-4 alternating with a staminod.

11. ABROMA. Petals with a clawed ovate blade. Capsule 5-winged.

12. GUAZUMA. Petals clawed, with a linear 2-cleft blade. Fruit globular, woody tubercled.

13. LEPTONYCHIA. Petals concave, not clawed. Filaments long, only at base connate, alternating by 2 with the short staminods, at the back augmented by a series of subulate staminods.

O O Anthers singly alternating with the staminods.

14. BUETTNERIA. Petals cucculate at the clawed base. Staminods short and blunt. Capsules woody, variously armed.

Sterculia, L.

Conspectus of species.

Subg. 1. *Sterculia.* Seeds without wings, 2 or more along the suture of the coriaceous carpels, never inserted at the base.

* Leaves digitate.

Leaves glabrous; calyx rather large, the lobes spreading, ...*St. fœtida.*

Leaves canescent tomentose beneath; calyx small, the lobes conniving, short, ...*St. versicolor.*

* * Leaves palmately lobed or cut. Leaf-shedding trees.

Carpels densely covered with stiff fragile hairs; flowers small, ...*St. urens.*

Carpels shortly tomentose from stellate hairs, ...*St. villosa.*

Carpels densely covered with stiff short hairs, glabrescent; flowers nearly ¾in. in diameter, ...*St. ornata.*

* * * Leaves all entire. Small evergreen trees or meagre shrubs.

O Leaves quite glabrous.

× Calyx-lobes not spreading, almost erect or more usually conniving with their tips.

Calyx shortly tubular, striate, the lobes of the length of the tube, ...*St. longifolia.*

× × Calyx almost rotate.

Calyx lobes from a broader base linear, very long and somewhat twisted, ..*St. coccinea.*

O O Leaves more or less tomentose or puberulous, at least beneath.

× Flowers more than ½ in. long, in simple brown tomentose racemes.

Leaves beneath and petioles softly rusty pubescent, ...*St. rubiginosa.*

× × Flowers in panicles.

Leaves tomentose; calyx-lobes free and spreading; flowers long-pedicelled, ...*St. angustifolia.*

Leaves beneath minutely stellate-puberulous; calyx-lobes short and connivent; flowers shortly pedicelled, ...*St parviflora.*

Subg. 2. *Firmiana.* Calyx tubular. Seeds without wings. Carpels chartaceous and expanded leaflike, bearing 1 or 2 seeds along the marginal sutures at about ½ of their length.

Leaves more or less lobed, occasionally almost entire, glabrous or puberulous beneath; calyx about 8-9 lin. long, ...*St. colorata.*

Leaves very large, much lobed, pubescent beneath; calyx about 1 to 1½ in. long, ...*St. fulgens.*

Subg. 3. *Scaphium.* (incl. *Pterocymbium* and *Carpophyllium*). Calyx more or less campanulate. Seeds without wings, solitary, laterally adnate to the base of the boat-shaped chartaceous or membranous follicles.

* Follicles produced below at about the middle into an additional bluntish sac-like lobe.

Leaves more or less tomentose or puberulous beneath; calyx campanulate, green, ...*St. campanulata.*

* * Follicles not produced into an additional lobe.

Leaves coriaceous, glabrous, glossy; calyx almost rotate, yellowish, ...*St. scaphigera.*

Subg. 4. *Pterygota.* Seeds numerous, winged along their upper end, enclosed in a woody large follicle.

Leaves entire, glabrous, 5-nerved at base; follicles as large as the fist, ... *St. alata.*

1. St. fœtida, L. sp. pl. 1431; Roxb. Fl. Ind. III. 154; Wight Ic. t. 181 and 364; Hf. Ind. Fl. I. 354.

Hab. Not unfrequent in the upper mixed forests of the Pegu Yomah. Fl. Apr. May; Fr. Febr. March.

2. St. versicolor, Wall. Pl. As. rar. I. 48. t. 59; Hf. Ind. Fl. I. 355.

Hab. Ava, on limestone hills on the right side of the Irrawaddi near Segain (Wall.) Fl. Octob.

3. St. urens, Roxb. Corom. Pl. I. t. 24 and Fl. Ind. III. 145; Hf Ind. Fl. I. 355.

Hab. Not unfrequent in the drier upper mixed forests of the Pegu Yomah and Martaban; and in the mixed dry forests of Prome; also Tenasserim. Fr. March.

4. St. villosa, Roxb. Fl. Ind. III. 153; Hf. Ind. Fl. I. 355.

Hab. Frequent in the upper mixed forests of the Pegu Yomah and Martaban; Tenasserim; Andamans. Fl. H. S.; Fr. Begin of R. S.

5. St. ornata, Wall. ap. Voigt Hort. Calc. 105; Kurz in Journ. As. Soc. Beng. 1873. 228.

Hab. Not unfrequent in the tropical forests of the Pegu Yomah and Martaban down to Tenasserim. Fl. Febr.; Fr. March, Apr.

6. St. longifolia, Vent. Malm. II. No. 91. in adnot.; DC. Prod. I. 482; Miq. Fl. Ind. Bat I/2. 173. (*St striatiflora*, Mast. in Hf. Ind. Fl. I. 356).

Hab. Birma (Griff. 586); probably Tenasserim.

7. St. coccinea, Roxb. Fl. Ind. III. 151; and Hook. Bot. Misc. I. 286; Hf. Ind. Fl. I. 357.

Hab. Frequent in the tropical forests of the Pegu Yomah and Martaban down to Tenasserim. Fl. March; Fr. Apr.

Masters refers my Pegu specimens to a species which he calls *St. lævis*, Wall., but my plant is certainly Roxburgh's.

8. St. rubiginosa, Vent. Hort. Malm. II. 91 in adn.; Hf. Ind. Fl. I. 358.

Hab. Birma (teste Masters).

9. St. angustifolia, Roxb. Fl. Ind. III. 148; DC. Prod. I. 482; Walp. Rep. V. 100.

Var. α. angustifolia, leaves on petioles 8 to 10 lin. long, lanceolate or broadly lanceolate, acuminate.

Var. β. mollis (*St. mollis*, Wall. Cat 1131; Walp. Rep. V. 101), leaves obovate oblong, on petioles 4 to 5 lin. long, shortly acuminate, rounded at the narrowed base; tomentum almost velvety; pedicels much shorter.

Hab. Both varieties in Tenasserim (Wall. Falc. Helf.) Fl. Febr.; Fr. Apr.

10. St. parviflora, Roxb. Fl. Ind. III. 147; Hf. Ind. Fl. I. 359.

Hab. Andamans, in the coast-forests. Fr. Apr. May.

My specimens being in fruit only the identification is somewhat doubtful, but they agree otherwise with Malacca specimens. Masters mentions *St. guttata*, Roxb. as growing on the Andamans.

11. St. colorata, Roxb. Corom. Pl. I. t. 23 and Fl. Ind. III. 146; Hook. Ic. pl. t. 143; Hf. Ind. Fl. I. 359.

Hab. Frequent in all leaf-shedding forests all over Burma from Chittagong and Ava down to Tenasserim and the Andamans. Fl. H. S.; Fr. H. and begin of R. S.

12. St. fulgens, Wall. Cat. 1135 (*Firmiana colorata, β. fulgens*, R. Br. and Benn. in Horsf. Pl. Jav. rar. 235; Walp. Rep. V. 104).

Hab. Ava, Taong dong; Tenasserim, Moulmein (Wall.)

I know not what Masters describes under the above name, unless it be the N. W. Indian *St. pallens*, Wall. ap. Voigt Cat. H. Bot. Calc. 105, a totally different tree with pale yellowish softly tomentose smaller and more campanulate flowers and different leaves.

13. St. campanulata, Wall. ap. Voigt. Hort. Calc. 105; Kurz in Flora 1872. 495.; Hf. Ind. Fl. I. 362. (*Pterocymbinm Javanicum*, R. Br. in Horsf. Pl. Jav. rar. 219. t. 45; Miq. Fl. Ind. Bat. I/2. 179).

Hab. Frequent in the tropical forests along the eastern slopes of the Pegu Yomah and Martaban. Fl. March; Fr. Apr.

14. St. scaphigera, Wall. Cat. 1130; Hf. Ind. Fl. I. 361. (*Scaphium Wallichii*, Schott and Endl. Melet. 33; Walp. Rep. V. 104; *Carpophyllium macropodum*, Miq. Suppl. Fl. Sumatr. 401).

Hab. Frequent in the tropical forests along the eastern and central slopes of the Pegu Yomah and Martaban; also Tenasserim. Fl. Febr. March; Fr. March, Apr.

15. St. alata, Roxb. Corom. Pl. III. 84. t. 287 and Fl. Ind. III. 182; Hf. Ind. Fl. I. 360. (*St. Heynii*, Bedd. Fl. Sylv. t. 230).

Hab. Frequent in the tropical forests all over Chittagong, Pegu and Martaban down to Tenasserim; also on the Andamans. Fl. Febr. March, Fr. Apr. May.

Doubtful species.

1. St. linguifolia, Mast. in Hf. Ind. Fl. I. 357.

Hab. Tenasserim, Tavoy (Parish).

2. St. ensifolia, Mast. in Hf. Ind. Fl. I. 359.

Hab. Tenasserim, Mergui (Griff.)

Heritiera, Ait.

Conspectus of species.

* Carpels glossy or at least smooth, brown; leaves shortly petioled.

Leaves usually cordate or rounded at base; carpels strong-crustaceous, obliquely ovoid with a sharp keel pointed at the summit, ...*H. Tothila.*

Leaves usually narrowed at base; carpels fibrous-woody under the thin bladdery epicarp, obliquely and broadly depressed, the keel at the summit broad and almost wing-like, ... *H. minor.*

* * Carpels sea-green or grey, rough and corky-tubercled; leaves long petioled.

Carpels obliquely ovoid, keel indistinct, at the extremity produced into a thick narrow wing-like appendage, ... *H. macrophylla.*

1. H. Tothila, (*H. littoralis*, Dry. in Ait. Hort. Kew. III. 546; Roxb. Fl. Ind. III. 142; DC. Prod. I. 63; *Balanopteris Tothila*, Gærtn. Fr. II. t. 99; Rheede Hort. Mal. VI. t. 21).

Hab. Frequent in the tidal forests all along the sea-shore from Chittagong down to Tenasserim and the Andamans. Fl. Apr. May; Fr. May.

2. H. minor, Lamk. Dict. III. 229; DC. Prod. I. 484; Roxb. Fl. Ind. III. 142. (*H. fomes*, Buch. in Sym. Ava Emb. 1800. t. 28; Hf. Ind. Fl. I. 363; *Balanopteris minor*, Gærtn. Fr. II. 1791. t. 98. f. 2; *H. littoralis*, Griff. Not. Dicot. 532. t. 585. f. 3).

Hab. Frequent in the tidal forests all along the Burmese shores from Chittagong down to Tenasserim, ascending the rivers as far as the tidal waves. Fl. Febr. Jun.; Fr. R. S.

3. H. macrophylla, Wall. ap. Voigt Hort. Calc. 103; Kurz in Journ. As. Soc. Beng. 1873. 61. and in Trim. Journ. Bot. 1874. 66. fig. 7.

Hab. Upper Tenasserim, at the foot of a hill a mile above Trogla (Wall. Cat. 1162).

Helicteres, L.

Conspectus of species.

Sect. 1. *Spirocarpæa.* (*Isora*, Schott and Endl.). Carpels spirally twisted; leaves unequally serrate.

Calyx about ½ in. long or longer, ...*H. Isora.*

Sect. 2. *Orthocarpæa.* (*Oudemansia*, Miq.). Carpels straight or nearly so.

* Calyx about ½ in. long or longer. Leaves unequally serrate or toothed.

Calyx laxly stellate-woolly and viscid, ...*H. viscida.*

Calyx shortly scurvy tomentose, ...*H. hirsuta.*

* * Calyx only 2 or 3 lin. long.

O Carpels firmly cohering forming a densely villous-echinate apiculate or obtuse capsule. Leaves entire or obtusely serrate, shortly whitish-tomentose beneath.

Stems tawny tomentose; leaves sprinkled above with stellate hairs, blunt or acute, ...*H. obtusa.*

Stems glabrescent; leaves glabrous above, acuminate, ...*H. lanceolata.*

O O Carpels loosely cohering, with the points all free, shortly hairy echinate. Leaves never whitish pubescent beneath, serrate.

Flowers in short axillary racemes, ...*H. plebeja.*

Flowers in elongated slender racemes usually much longer than the pubescent leaves, ... *H. elongata.*

1. H. ISORA, L. sp. pl. 1366; Roxb. Fl. Ind. III. 143; Wight Ic. t. 180; Bot. Mag. t. 2061; Hf. Ind. Fl. I. 365.

HAB. Burmah (accord. Revd. Dr. F. Mason.)

2. H. VISCIDA, Bl. Bydr. 79; Walp. Rep. I. 334. (*Oudemansia viscida*, Miq. Fl. Ind. Bat. I/2. 171; *H. spicata*, var. *lanigera*, Mast. in Hf. Ind. Fl. I. 366).

HAB. Ava, Taong dong (Wall.)

3. H. HIRSUTA, (Lour. Fl. Coch. II. 648 ?); Bl. Bydr, 80. (*Oudemansia hirsuta*, Miq. Fl. Ind. Bat. I/2. 171; *H. spicata*, Colebr. in Roxb. Hort. Beng. 97; G. Don. Gen. Syst. I. 507; Walp. Rep. I. 332; *H. oblonga*, Wall. ap. G. Don. l. c. Walp. Rep. I. 332 and II. 794 and Ann. IV. 320).

Var. *α*. SPICATA, (*H. spicata*. Coleb. l. c.).

Var. *β*. OBLONGA, (*H. oblonga*, Wall. l. c.; *H. vestita*, Wall. Cat. 1844).

HAB. Var. *β*. Tenasserim, from Moulmein to Tavoy. Fl. March.

4. H. OBTUSA, Wall. Cat. 1184; Kurz in Journ. As. Soc. Beng. 1873. 62; Hf. Ind. Fl I. 366.

HAB. Tenasserim, from Moulmein to Mergui; Pegu (Macl. teste Mast.); Andamans (V. Ball.) Fl. June; Fr. Jan. to Apr.

This is evidently a near ally to *H. virgata*, Wall. which some authors incorrectly combine with *H. Javensis*, Hassk. (= *Oudemansia integerrima*, Miq, and *H. lanceolata*, DC.). The Chinese *H. angustifolia*, L. (*H. virgata*, Wall.) differs greatly by the small stellate-velvety-tomentose capsules. Also the shape and nervature of the leaves and the indumentum of the flowers appear to me different. Masters gives Mergui as a habitat for it, but he evidently has two or three species in view.

5. H. PLEBEJA, Kurz in Journ. As. Soc. Beng. 1870. 67; Hf. Ind. Fl. I. 366. (*H. glabriuscula*, Wall. Cat. 1185, nomen nudum; Hf. Ind. Fl. I. 366).

HAB. Frequent in the mixed, especially the upper mixed, forests of Arracan, Pegu and Martaban, up to 3000 ft. elevation; also Ava. Fl. Oct. Sept.; Fr. Jan. Febr.

The species is also frequent in the Sikkim Terai.

6. H. ELONGATA, Wall. Cat. 1845; Hf. Ind. Fl. I. 365.

HAB. Ava, Taong-dong etc.

Hardly more than an elongate-racemed variety of the preceding.

Pterospermum, Schreb.

Conspectus of species.

* Capsules distinctly 5-cornered. Leaves large and broad.

O Stipules and bracteoles pinnatifid.

Calyx lobes 3-4 in. long; style towards the base villous, ...*P. acerifolium*.

O O Stipules...; bracteoles entire.

Calyx-lobes 1½-2 in. long; style glabrous, ...*P. aceroides.*

* * Capsules terete or nearly so.

O Leaves semi-sagittate at base; stipules pinnatifid.

Flowers 3 in. long or longer; bracteoles large, divided into several many-cleft and jaggy lobes, forming an involucre, ...*P. semisagittatum.*

O O Leaves never semi-sagittate, usually small, entire or shortly lobed; stipules small, entire or 2-3-cleft; flowers not above 2 in. long.

† Pedicels much longer than the petioles.

Leaves usually greyish or whitish tomentose beneath, acuminate; stipules and bracteoles 2-3- rarely 5-cleft. Capsules greyish or whitish velvety, ...*P. lanceæfolium.*

† † Pedicels short, about the length of the petioles or rarely a little longer.

Leaves entire, acuminate, beneath rusty coloured (rarely greyish) tomentose; stipules and bracteoles linear-subulate, with a cucullate basal appendage; capsules brown scurvy-tomentose, glabrescent, ...*P. cinnamomeum.*

Leaves usually small; stipules and bracteoles entire, lanceolate, ...*P. Blumeanum.*

1. P. ACERIFOLIUM, Willd. sp. pl. III. 729; Roxb. Fl. Ind. III. 158; Bot. Mag. t. 620; Wight Ic. t. 631; Hf. Ind. Fl. I. 368. p. p.

HAB. Frequent in the tropical and moister upper mixed forests along choungs all over Burma from Chittagong and Ava down to Tenasserim and the Andamans. Fl. H. S.; Fr. C. S.

2. P. ACEROIDES, Wall. Cat. 1171; Kurz in Journ. As. Soc. Beng. 1873. 62.

HAB. Tenasserim, and Andamans, in tropical forests. Fl. H. S.

Pt. diversifolium, Bl. appears to be an intermediate form between *Pt. acerifolium* and *Pt. aceroides,* having the flowers and styles of the former but smaller, and the bracteoles of the latter.

3. PT. SEMISAGITTATUM, Roxb. Hort. Beng. 50 and Fl. Ind. III. 160; Hf. Ind. Fl. I. 368.

HAB. Frequent in the mixed and dry forests all over Burmah from Chittagong and Ava down to Tenasserim. Fl. H. S.; Fr. C. S.

4. PT. LANCEÆFOLIUM, Roxb. Fl. Ind. III. 163; Hf. Ind. Fl. I. 368.

HAB. Chittagong; Tenasserim, Tavoy (Wall. teste Mast.)

5. P. CINNAMOMEUM, nov. sp.

HAB. Not unfrequent in the tropical forests of Martaban; also Tenasserim. Fr. March.

I attempted to identify the above species with *Pt. fuscum,* Korth. when I had only fruits, but Khasya flowering specimens shew its complete distinctness. Some Khasya specimens in leaf distributed from Kew under the name *Pt. lanceæfolium* belong here. It is nearest to *P. rubiginosum.*

6. PT. BLUMEANUM, Korth. Ned. Kruidk. Arch. I. 311; Miq. Fl. Ind. Bat. I/2. 191.

HAB. Tenasserim (Helf. 569).

Eriolæna, DC.

1. E. Candollei, Wall. Pl. As. rar. I. 51. t. 64; Hf. Ind. Fl. I. 370.

Hab. Not unfrequent in the dry and low, rarely in the mixed, forests of Prome and Ava down to Martaban and Pegu. Fl. H. S.; Fr. C. S.

Pentapetes, L.

1. P. phœnicea, L. sp. pl. 958; Roxb. Fl. Ind. III. 157; Bot. Reg. t. 525; Hf. Ind. Fl. I. 371. (*Eriorhaphe punicea,* Miq. Pl. Jungh. I. 289).

Hab. In cultivated plains, along rice-fields, etc., in Pegu, Ava and Prome. Fl. R. S.

Melhania, Forsk.

1. M. Hamiltoniana, Wall. Pl. As. rar. I. 69. t. 77; Walp. Rep. I. 349; Hf. Ind. Fl. I. 372.

Hab. Ava, frequent along the sandy dry banks of the Irrawaddi; also Taong-dong (Wall.). Fl. Sept. Oct.; Fr. Nov.

Melochia, L.

1. M. corchorifolia, L. sp. pl. 944; Roxb. Fl. Ind. III. 139; Hf. Ind. Fl. I. 374.

Hab. Common as well in cultivated lands, waste places around villages, long-grassed pastures, etc., as in the leaf-shedding forests, all over Burma and adjacent provinces. Fl. Fr. Sept. to Octob.

Visenia, Houtt.

1. V. Indica, Houtt. Syst. Linn. VI. 287. t. 46; Miq. Fl. Ind. Bat. I/2. 189. (*V. umbellata,* Bl. Bydr. 88; Wight Ic. t. 509; *Riedleia velutina,* DC. Prod. I. 491; *Melochia velutina,* Bedd. Fl. Sylv. t. 5; Hf. Ind. Fl. I. 374).

Hab. Rather rare in the tropical forests of Pegu, Martaban and Tenasserim (Brandis). Fl. R. S.

Waltheria, L.

1. W. Americana, L. sp. pl. 941; DC. Prod. I. 492. (*W. Indica,* L. l. c. 941; Hf. Ind. Fl. I. 374).

Hab. Not uncommon on the lower hills of the Irrawaddi valley from Ava (Segain) to Prome. Fl. Sept. Oct.

Guazuma, Plum.

*1. G. tomentosa, H. B. K. Nov. Gen. V. 320; Wight Ill. t. 31; Bedd. Fl. Sylv. Madr. t. 107; Hf. Ind. Fl. I. 375.

Hab. An American tree sometimes seen planted as an avenue-tree. Fl. R. S.; Fr. C. S.

Leptonychia, Turcz.

Conspectus of species.

Outer staminods 15, the inner staminods ciliate; capsule 1-celled, rugose, ...*L glabra.*
Outer staminods 10, the inner not ciliate; ovary and capsule 3-5-celled and lobed, the latter minutely tubercled, ...*L. heteroclita.*

1. L. GLABRA, Turcz in Bull. Mosc. 1858. 222; Hf. Ind. Fl. I. 379. excl. syn.

HAB. Tenasserim (Helf. 658); Moulmein (Lobb. teste Mast.).

2. L. HETEROCLITA, Kurz in Journ. As. Soc. Beng. 1870. 67. excl. syn. Turcz. (*Grewia heteroclita,* Roxb. Fl. Ind. II. 590; *Binnendykia trichostylis,* Kurz in Tydsch. Nat. Ver. Ned. Ind. ser. 3. III. 164; *L. moacurroides,* Bedd. Fl. Sylv. Madr. t. 114; Hf. Ind. Fl. I. 379; *Grewia acuminata,* Bedd. in Linn. Trans. XXV. 210?; Hf. Ind. I. 393?).

HAB. South Andaman, in tropical forests.

Buettneria, L.

Conspectus of species.

× Leaves cordate-oblong, entire.

Capsules large, greyish velvety, covered with strong woody prickles, ...*B. aspera.*

× × Leaves more or less lobed or angular. Capsules the size of a cherry.

More or less roughish stellate-tomentose; capsules densely covered with brown setose flexible bristles, ...*B. pilosa.*
Glabrous or almost so; capsules covered with long stiff smooth bristles, *B. Andamanensis.*

1. B. ASPERA, Colebr. ap. Wall. in Roxb. Fl. Ind. ed. Car. II. 383; Hf. Ind. Fl. 1. 377.

HAB. Not unfrequent in the tropical forests from Pegu and Martaban down to Tenasserim and the Andamans. Fl. Apr. May.

2. B. PILOSA, Roxb. Fl. Ind. I. 618; Hf. Ind. Fl. I. 377.

HAB. Frequent in tropical and mixed forests all over Burma and adjacent provinces. Fr. C. S.

3. B. ANDAMANENSIS, Kurz in Andam. Rep. App. B. p. 3. and Journ. As. Soc. Beng. 1871. 47; Hf. Ind. Fl. I. 377.

HAB. Frequent in the coast forests of South Andaman; also Upper Tenasserim, along the Thoungyeen and Attaran rivers (Brandis); Moulmein (Lobb). Fr. H. S.

Doubtful species.

I. B. CRENULATA, Wall. Cat. 1150; Hf. Ind. Fl. I. 376.

HAB. Pegu (McLelland); Tenasserim, Attaran and Salween (Wall.) ex Masters.

Wall. Cat. 1152 is mentioned in the Lith. List as *Kleinhovia hospita. B. catalpifolia,* as represented in the Wallichian Herb. in H. B. C., is a Caracas plant, cultivated and collected in H. B. C. and bears no number.

B. echinata Wall. Cat. 1149 is the only No. which I have myself seen, and consists of loose leaves and a piece of a capsule, the former differing from his *St. parviflora,* Wall. Cat. 1121 from Silhet only in size, the latter almost indistinguishable from *B. Andamanensis.* Nipal is also given as a locality but Wallich's Nos. cited are all Burmese.

TILIACEÆ.

Conspectus of genera.

A. *Anthers opening by slits.*

Trib. I. BROWNLOWIEÆ. Sepals united into a bell-shaped 3- to 5-cleft calyx. Anthers short, usually globular or didymous, the cells ultimately confluent at the top.

* The 5 inner stamens reduced to staminods.

1. BROWNLOWIA. Carpels distinct, globular, 2-valved.

2. PENTACE. Fruits 3-5-winged, indehiscent, by abortion 1-seeded.

* * Anthers all anther-bearing,

3. BERRYA. Capsule 3-4-valved, with twice as many wings. Styles 1-4, filiform.

Trib. II. GREWIEÆ. Sepals distinct. Petals with a basal scale more or less adnate, inserted round the base of a more or less raised torus bearing at the top the stamens. Anthers short, the cells parallel and distinct.

* Fruit dry, winged.

4. COLUMBIA. Fruit 3-5-celled, separating into as many 2-winged cocci.

* * Fruit more or less drupaceous, not winged.

O Fruit unarmed, tomentose to glabrous.

5. GREWIA. Drupes more or less lobed or globular.

O O Fruits prickly.

6. TRIUMFETTA. Drupe usually small, globular, indehiscent or separating into cocci.

Trib. III. TILIEÆ. Sepals distinct. Petals without a scale at base, inserted directly round the stamens.

* Capsule opening loculicidally, almost pod-like or globular, many-seeded.

7. CORCHORUS. Stamens all anther-bearing. Capsules pod-like or globular, striate or muricate.

* * Fruits globular, indehiscent, usually 1-seeded.

8. SCHOUTENIA. Calyx enlarged under the fruit, membranous, spreading. Stamens free, all anther-bearing.

B. *Anthers opening by apical pores.*

Trib. IV. SLOANEÆ. Anthers linear. Staminal disk flat or cushion-like, the sepals and petals inserted directly round the stamens.

9. ECHINOCARPUS. Sepals 4, imbricate in 2 series. Petals 4, gashed, almost imbricate. Disk thick and broad. Capsule woody, 4-valved, echinate setose or velvety.

Trib. V. ELÆOCARPEÆ. Anthers linear. Petals inserted round the base of a raised torus from the top of which the stamens spring.

10. ELÆOCARPUS. Sepals 4-5. Petals induplicate-valvate, laciniate or rarely entire, Drupes fleshy.

Brownlowia, Roxb.

Conspectus of species.

* Leaves deeply peltate.

Leaves oblong or rotundate; calyx velvety, ...*B. peltata.*

* * Leaves not peltate.

Leaves cordate-oblong; calyx velvety, ...*B elata.*

Leaves lanceolate; calyx scaly, ...*B. lanceolata.*

1. B. PELTATA, Bth. in Linn. Proc. V. Suppl 56.

HAB. Tenasserim (Helf. 624).

Apparently merged by Masters into *B. elata* and possibly rightly so.

2. B. ELATA, Roxb. Corom. Pl. III. t. 265; Bot. Reg. t. 1472. Wall. Pl. As. rar. III. 45; Hf. Ind. Fl. I. 381. (*Humea elata*, Roxb; Fl. Ind. II. 640).

HAB. Chittagong; Tenasserim, Moulmein.

3. B. LANCEOLATA, Bth. in Linn. Proc. V. Suppl. 57; Hf. Ind. Fl. I. 381.

HAB. Rather frequent in the tidal forests and mangrove swamps from Arracan (Akyab) and Rangoon down to Tenasserim (Moulmein). Fl. Febr.—May.

Pentace, Hassk.

1. P. BURMANICA, Kurz in Journ. As. Soc. Beng. 1871. 47; Hf. Ind. Fl. I. 381.

HAB. Frequent in the tropical forests of the eastern and southern slopes of the Pegu Yomah and Martaban down to Upper Tenasserim. Fl. Jan.; Fr. Febr. March.

Berrya, Roxb.

1. B. MOLLIS, Wall. Cat. 1186; Kurz in Journ. As. Soc. Beng. 1873. 62. (*B. Ammonilla, var. mollis*, Mast. in Hf. Ind. Fl. I. 383).

HAB. Not unfrequent in the drier upper mixed and hill Eng forests of Martaban and the Pegu Yomah up to 3000 ft. elevation. Fr. March.

Columbia, Pers.

Conspectus of species.

Leaves cordate-oblong; fruits ¾-1 in. across, ...*C. floribunda.*

Leaves lanceolate; fruits 1½ in. across, ...*C. Merguensis.*

1. C. FLORIBUNDA, Kurz in Journ. As. Soc. Beng. 1873. 63; Hf. Ind. Fl. I. 393. (*Grewia floribunda*, Wall. ap. Voigt (not Voight) Cat. Hort. Calc. 128).

HAB. Martaban, in Toukyeghat E. of Toungboo; also Ava, on Taongdong. Fr. Nov. Jan.

2. C. MERGUENSIS, Planch. in Hf. Ind. Fl. I. 394.

HAB. Tenasserim, Mergui (Griff.)

Grewia, L.

Subg. 1. *Microcos.* Stigma shortly toothed. Flowers forming terminal panicles, involucred while in bud.

* Endocarp of drupes fibrous-woody.

Leaves entire, almost coriaceous, quite glabrous; ovary and torus velvety-tomentose, ... *G. calophylla.*

× × Endocarp of drupes crustaceous or bony.

Leaves thin chartaceous, glabrous or beneath puberulous, not sinuate; ovary and torus glabrous, ... *G. microcos.*

As preceding but flowers and leaves much smaller, the latter sinuate-lobed, ... *G. sinuata.*

Leaves thick chartaceous and rugose, tomentose beneath; ovary and torus villous, ... *G. paniculata.*

Subg. 2. *Grewiæ veræ.* Stigmas dilated and fringed, radiating. Flowers in axillary or leaf-opposed cymes or clusters.

O Cymes or clusters axillary.

× Leaves at base 3-nerved, rarely with an additional lateral one.

† Drupes deeply 2-4-lobed from the top, by abortion sometimes 1-lobed.

Cymes and sepals shortly rusty tomentose; leaves on both surfaces very scabrous from minute stellate hairs; drupes deeply 4-lobed, ... *G. scabrida.*

Cymes sprinkled with stiff hairs, glabrescent; sepals greyish or tawny velvety; leaves glabrous, or sprinkled with simple short hairs, rarely puberulous beneath; drupes didymous, ... *G. lævigata.*

† † Drupes entire or only slightly and obtusely lobed at the top.

Leaves beneath and young parts greyish velvety; drupes globular, grey-pubescent, ... *G. excelsa.*

Leaves at base 3- or 4-nerved; cymes rather long peduncled; drupes obsoletely 4-lobed red, sparingly hirsute, ... *G. hirsuta.*

As preceding, but more densely pubescent or tomentose; drupes obsoletely 2-lobed, red sparingly hirsute, ... *G. humilis.*

Leaves at base 3- or 4-nerved, scabrous; flowers in short dense sessile clusters; stamens 16, ... *G. microstemma.*

× × Leaves usually broad, at base 5-7-nerved, the upper ones often only 3-nerved or 3- and 5-nerved ones mixed.

† Peduncles slender, much longer than the petioles.

Leaves obliquely lanceolate, especially while young greyish or whitish tomentose beneath, ... *G. elastica.*

Leaves broadly obovate or almost rotundate, on both sides sprinkled with stellate hairs, or pubescent beneath, often scabrous, ... *G. Asiatica.*

† † Peduncles very short or almost reduced and the flowers appearing clustered.

Leaves very variable in shape, tomentose to pubescent; drupes from the top deeply 4- or only by abortion fewer-lobed, ... *G. abutilifolia.*

Leaves very scabrous and harsh; drupes the size of a cherry, almost globular, ... *G. sclerophylla.*

O O Cymes opposite the leaves, ... *G. oppositifolia.*

1. G. CALOPHYLLA, Kurz in And. Rep. App. B. 3; and in Flora 1872 398; Hf. Ind. Fl. I. 392.

HAB. Not uncommon in the tropical coast-forests of South Andaman. Fl. May, June.

2. G. MICROCOS, L. sp. pl. ed. 12. 602; Wight Ill. t. 33; Hf. Ind. Fl. I. 392. (*G. ulmifolia*, Roxb. Fl. Ind. II. 591; Wight Ic. t. 84).

HAB. Frequent all over Burma from Chittagong and Ava down to Tenasserim, in the mixed forests, especially the lower ones. Fl. Apr.—June.

Like a few other *Grewiæ* perplexingly variable in size and shape, here a well-shaped tree 40 to 50 ft. high, there a meagre shrub of only a few feet in height; the latter form growing chiefly on deep alluvium, in savannahs and similar localities.

3. G. SINUATA, Wall. Cat. 1108; Hf. Ind. Fl. I. 392.

HAB. Frequent in the swamp-forests of the Irrawaddi and Sittang alluvial plains in Pegu and Martaban; also Tenasserim as far down as Mergui. Fl. May.

Possibly only a marsh-form of the preceding.

4. G. SCABRIDA, Wall. Cat. 11,13. p. p.; Kurz in Journ. As. Soc. Beng. 1873. 63; Hf. Ind. Fl. I. 398, excl. syn.

HAB. Tenasserim, from Moulmein (Falconer) and Tavoy (Wall.) down to Mergui (Helf.). Fl. Sept.; Fr. Febr.

5. G. LÆVIGATA, Vhl. Symb. I. 34; Hf. Ind. Fl. I. 389. (*G. didyma*, Roxb. Fl. Ind. III. 591).

Var. *α*. GLABRA, leaves glabrous, or tufted-hairy in the nerve-axils beneath.

Var. *β*. PUBESCENS, leaves beneath minutely puberulous or densely downy.

HAB. Var. *β*. not uncommon in the upper mixed forests all over Pegu and adjacent provinces down to Tenasserim; var. *α*. in Arracan. Fl. Sept. Oct.; Fr. March Apr.

6. G. EXCELSA, Vhl. Symb. III. 35; Roxb. Fl. Ind. II. 586?; Hf. Ind. Fl. I. 385. (*G. salvifolia*, Roxb. l. c. 587).

HAB. Chittagong (teste Masters).

I have not seen specimens; the occurrence of such a xeroclimatic form in Chittagong is exceptional.

7. G. HIRSUTA, Vhl. Symb. I. 34; DC. Prod. I. 509; Roxb. Fl. Ind. II. 587; Wight Ic. t. 76; Hf. Ind. Fl. I. 391. (*G. pilosa*, Roxb. Fl. Ind. II. 588).

Var. *α*. GENUINA, leaves green, 3-nerved, more or less sprinkled with short stiff hairs.

Var. *β*. VIMINEA, (*G. viminea*, Wall. Cat. IV), as the preceding, but the leaves longer and narrower, very long acuminate.

Var. *γ*. HELICTERIFOLIA (*G. helicterifolia*, Wall. MS.), leaves acuminate, at base 3- or almost 4-nerved, thinly hirsute or tomentose above, beneath clothed with a whitish velvety tomentum.

HAB. Var. *a.* and *β.* frequent all over Burmah in the mixed forests, especially in the upper ones; var. *γ.* not yet found. Fl. H. and R. S.; Fr. C. S.

8. G. HUMILIS, Wall. ap. Voigt Cat. Hort. Beng. 128; Hf. Ind. Fl. I. 390.

Var. *a.* WALLICHII, tomentum more villous, leaves acute.

Var. *β.* RETUSIFOLIA, (*G. retusifolia*, Kurz in Journ. As. Soc. Beng. 1872. 294), tomentum velvety; leaves deeply retuse and broader.

HAB. Var. *a.* Ava, Segain hills (Wall.); var. *β.* not unfrequent in savannahs, especially along the borders of swamp forests of the Irrawaddi alluvium in Pegu. Fr. C. S.

The drupes are normally 4-lobed, but by abortion usually 2- rarely 1- or 3-lobed. The species is hardly more than an extreme form of *G. hirsuta*, Vhl.

9. G. MICROSTEMMA, Wall. ap. Voigt Cat. Hort. Calc. 128; Kurz in Journ. As. Soc. Beng. 1873. 63; Hf. Ind. Fl. I. 390.

HAB. Ava; Prome hills (Wall.) Fl. Sept. Oct.

10. G. ELASTICA, Royle Ill. Him. Pl. 104. t. 22; Walp. Rep. I. 361. (*G. asiatica, var. vestita*, Mast. in Hf. Ind. Fl. I. 387.)

HAB. Frequent in the upper mixed forests of the Pegu Yomah and Martaban; also Chittagong. Fl. Nov. Decb.

11. G. ASIATICA, L. Mant. 122; Roxb. Fl. Ind. II. 586; Hf. Ind. Fl. I. 386.

Var. *β.* NANA, (*G. nana*, Wall. Cat. 1102), stunted and low, possibly the result of jungle fires.

HAB. Only the stunted variety appears to grow in Burma (Griff. 656) probably Ava?

12. G. TILIÆFOLIA, Vhl. Symb. I. 35; Roxb. Fl. Ind. II. 587; Bedd. Fl. Sylv. Madr. t. 108; Hf. Ind. Fl. I. 386.

HAB. Birma (teste Masters).

13. G. ABUTILIFOLIA, Juss. Ann. II. 92; DC. Prod. I. 511; WA. Prod. I. 79? Miq. Fl. Ind. Bat. I/2. 201; Hf. Ind. Fl. I. 390. (*G. aspera*, Roxb. Fl. Ind. II. 591).

Var. *a.* ASPERA, (*G. aspera*, Roxb. l. c.) leaves all rotundate and often somewhat lobed towards the summit; sepals only 2½ lin. long or a little longer, pubescent from stiff appressed hairs; petals ½ lin. long; bracteoles short, oblong, acute. A low shrub, 2 to 3, often only ½ foot high, the tomentum usually short.

Var. *β.* VIRIDESCENS, as the preceding, but the leaves of a very thin chartaceous texture and very large, green, acuminate, above hirsute from simple, beneath from stellate, tawny hairs; flowers usually larger; sepals tawny pubescent; petals as in the preceding variety, but the lamina more acute; ripe drupes glabrous. Low shrub, 2-3 ft. high.

Var. γ. *sclerophylloides*, a low shrub, 3-4 ft. high, more or less branched, the younger parts densely rusty-coloured villous; leaves very variable in shape on the same branch, the lower ones usually ovate-oblong, up to nearly one foot long, the upper and uppermost ones gradually smaller and narrower, from ovate to lanceolate, doubly and sometimes bristly serrate, acuminate, scabrous or thinly pubescent above, beneath more or less stellate-pubescent or almost tomentose; bracteoles linear-lanceolate, acuminate, pubescent externally, longer or as long as the flower-buds; petals a line long, the lamina acuminate, pubescent outside; drupes deeply 4-lobed, often remaining sparingly hirsute during ripeness. A laterite form.

HAB. Var. α. Pegu (Col. Eyre); var. β. not unfrequent in the upper mixed forests of the Pegu Yomah; var. γ. frequent in the open, especially the low and Eng forests of Pegu, Prome and Martaban. Fl. May.

A very variable plant of which I entertained some hope of being able to separate var γ. (which is also a common Assam plant) specifically. It resembles in size of flowers *G. sclerophylla*, but the deeply 4-lobed drupes at once separate it.

14. G. SCLEROPHYLLA, Wall. Cat. 1095; Wight Ic. t. 89. (*G. scabrophylla*, Roxb. Fl. Ind. II. 584 [nomen latino-græcum]; Hf. Ind. Fl. I. 387).

HAB. Ava and Chittagong (teste Masters).

Doubtful species.

1. *G. lanceolata*, Roxb. Fl. Ind. II. 586.

HAB. Chittagong (Roxb.)

Possibly the same as *G. viminea*, Wall.

Triumfetta, L.

Conspectus of species.

Sect. 1. *Lappula.* Capsules indehiscent or nearly so, globular, echinate, the cells usually 1-seeded.

Leaves rotundate, not lobed, blunt, beneath greyish-tomentose like the sepals, ... *T. rotundifolia.*

Leaves rotundate, acuminate, often lobed; the sepals stellate-hairy, ... *T. rhomboidea.*

Sect. 2. *Bartramia.* Capsules when ripe separating into 3-4 cocci, densely covered by long bristles, the cells usually 2-seeded.

Leaves slightly hirsute; capsules and bristles glabrous, ... *T. annua.*

Leaves at least beneath densely tomentose or pubescent; capsules tomentose, the bristles more or less pilose, straight or curved, ... *T. pilosa.*

1. T. RHOMBOIDEA, Jacq. Am. 147. t. 90; Mast. Fl. Trop. Afr. I. 257 and Hf. Ind. Fl. I. 395. (*T. angulata*, Lamk. Dict. III. 41; Wight Ic. t. 320; *T. Bartramia*, Roxb. Fl. Ind. II. 463; *T. cana*, Bl. Bydr. 116, non Mast.).

Hab. A common weed not only in cultivated lands but also in all leaf-shedding forests all over Burma and adjacent provinces. Fl. R. and C. S.; Fr. C. S.

2. *T. semitriloba*, L. Mant. 73; Hf. Ind. Fl. I. 396.

Hab. Tenasserim, Tavoy (teste Masters).

3. T. rotundifolia, Lamk. Dict III. 421; Hf. Ind. Fl. I. 395.

Hab. Ava (Wall.)

4 T. annua, L. Mant. 73; Bot. Mag. t. 2296; Hf. Ind. Fl. I. 396

Hab. Not unfrequent in the upper-mixed and dry forests all over Pegu, also frequent in deserted hill-toungyas; Ava. Fr. Nov.—Febr.

5. T. pilosa, Roth Nov. sp. 223; Hf. Ind. Fl. I. 394.

Var. *β*. oblonga, (*T. oblonga*, Wall. in Don I. Prod. Rep. 227; *T. tomentosa*, Mast. in Hf. Ind. Fl. I. 394, non Boj.; *T. octandra*, Griff. Nat. Dicot. 512?) the bristles of the carpels somewhat shorter and straight or nearly so.

Hab. Var. *β*. common all over Burma and adjacent provinces, in the mixed forests and deserted toungyas. Fr. Nov. Jan.

Masters, in Fl. trop. Afr. and Fl. Ind., identifies var. *β*. of this species with *T. tomentosa*, Boj. The Mauritian plant, which for a long time was cultivated in H.B.C. but is now apparently lost, has a velvety tomentum and small globular fruits not larger than those of *T. rhomboidea*, while Masters describes them as being as large as a cherry.

Doubtful species.

1. T. cana, Masters in Hf. Ind. Fl. I. 396, non Bl.

Hab. Chittagong (teste Masters).

Corchorus, L.

Conspectus of species.

§ 1. Capsules globular or nearly so, more or less muricate.

Lower pairs of serratures of leaves produced into five bristles: capsules 10-sulcate, truncate, ...*C. capsularis*.

§ 2. Capsules more or less elongate or linear, cylindrical or angular, but not winged.

* Capsules 1 to 2 in. long or longer. Stamens very numerous.

O Lower pair of serratures of leaves produced into long bristles.

Capsules 2 in. long, 5-celled and 5-ribbed, longitudinally pitted, the partitions within very distinct, ... *C. olitorius*.

O O Leaves without basal bristles, usually small and blunt.

Capsules about 2 in. long, sparingly and minutely tubercled, glabrous, simply beaked, ...*C. 3-locularis*.

As preceding, but capsules only about 1 in. long, thinly pilose, .. *C. urticæfolius*.

Capsules 1-1½ in. long, almost terete, not wrinkled, 3-4-celled, 3-4-toothed at apex, without partitions inside, ...*C. tridens*.

* * Capsules about ½ in. long. Stamens 5 to 10.

Capsules almost terete, tomentose, 3-celled, without partitions inside, ...*C. fascicularis*.

§ 3. Capsules elongate, thick, truncate, 6-angled, the alternate angles winged. Stamens 15 to 20. Leaves without bristles. Capsules ¾—1 in. long, terminating in 3 simple or 2-cleft spreading points, ...*C. acutangulus*.

1. C. CAPSULARIS, L. sp. pl. 746; Roxb. Fl. Ind. II. 581; Wight Ic. t. 311; Hook. Journ. Bot. II. 92. t. 3, Hf. Ind. Fl. I. 397.

HAB. Cultivated all over Burma, and frequently seen in deserted toungyas, along the borders of forests, around villages, etc. Fl. C. S.; Fr. H. S.

2. C. OLITORIUS, L. sp. pl. 746; Roxb. Fl. Ind. II. 581; Bot. Mag. t. 2810; Griff. Not. Dicot. 512; Hf. Ind. Fl. I. 397. (*C. decemangularis*, Roxb. l. c. 582).

HAB. Ava, Pegu, cultivated and wild in rubbishy places and agrarian lands. Fl. R. S.; Fr. C. S.

3. C. TRILOCULARIS, L. Mant. 77; Roxb. Fl. Ind. II. 582; Hf. Ind. Fl. I. 397.

HAB. Burma (according to Dr. Mason).

4. C. URTICÆFOLIUS, WA. Prod. I. 73; Hf. Ind. Fl. I. 397.

HAB. Ava (Wall).

5. C. TRIDENS, L. Mant. 566; Hf. Ind. Fl. I. 398. (*C. trilocularis*, Burm. Fl. Ind. t. 37. f. 2).

HAB. Prome District (Wall.).

6. C. FASCICULARIS, Lamk. Dict. II. 104; Roxb. Fl. Ind. II. 582; Hf. Ind. Fl. I. 398.

HAB. Not unfrequent in dried up river-beds in the swamp forests and savannahs between the Lhein and Irrawaddi rivers in Pegu Fr. C. S.

7. C. ACUTANGULUS, Lamk. Dict. II. 104; Wight Ic. t. 739; Hf. Ind. Fl. I. 398. (*C. fuscus*, Roxb. Fl. Ind. II. 582).

HAB. Very frequent not only in rubbishy places, deserted toungyas, etc., but also in the leaf-shedding forests, all over Burma, up to 3000 feet elevation. Fl. R. S.; Fr. C. S.

Echinocarpus, Bl.

Conspectus of species.

Leaves entire, tufted-hairy in the nerve-axils beneath; prickles of fruit strong, usually thickened at base, ... *E. Sigun*.

Leaves crenate-serrate or toothed, at least when young puberulous beneath, the prickles longer, all thin and subulate, ...*E. sterculiaceus*.

1. E. SIGUN, Bl. Bydr. 56; Miq. Fl. Ind. Bat. I/2. 109. (*E. murex*, Bth. in Linn. Proc. V. Suppl. 72; Hf. Ind. Fl. I. 399).

HAB. Tenasserim, Thoungyeen, Ta-oo-road (Brandis). Fr. Apr.

Masters states that the prickles of *E. murex* are dilated at the base; the Khasya specimens No. 5. Hb. or. Hf. and Th., however, exhibit not a vestige of dilatation being simply incrassate at base just as those of the Javanese plant. The sígún is a common tree in the hill-forests of western Java and there well-known to Dutch botanists.

2. E. sterculiaceus, Bth. in Linn. Proc. V. Suppl. 72; Hf. Ind. Fl. I. 400.

Hab. Not unfrequent in the drier hill-forests of Martaban; Tenasserim, Moulmein District (Falconer); Birma (Griff. 675).

Elæocarpus, L.

Conspectus of species.

Subg. 1. *Monoceras.* Anthers cuspidate or aristate. Flowers usually rather large, the petals silky-hairy, fringed or very rarely entire.

* Petals entire with a few short teeth at apex or simply fringed, not cut or cleft. Petioles continuous, not geniculate-incrassate.

O Inflorescence and sepals outside almost glabrous.

All parts glabrous, ...*E. petiolatus.*

O O Inflorescence and sepals outside silky-pubescent.

Glabrous; petals entire, acuminate; pedicels $\frac{1}{3}$-$\frac{1}{2}$ in. long, ... *E. Griffithii.*

Glabrous; petals deeply but simply fringed; pedicels 3 4 lin. long, ...*E. Varunua.*

* * Petals 2-3-cleft, the lobes jagged or fringed; anthers glabrous or puberulous.

O Petiole geniculate-thickened at apex.

† Inflorescence with long-persistent leafy bracts.

All parts also sepals and inflorescence glabrous, ...*E. bracteatus.*

† † Bracts of inflorescence small, very deciduous.

× Racemes and sepals glabrous or nearly so, ...*E. simplex.*

× × Racemes and sepals more or less tomentose or pubescent.

Leaves 1-1$\frac{1}{2}$ ft. long, cuneate-acuminate at base, acute; anthers shorter than the bristle; drupes puberulous, the putamen slightly compressed, ...*E. grandifolius.*

Leaves $\frac{1}{2}$-1 ft. long, rounded at the narrowed base; leaves glabrous or nearly so; putamen terete, ...*E. rugosus.*

O O Petiole continuous, not geniculate-thickened at apex.

Glabrous. Putamen long recurved-aculeate, ...*E. grandiflorus.*

Putamen lacunose-tubercled; leaves blunt, very thick coriaceous, glabrous, *E. littoralis.*

Subg. 2. *Elæocarpi veri.* Anthers blunt, or the longer valve sharply produced; flowers small; petals glabrous.

† Putamen even and usually slightly rimose, or obsoletely wrinkled. Calyx and pedicels glabrous.

Leaves glabrous, blistered-speckled and opaque; petioles long, thickened at the summit; anthers bearded, ... *E. floribundus.*

Leaves glabrous, opaque, acuminate; petiole not geniculate-thickened, ...*E. lanceæfolius.*

Leaves glabrous, blunt or rounded at apex; petioles short but slender, not thickened; anthers naked; drupes unknown, ...*E. hygrophilus.*

† † Putamen wrinkled or tubercled. Calyx and pedicels puberulous.

× Petioles not geniculate-thickened at apex.

Leaves and petioles glabrous; style long, exserted; the longer anther-cell acute; drupes globular, ...*E. ganitrus.*

Leaves beneath along the nerves and the short petioles densely puberulous; style short; anther-cells equal, blunt; drupes oblong, ...*E. lacunosus.*

× × Petioles thickened at summit.

Leaves beneath and the rather short petioles densely puberulous, .. *E. Wallichii.*

Leaves and the long petioles glabrous; drupes oblong, ...*E. robustus.*

All parts densely and shortly pubescent; drupe globular, ...*E. stipularis.*

1. E. Griffithii, Kurz in Journ. As. Soc. Beng. 1870. 68; Hf. Ind. Fl. I. 408. (*Monoceras trichanthera*, Griff. Not. Dicot. 518 t. 619. f. 2).

Hab. Tenasserim, Mergui, in shrubberies (Griff.). Fl. Dec. Jan.

2. E. petiolatus, (*Monocera petiolata*, Jack. Mal. Misc. in Hook. Bot. Misc. II. 86; *E. integra*, Wall. Cat. 2668; Hf. Ind. Fl. I. 408; *E. ovalis*, Miq. in Suppl. Fl. Sum. 406).

Hab. Tenasserim (Helf. teste Masters).

3. E. bracteatus, Kurz in Journ. As. Soc. 1871. 48; Hf. Ind. Fl. I. 406).

Hab. Tenasserim, in tropical forests of Thoungyeen (Brandis); Moulmein (Falconer). Fl. March, Apr.

4. *E. simplex*, Kurz MS.

Hab. Tenasserim (Griff. 701).

Evidently nearly allied to *E. aristatus*, Roxb. but differing in the shape of the leaves and the glabrous racemes. The flowers conform to those of the preceding species. Griffith's specimens from E. Bengal (No. 702) differ only by a puberulous inflorescence and may also belong here.

5. E. grandiflorus, Smith in Rees Cycl. No. 5. (*Monoceras lanceolatum*, Hassk. Cat. Bog. 208; Miq Fl. Ind. Bat. I/2. 212; *Monocera grandiflora*, Hook. Bot. Mag. t. 4680; *E. lanceolatus*, Bl. Bydr. 129).

Hab. Martaban, not rare along the banks of rivers in Toukyeghat District E. of Tounghoo.

6. E. grandifolius, Kurz in Journ. As. Soc. Beng. 1872, 294.

Hab. Frequent in the tropical forests of the eastern slopes of the Pegu Yomah and Martaban down to Tenasserim. Fr. Febr. March.

7. E. rugosa, Roxb. Fl. Ind. II. 596; Wall Cat. 2658. A. C.; Hf. Ind. Fl. I. 405. (*Monocera rugosa*, Wight Ill. I. 83 and Ic. t. 61).

Hab. Frequent in the tropical forests, especially along choungs, of the eastern slopes of the Pegu Yomah and Martaban. Fl. March, Apr.

Masters refers Wallich's *E. rugosus* to *E. tuberculatus*, Roxb. without giving his reasons for so doing.

8. E. littoralis. T. and B. MS.

Hab. Tenasserim, Moulmein (Falconer). Fr. Febr.

N. B.—What I have from the Botanical Gardens, Buitenzorg, under the name of *Monoceras obtusum*, Hassk. belongs to *E rugosus*. The Tenasserim plant (with which Griffith's No. 700 is identical) has very thick and obtuse leaves, and is in my opinion a distinct species. I have therefore retained the MS. name of Teysm. and Binnend. for the plant.

9. E. VARUNUA, Ham. ap. Hf. Ind. Fl. I. 407.

HAB. Chittagong (teste Masters).

Differs from *E. prunifolius*, Wall. solely by the silvery silk-hairy inflorescence and larger flowers.

10. E. FLORIBUNDUS, Bl. Bydr. 120; Miq. Fl. Ind. Bat. I/2. 210; Hf. Ind. Fl. I. 401. (*E. serratus*, Roxb. Fl. Ind. II. 596).

HAB. Frequent in the tropical forests, along choungs, of the Martaban hills E. of Tounghoo down to Tenasserim; also Chittagong. Fl. Apr.

The species is easily recognised in a dried state by its peculiar blistered opaque leaves.

11. E. HYGROPHILUS, Kurz, MS.

HAB. Frequent in the swamp forests of the alluvial plains of Pegu and Martaban; also Upper Tenasserim (Falc.) Fl. Jan. March.

I looked for some time upon this species as a variety of *E. photiniæfolius*, but the habitat as well as the structure of the leaves are inconsistent with such a view. It is nearest to *E. lanceæfolius*, Roxb., but differs by obtuse or rounded leaves and beardless anthers.

12. E. LANCEÆFOLIUS, Roxb. Fl. Ind. II. 598; Hf. Ind. Fl. I. 402.

HAB. Tenasserim (teste Masters.)

13. E. GANITRUS, Roxb. Fl. Ind. II. 592; Hf. Ind. Fl. I. 400. (*Ganitrus sphæricus*, Gærtn. fruct. II. 271. t. 139; Wight Ic. t. 66; *E. cyanocarpus*, Mast. in Hf. Ind. Fl. I. 406).

HAB. Chittagong.

14. E. LACUNOSUS, Wall. Cat. 6858.

HAB. Not unfrequent in the tropical forests and along choungs in the moister upper mixed forests of Pegu and Martaban down to Tenasserim. Fl. May, July; Fr. March, Apr.

15. E. WALLICHII, (*E. longifolius*, Wall. Cat. 6682; Hf. Ind. Fl. I. 409. non Bl.)

HAB. Not unfrequent in the Eng and low forests from Martaban (Toukyeghat) down to Upper Tenasserim; also base of Pegu Yomah; Ava (Wall.)

I have often met with the tree, but always without flowers or fruit. The leaves generally resemble *E. Ganitrus* but are puberulous all over or, in very old ones, only beneath along the nerves, and so are the petioles and branchlets. It appears to be a distinct species.

16. E. ROBUSTUS, Roxb. Fl. Ind. II. 597; Wight Ic. t. 64; Hf. Ind. Fl. I. 402. (*E. Helferi*, Kurz And. Rep. ed. 2. 32. and Mast. in. Hf.

Ind. Fl. I. 402 E. sp. Griff. Not. Dicot. 517. t. 592. f. 2).

HAB. Frequent in the tropical forests of Martaban and Tenasserim; also Andamans; and Chittagong (teste Mast.) Fl. Apr. May; Fr. Aug.

N. B.—E. cuneatus, Wight, is noted by Masters as growing in Chittagong, Birma, and Tenasserim. I do not know the species. Possibly the Burmese localities refer to *E. lacunosus*, Wall.

17. E. STIPULARIS, Bl. Bydr. 121; Miq. Fl. Ind. Bat. I/2 210; Hf. Ind. Fl. I. 404.

HAB. In tropical forests of Martaban and Tenasserim, up to 3000 feet elevation; also Rangoon District (Brandis). Fl. May.

Doubtful species.

1. E. LEPTOSTACHYA, Wall. Cat. 2672; Hf. Ind. Fl. I. 403.

HAB. Tenasserim (Helf. teste Mast.).

Masters states that the species is very like *E. robustus* but that the anthers are bearded, while in *E. robustus* itself he tells us that the anthers are both bearded and beardless.

2. E. LUCIDUS, Mast. in. Hf. Ind. Fl. I. 403, non Roxb.

HAB. Chittagong (Griff. teste Mast.).

Masters identifies his specimens with Roxburgh's plant, which the late Dr. Anderson had already recognised as an *Euphorbiacea* and which is *Cleidion Javanicum*, Bl. I doubt the correctness of the habitat given for the reason that Griffith had never visited Chittagong.

I have not seen *E. oblongus*, Gærtn. from Moulmein.

LINEÆ.

Conspectus of species.

Trib. I. EULINEÆ. Petals twisted. Perfect stamens as many as petals. Capsule opening septicidally. Herbs or small shrubs.

1. REINWARDTIA. Calyx glabrous. Styles 3 or 4. Capsule 3-4-celled.

2. LINUM. Calyx glabrous or pubescent. Styles 5. Capsule 5-celled.

Trib. II. ERYTHROXYLEÆ. Petals usually imbricate, rarely twisted, with a basal scale inside. Perfect stamens twice as many as petals. Fruit a drupe. Shrubs or trees.

3. ERYTHROXYLON. Petals with a double basal scale inside. Pedicels 1-flowered, axillary.

Reinwardtia, Dum.

1. R. INDICA, Dum. Comm. Bot. 1822. 19. (*R. trigyna*, Planch. in Hook. Journ. of Bot. VII. 522; Hf. Ind. Fl. I. 412.; *Linum trigynum*, Roxb. Fl. Ind. II. 1832. 110; Bot. Mag. t. 1100; Sm. Exot. Bot. 31. t. 17; *Linum repens*, Don. Prod. Nep. 1826. 217).

HAB. Martaban, Karen country (Riley); Chittagong.

Erythroxylon, L.

Conspectus of species.

§ 1. *Erythroxylon.* Styles free from the base.

Leaves oblong lanceolate, shortly acuminate glaucescent beneath; pedicels about ½ in. long, ... *E. Kunthianum.*

§ 2. *Sethia.* Styles united for about ½ of their length.

Leaves obovate or oblong, blunt; pedicels usually 3 lin. long, rarely longer, ...*E. monogynum.*

Leaves broadly obovate or oblong, retuse; pedicels short, ... *E. cuneatum.*

1. E. Kunthianum, Kurz in Journ. As. Soc. Beng. 1872. 294; Hf. Ind. Fl. I. 414. (*Sethia? Kunthiana,* Wall. Cat. 6849, nomen chartaceum).

Hab. Not unfrequent in the drier hill-forests, especially the stunted ones, on the Martaban hills E. of Tounghoo, at 5000 to 7200 ft. elevation; also Tenasserim, top of Thoungyeen hills, (Parish). Fl. March.

2. E. monogynum, Roxb. Corom. Pl. I. t. 88. and Fl. Ind. II. 449; Hf. Ind. Fl. I. 414. (*E. Indicum,* Bedd. Fl. Sylv. Madr. t. 81; *Sethia Indica,* DC. Prod. I. 576; Wight Ill. t. 48).

Hab. Pegu (accord. Dr. Mason).

3. E. cuneatum, (*Urostigma? cuneatum,* Miq. in Hook. Lond. Journ. VI. 585; *E. Burmannicum,* Griff. Not. Dicot. 468. t. 581. f. 3.; Hf. Ind. Fl. I. 414).

Hab. Tenasserim, from Moulmein (Falconer, Wall.) down to Mergui, along the coast of Madamaca (Griff.). Fl. Apr.

MALPIGHIACEÆ.

Conspectus of genera.

Trib. I. MALPIGHIEÆ. Carpels never winged, free or united into a fleshy or drupaceous 1- to 3-celled fruit. Usually erect shrubs, with usually opposite leaves and connate stipules.

1. Malpighia. Calyx 6-10-glandular. Filaments at base glabrous. Ovary entire, 2-3-celled, styles terminal and free. Drupes containing 3 or fewer crested nuts.

Trib. II. HIREÆ. Samaras 1-3, obliquely accumbent to a short pyramidal torus, or the carpels united into a winged indehiscent capsule. Woody climber or rarely erect shrubs or trees, the stipules minute or wanting.

* Stamens definite, usually 10, all perfect.

O Style 1, rarely 2.

2. Hiptage. Calyx with a single large gland adnate to the pedicel. Carpels 3-winged. Trees or woody climbers.

O O Styles 3. Ca'yx without glands.

3. Aspidopterys. Petals not clawed. Stigmas capitellate. Samaras broadly winged all round. Woody climbers.

* * Stamens numerous. Styles 3, consolidated. Calyx minute, without glands.

4. Plagiopteron. Capsules indehiscent, 3-4-winged as in *Hiptage.* Petals reflexed. Woody climbers.

Malpighia, L.

*1. M. COCCIGERA, L. sp. pl. 611. (*M. coccifera*, L. sp. pl. ed. Rchb. II. 371; DC. Prod. I. 578; Walp. Rep. V. 152; Bot. Reg. t. 568. *M. heteranthera*, Wight Ill. 138. t. 49).

HAB. Frequently cultivated, and sometimes domesticated in rubbishy places round villages in Chittagong. Fl. H. and R. S.; Fr. R. S.

Hiptage, Gærtn.

Conspectus of species.

Scandent diffuse shrub, branched almost from the base; leaves larger, more acute and greyish green; bark grey, ...*H. Benghalensis.*

A lofty climber, the stem simple, cable-like, up to 100 ft. long; leaves smaller and broader, often bluntish apiculate, glabrous and glossy, dark-green; bark dark-brown, ...*H. obtusifolia.*

A small tree; flowers often pale pink with the usual yellow basal blotch; capsule not ridged on top, the wings shorter and broader, obliquely truncate; bark dark-brown, ...*H. candicans.*

1. H. BENGHALENSIS, (*Banisteria Benghalensis*, L. sp. pl. 356; *H. Madablota*, Gærtn. Fr. II. 169. t. 116. f. 4; Wight Ill. t. 50; Hf. Ind. Fl. I. 418; *Gærtnera racemosa*, Roxb. Corom. Pl. I. t. 18 and Fl. Ind. II. 368).

HAB. Not unfrequent in the dry and open, especially the Eng, forests of Prome and Martaban; also Tenasserim, Moulmein. Fl. March, Apr; Fr. Apr. May.

2. *H. obtusifolia*, DC. Prod. I. 583. (*Gærtnera obtusifolia*, Roxb. Fl. Ind. II. 369).

HAB. Rather rare in the tropical forests in the deep ravines of the Pegu Yomah. Also Ava, Khakyen hills (J. Anderson) Fl. March.

It is difficult to give good characters for this species, but it is in my opinion certainly distinct.

3. H. CANDICANS, Hf. Ind. Fl. I. 419. (*H. arborea*, Kurz in Pegu Rep. and in Journ. As. Soc. Beng. 1873. 228).

HAB. Frequent in the dry and eng forests of the Prome District and there forming the upper dry forests. Fl. March; Fr. March, Apr.

Aspidopterys, A. Juss.

Conspectus of species.

* Gynobase persistent after the fall of the samaras, conical, acute, exserted, surrounded by 3 smooth acute disk-lobes.

Leaves tomentose beneath, acuminate; ovary hirsute; nucleus of samara with or without a crest, ... *A. nutans.*

Leaves tomentose beneath, more or less glabrescent, apiculate; ovary quite glabrous; nucleus of samara with a crest, ... *A. tomentosa.*

* * Gynobase absent after the fall of the samaras or minute and shorter than the disk-lobes, the thick 3-lobed often cup-shaped disk usually wrinkled.

× Samara nearly as broad as long, with a vertical crest between the wings.

All parts, also the ovary, quite glabrous; disk in fruit about 1 lin. broad, ...*A. concava.*

Leaves more or less puberulous along the nerves beneath; disk doubly smaller, hardly wrinkled, ...*A. Helferi.*

× × Samara more than twice as long as broad, not crested.

All parts glabrous; ovary hirsute, ...*A. Roxburghii.*

All parts hirsute; ovary glabrous, ...*A. hirsuta.*

1. A. NUTANS, Hf Ind. Fl. I. 421, non Juss. (*A. lanuginosa*, A. Juss. in Arch. Mus. Nat. Hist. III. 512; *Hiræa nutans*, Roxb. Fl. Ind. II. 447, non Wall.).

HAB. Chittagong (Wall. 1057); Ava, Bhamo (J. Anderson). Fr. Jan.

2. A. TOMENTOSA, A. Juss. in Arch. Mus. Hist. Nat. III. 514; Walp. Rep. V. 299. (*Hiræa tomentosa*, Bl. Bydr. 225).

HAB. Not unfrequent in the tropical forests of Martaban E. of Tounghoo; Ava, Khakyen hills (J. Anderson). Fl. March; Fr. May.

3. A. CONCAVA, A. Juss. in Arch. Mus. Hist. Nat. III. 509; Hf. Ind. Fl. I. 420.

HAB. Tenasserim, from Moulmein to Mergui. Fl. Fr. Apr.

4. A. HELFERIANA, Kurz MS.

HAB. Tenasserim, Moulmein district (Falc., Helf. No. 923.) Phanoë (Wall. No. 1057 not in Cat.) Fl. Febr.

Nearest to *A. concava*, from which it is distinguished by the different leaves and structure of the retuse-narrowed samara-wings, the smaller almost not wrinkled disk-lobes, etc.

5. A. ROXBURGHIANA, A. Juss. in Arch. Hist. Nat. III. 511; Hf. Ind. Fl. I. 420. (*Triopteris Indica*, Willd.; Roxb. Corom. Pl. II. 32. t. 160; *Hiræa Indica*, Roxb. Fl. Ind. II. 247).

HAB. Ava; (Tenasserim, Salween river, teste Hf.).

6. A. HIRSUTA, A. Juss. in Arch. Mus. Hist. Nat. III. 512. t. 17; Hf. Ind. Fl. I. 421. (*Hiræa hirsuta*, Wall. Pl. As. rar. I. 13. t. 13).

HAB. Ava, Taong-dong; Prome hills. (Wall.) Fl. Fr. Aug. Nov.

Doubtful species.

1. A. ROTUNDIFOLIA, A. Juss. in Arch. Mus. Hist. Nat. III. 514; Walp. Rep. V. 299. (*Hiræa rotundifolia*, Roxb. Fl. Ind. II. 448).

HAB. Chittagong (Roxb.) Fl. March, Apr.

Hooker refers this species to his *A. nutans*, but the description agrees better with *A. tomentosa.*

Plagiopteron, Griff.

1. P. SUAVEOLENS, Griff. in Macl. Calc. Journ. IV. 244. t. 13; Hf. Ind. Fl. I. 399.

HAB. Tenasserim, Mergui (Griff. 679).

ZYGOPHYLLEÆ.

Conspectus of genera.

1. TRIBULUS. Stamens 10. Fruits dry, composed of 5-12 cocci usually winged or spiny. Herbs with pinnate leaves.

Tribulus, L.

Conspectus of species.

Flowers 1-2 in. in diameter, the peduncles as long or longer than the leaves, *T. cistoides.*
Flowers ½-¾ in. in diameter, the peduncles shorter than the leaves, ...*T. lanuginosus.*

1. *T. cistoides*, L. sp. pl. 554; Jacq. Hort. Schœnb. I. t. 103; Bot. Reg. t. 791; Hf. Ind. Fl. I. 423.

HAB. Tenasserim, Mergui (teste Edgew. and Hf.).

2. T. LANUGINOSUS, L. sp. pl. 553; Roxb. Fl. Ind. II. 401; Wight Ic. t. 98. (*T. terrestris*, L. sp. pl. 554; Sibth. Fl. Græc. t. 372; Rchb. Fl. Germ. V. t. 161; Hf. Ind. Fl. 423).

HAB. Ava, apparently frequent in the Irrawaddi valley; Prome District. Fl. March, Apr.

N. B.—I am not sure whether *T. terrestris*, L. and *T. lanuginosus* are not really different species.

GERANIACEÆ.

Conspectus of genera.

Trib. I. GERANIEÆ. Flowers regular or nearly so. Sepals imbricate. Glands alternating with the petals. Fertile stamens as many or 2 or 3 times as many as petals. Capsules dry, the valves elastically rolled upwards, or rarely indehiscent.

1. GERANIUM. Perfect stamens 10, or rarely fewer. Ovary-cells 2-ovuled. Capsule dehiscent, beaked.

Trib. II. OXALIDEÆ. Flowers regular. Sepals imbricate. Glands none. Stigmas capitate. Ovary-cells with 2 or more ovules.

* Capsule dry or nearly so, dehiscent. Herbs.

2. OXALIS. Stamens 10. Capsule dehiscing loculicidally, the valves cohering with the axis. Leaves usually digitately compound.

3. BIOPHYTUM. Stamens 10. Capsule dehiscing loculicidally, the valves usually separating from the axis to the base. Leaves pinnate.

* * Berry fleshy, indehiscent. Shrubs or trees.

4. AVERRHOA. Stamens 10, of which 5 often reduced to staminods. Styles distinct. Ovary-cells many-ovuled. Seeds arillate or without arillus. Trees with pinnate leaves

Trib. III. BALSAMINEÆ. Flowers regular, Sepals usually coloured, the posticous spurred Anthers almost connate.

5. IMPATIENS. The lateral petals connate in pairs. Capsule elastically dehiscent.
6. HYDROCERA. All petals free. Drupes sappy, indehiscent.

Oxalis, L.

1. O. CORNICULATA, L. sp. pl. 624; Roxb. Fl. Ind. II. 457; Wight Ic. t. 18; Jacq. Oxal. t. 5; Fl. Dan. V. t. 873 and X. t. 1753; Engl. Bot. XXIV. t. 1726; Sibth. Fl. Græc. t. 451; Sturm. Germ. Fl. I. t. 1; Rchb. Fl. Germ. V. t. 199; Hf. Ind. Fl. I. 436. (*O. pusilla*, Salisb. in Linn. Trans. II. 243; Roxb. Fl. Ind. II. 457).

HAB. Frequent in rubbishy places, toungyas, garden-lands, along road-sides, etc., all over Burmah up to 3500 ft. elevation Fl. Fr. ∞.

Biophytum, DC.

Conspectus of species.

Leaflets nearly straight, in 10-14 pairs; flowers larger; capsule usually much shorter than the calyx; seeds obliquely transverse-furrowed, ...*B. sensitivum.*
Leaflets very unequal at base, in 12-25 pairs; peduncles with a clubbed mass of bracts at apex, ...*B. adiantoides.*
Leaflets equal, in 10-20 pairs; flowers smaller; capsule almost as long as or a little longer than the sepals, small; slender herb, ...*B. Reinwardtii.*

1. B. SENSITIVUM, DC. Prod. I. 690; Wight Ill. t. 62. f. 9; Hf. Ind. Fl. 436. (*Oxalis sensitiva*, L. sp. pl. 622; Roxb. Fl. Ind. II. 457; Bot. Reg. XXXI. t. 68; Jacq. Oxal. t. 78; *B. Candolleanum*, Wight Ill. t. 62).

HAB. Frequent in rubbishy places, on brick-laid paths, fields and toungyas, etc., all over Burma. Fl. May, June; Fr. R. S.

2. B. ADIANTOIDES, Wight ap. Hf. Ind. Fl. I. 437.

HAB. Tenasserim, Mergui (Griff.).

3. B. REINWARDTII, Walp. Rep. I. 476; Hf. Ind. Fl. I. 437.

HAB. Not unfrequent on poor and rocky soil in shrubberies and in the dry and open, especially the Eng, forests all over Burma from Chittagong and Ava down to Tenasserim. Fl. Apr. May.

Averrhoa, L.

Conspectus of species.

Fruits sharply angled; seed arillate, ...*A. Carambola.*
Fruits bluntish angular; seeds without arillus, ...*A. Bilimbi.*

*1. A. CARAMBOLA, L. sp. pl. 613; Roxb. Fl. Ind. II. 450; Griff. Not. Dicot. 455. t. 540. f. 4; Bedd. Fl. Sylv. Madr. t. 39; Hf. Ind. Fl. I. 439.

HAB. Much cultivated in gardens all over the country. Fl. H. S. and R. S.; Fr. C. S.

*2. A. BILIMBI, L. sp. pl. 613; Roxb. Fl. Ind. II. 451; Bedd. Fl. Sylv. t. 117; Hf. Ind. Fl. I. 439.

Hab. Rarely cultivated in Pegu and Tenasserim. Fl. H. S.; Fr. R. S.

The differences between *A. Carambola* and *A. Bilimbi* appear to me to be of generic value.

Impatiens, L.

Conspectus of species.

* Leaves all opposite or occasionally ternately-whorled.

Leaves almost sessile; flowers rather large, wings obtuse, the spur long and slender, inflexed, ... *J. Chinensis.*

Exactly as the preceding, but the spur short and inflexed, ...*J. reticulata.*

Leaves on long petioles; flowers rather small, the wings acuminate, the spur short, incurved, ...*J. circæoides.*

* * Leaves all alternate.

O Flowers shortly racemose, umbellate or corymbose at the ends of the long peduncles.

Leaves petioled; flowers small with a long straight or curved spur, ..*J. Tavoyana.*

O O Peduncles 1- or rarely 2- or 3-flowered, shorter than the leaves.

✕ Spur usually much shorter than the corolla.

† Flowers 1-2 in. long.

Stem succulent, the thickness of a goose-quill; leaves narrow, pubescent or glabrescent shortly petioled. (Spur often very long and slender), ...*J. Balsamina.*

Stem the thickness of the finger, short; leaves elliptic or ovate, glabrous, long-petioled, ...*J. Parishii.*

† † Flowers small.

Glabrous, slender; leaves long-petioled, narrow, ... *J. capillipes.*

✕ ✕ Spur longer than the corolla.

Very slender, glabrous; capsule puberulous; flowers rather large, ...*J. violæflora.*

1. J. Chinensis, L. sp. pl. 1328; Hf. and Th. in Linn. Proc. IV. 119; Hf. Ind. Fl. I. 444. (*J. fasciculata*, Lamk. Enc. Méth. I. 359; Wight Ic. t. 748; Hook. Bot. Mag. t. 4631; *J. heterophylla*, Wall. in Roxb. Fl. Ind. ed. Car. II. 458; *I. setacea*, Coleb. in Hook. Exot. Fl. t. 137).

Hab. Birma (Wall.) Tenasserim (Helf.)

2. J. reticulata, Wall. Pl. As. rar. I. 19. t. 19; Hf. Ind. Fl. I. 448.

Hab. Common in the open especially the low forests and in cultivated lands all over Burma from Ava and Martaban down to Tenasserim. Fl. Nov. Decb.

Hardly more than a form of the preceding. *J. tomentosa*, Heyne, is stated by Hf. and Thoms. in Linn. Proc. to grow in Pegu, but the habitat is omitted in Hf. Fl. Ind. It seems to be the above species, at any rate the Wallichian specimens cited belong here.

3. *J. circæoides*, Wall. ap. Hf. and Th. in Linn. Proc. IV. 130; Hf. Ind. Fl. I. 453.

Hab. Rare in shady places in the moister upper mixed forests of the southern parts of the Pegu Yomah; Tenasserim, Tavoy (Wall.) Fl. Jan.

4. J. Tavoyana, Bth. ap. Hf. and Th. in Linn. Proc. IV. 146.

Hab. Tenasserim, Moulmein District (Zwakabin; Thoungyeen, etc.,) down to Tavoy. Fl. Octob.

*5. J. Balsamina, L. sp. pl. 1328; Roxb. Fl. Ind. I. 651; Hf. and Th. in Linn. Proc. IV. 131; Hf. Ind. Fl. I. 453. (*J. Malayensis*, Griff Not. Dicot. 457. t. 576. f. 2?).

Var. *α*. vulgaris, Hf. and Th. l. c.

Var. *β*. coccinea, Hf. and Th. l. c. (*J. coccinea*, Sims. Bot. Mag. t. 1256).

Hab. Much cultivated by all natives and often as wild in toungyas and in rubbishy places around villages. Fl. H. S.

6. J. Parishii, Hf. Ind. Fl. I. 456.

Hab. Tenasserim, on limestone rocks near Moulmein (Parish).

7. J. capillipes, Hf. and Th. in Linn. Proc. IV. 135; Hf. Ind. Fl. I. 456.

Hab. Tenasserim, Moulmein District on limestone rocks.

8. J. violæflora, Hf. Ind. Fl. I. 457.

Hab. Tenasserim, Moulmein (Lobb.)

Hydrocera, Bl.

1. H. triflora, WA. Prod. I. 140; Miq. Fl. Ind. Bat. I/2. 132. (*Impatiens natans*, Willd. sp. pl. I. 1175; Roxb. Fl. Ind. I. 652).

Hab. Not unfrequent along borders of ditches, watercourses and rice-fields of the Pegu plains. Fl. R. S.

On the Asiatic Species of Molossi.

By G. E. Dobson, B. A., M. B., F. L. S.

(Read May 7th, 1873.)

The *Molossi* are found in all the warmer regions of the earth, but apparently exist in greatest abundance in the tropical and sub-tropical parts of America. They have been divided into several genera of which two only have hitherto been discovered in Asia; of these *Nyctinomus* is alone represented in the Peninsula of India; the other genus *Chiromeles*, containing a single species *C. torquatus*, inhabits the Malay Peninsula, Java, Sumatra, Borneo, and probably other islands of the Malay Archipelago.

Although *Nyctinomus* has a distribution equalled only by *Vespertilio*, extending through the warmer parts of the five great continents, a single species only, *Nyctinomus plicatus*, has been known to exist in the Indian Peninsula.

Another species of *Nyctinomus* has been reported from China by Mr. Swinhoe, most probably *N. Cestonii*, Savi, also from Southern Europe.

The total number of Asiatic species of *Molossi* known previous to 1873 was therefore three, and to these I added in January 1873 a new and most remarkable species, *N. Johorensis*, which Mr. Wood-Mason's private collector* obtained at Johore in the Malay Peninsula, and in this paper I shall describe another new species from India (preserved in the collection in the Indian Museum) which had been confounded with *N. plicatus*.

Genus Nyctinomus, Geoff. *Ears connivent.*

Dentition:—in. $\frac{2}{4}$; c. $\frac{1-1}{1-1}$; p. m. $\frac{2-2}{2-2}$, m. $\frac{3-3}{3-3}$.

a. Ears close together in front, their inner margins having a common point of origin on the forehead; tragus expanded and rounded off above. (Subgenus, *Dinops*).

Nyctinomus Cestonii.

Dinops Cestonii, Savi, Bull. de Sc Nat., VIII, p. 286.

Dysopes Cestonii, Wagner, Suppl. Screber Säugeth., V, p. 702.

Nyctinomus insignis, Blyth, Cat. Mamm. Mus. Asiat. Soc. Beng.

? *Dysopes* (*Molossus*) *Rüppelii*, Swinhoe, Proc. Zool. Soc. Lond., 1870, p. 619.

A specimen in the Indian Museum labelled by Blyth "*Nyctinomus insignis*, Blyth" sent by Mr. Swinhoe from Amoy, undoubtedly belongs to this species. It is an adult male agreeing in every respect with specimens from Southern Europe, having also the peculiar throat pore concealed by the long hair of the neck. I have no doubt that the specimen obtained also at

* I have since ascertained that the specimen alluded to by the author was captured by my valued correspondent Mr. James Meldrum of Johore. J. W-M. [Editor].

Amoy by Mr. Swinhoe and referred to by him under the name of *Dysopes Rüppelii* belongs to this species also.

This adds another species to the large number of *Chiroptera* known to be common to Europe and Asia.

Nyctinomus tragatus, n. sp.

The shape of the tragus is similar to that of *N. Cestonii*, and has the same relative size; ears like those of *N. plicatus* but not connected by a band in front; wing-membrane from the ankles; calcaneum distinct, terminating in a lobe; free portion of the tail shorter than in *N. plicatus*.

This species, though so very well distinguished from *N. plicatus* by the above-mentioned characters, resembles that species very closely in general aspect, and the measurements of the different parts correspond so closely that on a superficial examination it may be confounded with it.

I found, in a bottle in the Indian Museum which had been labelled *N. plicatus* by Blyth, two specimens, of which one only was referable to that species, the other presented the characters enumerated above and so has formed the type for my new species. The Indian Museum has since received other specimens of *N. tragatus* from Rajanpur on the north-western frontier of India, and from Jashpur near Chutia Nagpur.

b. Ears conjoined at the base of their inner margins; tragus very small, quadrate. (Subgenus, *Dysopes*).

Nyctinomus plicatus.

Vespertilio plicatus, Buchanan, Trans. Linn. Soc., 1800, Vol. V, p. 261.
Nyctinomus Bengalensis, Geoff., Desc. de l'Egypte, II, p. 130.
Nyctinomus tenuis, Horsf., Zool. Researches in Java.
Mops Indicus, F. Cuvier, Dents des Mammif., p. 49.
Dysopes plicatus, Temm., Monog. de Mammal., Vol. 1, p. 223.

I have examined Buchanan's type of this species from General Hardwicke's collection in the British Museum, also specimens of *N. tenuis*, Horsfd. from Java. The only perceptible difference consists in the attachment of the wing-membrane. In *N. plicatus* although a strong raphé passes from the ankle along the tibia to the margin of the wing-membrane yet the latter can only be said to commence from a point nearly midway between the ankle and the knee joints, while in *N. tenuis* the wing has its origin from the ankle joint or very close to it. It would be necessary before separating the Indian and Javanese forms into distinct species to examine a large series of specimens as it is probable that intermediate examples exist.

To this section, distinguished by the very small tragus, and by the connection of the ears in front by a low band, belongs also *N. Ægyptiacus* from Africa.

c. Ears connected in front by a deep band produced upwards, and posteriorly by a second band enclosing a hollow naked space between, on the crown of the head ; tragus small quadrate. (Subgenus, *Chærephon**).

NYCTINOMUS JOHORENSIS.

Nyctinomus Johorensis, Dobson, Proc. As. Soc. Beng., January 1873.

I have nothing to add to my description of this very interesting species. The type specimen preserved in the Indian Museum, an adult male, is the only representative of the species. It would be very desirable to obtain other specimens, especially females, as the peculiar cavity on the head between the ears may be a secondary sexual character analogous to the frontal sac of some species of *Phyllorhina*.

Genus CHIROMELES, Horsf. *Ears separate, distinct.*

Dentition :—in. $\frac{2}{2}$; c. $\frac{1-1}{1-1}$; p. m. $\frac{1-1}{2-2}$; m. $\frac{3-3}{3-3}$.

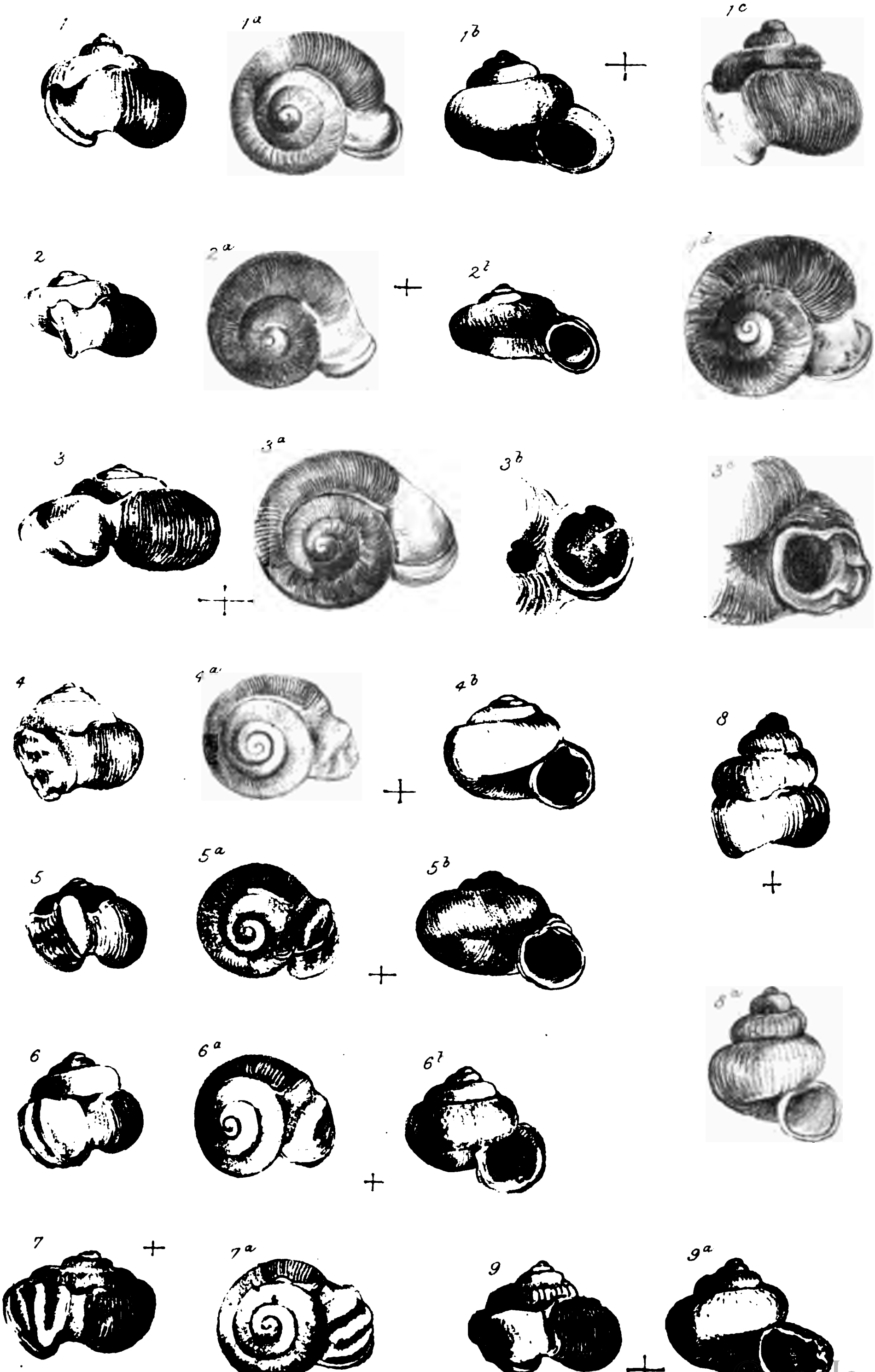
CHIROMELES TORQUATUS.

Chiromeles torquatus, Horsfd., Zool. Researches in Java.

Chiromeles torquatus et caudatus, Temm., Monog. de Mammal., I, p. 218 and II, p. 348.

The upper incisors are stout and placed close together; the upper premolar is large and tricuspidate; the 1st lower premolar is minute and wedged in the space between the canine and second premolar, which are close together; the last upper molar is less than half the size of the second molar.

* Χαιρεφῶν, Aristophanes, *Aves*, 1296, 1564.



ALYCÆI, NAGA HILLS AND ASSAM.

JOURNAL

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Part II.—PHYSICAL SCIENCE, &c.

No. III.—1874.

Descriptions of nine species of Alycæinæ from Assam and the Naga Hills.—*By Major* H. H. Godwin-Austen, *F. R. G. S., F. Z. S., &c., Deputy Superintendent Topographical Survey of India.*

(With Plate III).

(Read August 6th, 1874).

Another season of research in the N. E. frontier has added largely to its terrestrial molluscan fauna, and I was particularly fortunate among the smaller forms of the Cyclostomacea. The *Alycæi* particularly seem to be inexhaustible; the different species are very local but very persistent in character over comparatively small areas, and as they are generally abundant where they occur, the idea that they are accidental varieties is not supported. Very few have a wide vertical distribution and several common forms of the Khási Hills, at a distance of 120 miles east, in the Naga country, are absent or become very rare indeed. The whole section is a most interesting one and illustrates admirably the many changes that nature will ring on any particular form of life, when confined to particular habitats suited for their development and again subjected to all the slow alternations in climate, soil, &c. that time produces.

I give at the end of the paper a few additional notes as to the range of some species of the group previously described and again met with. Several species of *Alycæi* when taken in a fresh state are found covered with a coating of earthy matter rendering them very indistinct and difficult to find, especially as they are to be generally found below the surface and under the dead leaves and decaying bark and sticks that cover the ground so thickly in old forest. Dead shells may be sometimes seen in hundreds in the clearings after the cut jungle has been fired, when all the surface vegetable mould is burnt and the ground deeply heated; in this way many local forms of landshells are destroyed off large areas as the country becomes cleared, and many of the more local species no doubt have thus died out.

ALYCÆUS INFLATUS, n. sp., Plate III, Fig. 1.

Shell depressedly turbinate, solid, pale ochreous horny, moderately umbilicated, smooth, finely sculptured on the swollen portion of the last whorl adjacent to the sutural tube. Spire conoid, apex blunt; suture impressed. Whorls $4\frac{1}{2}$, the last very much swollen for the size of the shell. Constriction smooth, very short. Sutural tube moderate. Aperture oblique, circular; peristome double, solid, united, and reflected. Operculum concave, black, its position far forward at the very edge of the aperture.

Dimensions, major diam. 0·28″—0·16,″ minor diam. 019″—0·13,″ alt. 0·15 —0·11,″ diam. ap. 0·07.″

Habitat.—I first noticed this shell in the collection of Mr. F. Stoliczka, who kindly allowed me to take it for figuring; it had been found in Assam, but its exact locality was unknown. In the winter of 1872-73 I was fortunate to find it myself in the Naga Hills under Japvo Peak and again at Yémi, Phúnggum, and Gaziphimi at the head of the Lanier River on the main water-shed.

This shell in many respects assimilates to *A. conicus*, mihi, but is more openly umbilicated; in another direction it has the character of the sub-genus *Dioryx* viz. in form of mouth, the short constriction, and position of operculum close to the edge of the aperture.

ALYCÆUS STRIGATUS, n. sp., Plate III, Fig. 2.

Shell pale corneous or amber, finely and evenly costulated throughout. Spire depressed, apex blunt and darker coloured. Suture moderate. Whorls $3\frac{1}{2}$, the last very little swollen, slightly constricted, with a single low ridge close behind the aperture, the constriction smooth and very finely striated. Sutural tube very short. Aperture slightly oblique, circular; peristome single, simple, continuous, moderately thickened. Operculum...... ?

Habitat.—Assam in collection Ferd. Stoliczka.

Major diam. 0·15,″ minor diam. 0·11,″ alt. 0·08,″ diam. ap. 0·05,″.

This is another species of the short-sutural-tubed section of *Alycæus*, of which *A. Khasiacus* (vide Pl. III, Fig. 4, J. A. S. Bengal, Vol. XL, Pt. II, 1871) is a good type. The general and distinct costulation from constriction to apex, particularly the form of constriction and mouth, mark it as a good species. It is more openly umbilicated than *A. Khasiacus.*

I have an *Alycæus* from Darjeeling, found by Mr. F. Stoliczka, but as I possess but a a single much worn specimen, I hesitate to describe it more fully: it is very similar to *A. Theobaldi,* Bs. from the Khási Hills, but is smaller with a more expanded aperture; peristome less thickened, and the sculpture appears to have been very fine; I name it *A. lenticulus,* and trust some day to get other specimens. Dimensions, major diam. 0·14," minor diam. 0 11," alt. 0·08".

ALYCÆUS STOLICZKII, n. sp., Pl. III. Fig. 3.

Shell globosely turbinate, thick, pale horny, finely and closely ribbed from the swell of the first whorl as far back as the end of the sutural tube, thence to the apex distantly and finely costulated; narrowly umbilicated, spire conoid; apex blunt; suture well impressed. Whorls 4½, rounded, the last swollen, then sharply constricted close to the origin of the sutural tube, again swelling and expanding to the mouth. Constriction smooth with a few distant lines of costulation. The sutural tube peculiarly long. Aperture oblique, circular; peristome double, outer lip small, the inner much produced and expanded into 2 broad shallow channels on the inside of the outer margin separated by a V-shaped thickening of the same (see Fig. 3^b). Operculum black, concave, of the usual multi-spiral form.

Major diam. 0·31"—C·28," minor diam. 0·24"—0·20," alt. 0.17"—0·15," diam. ap. 0·12," sutural tube 0·15."

Habitat.—Two specimens were obtained for me by Mr. Belletty on Angaoluo Peak, Nágá Hills at 7,000 feet, during field season of 1872-73. I found it again further to the east at Kezakenomih, and at the head of the Lanier River at about 5,000 feet where the specimens were much larger. It comes near to the forms of *A. Ingrami,* W. Blf. var. (Pl. IV and V, J. A. S. Bengal, Vol. XL, Pt. II, 1871) from the same range of mountains, but its tumid shape, and particularly the very produced aperture, render it a very distinct and well marked species. I have named it after that very accomplished conchologist F. Stoliczka* of the Geological Survey of India.

ALYCÆUS GLOBULUS, n. sp., Pl. III. Fig. 4.

Shell moderately umbilicated, globosely turbinate, white, finely costulated on the swell of the first whorl, becoming gradually smooth thence to the apex. Spire conoid, apex flat and rounded. Whorls 4½, flat, the last mo-

* Since this paper was written, the sad news has reached us that this highly gifted naturalist—to whom all readers of this Journal and I personally owe so deep a debt of gratitude, and who to many of us was a dear and cherished friend—had succumbed to the exposure when in Yarkund and on his return journey to Leh. It may be truly said of Stoliczka that he gave his life to the very last, and died nobly in the pursuit of Science.

derately swollen, then sharply constricted and again enlarged by a ridge, from which emanate four minor longitudinal ridges on the expanded portion of the peristome. Constriction narrow, close to sutural tube, this is moderate in length and about equal to the distance of its base to lip. Aperture much expanded, oblique, round, angulate above, waved on outer margin and channelled within; the outer lip of peristome thin, slightly recurved on the inner lower margin. Operculum black, multi-spirial, concave.

Major diam. 0·20,″ minor diam. 0·16,″ alt. 0·13,″

Habitat.—Phunggum, a Naga village at head of the Lanier valley, at 5,000 feet, where it is abundant.

It is near the *crispatus* form described in my last paper. Its larger globose form, long sutural tube, and more open umbilicus, mark it as distinct.

Alycæus bicrenatus, n. sp., Pl. III, Fig. 5.

Shell moderately umbilicated, sub-turbinate, pale corneous or nearly white, fine close ribbing on swell of last whorl, extending to behind the termination of the sutural tube and thence to apex very finely and evenly costulated. Spire depressedly conoid, suture impressed, apex blunt. Whorls 4, the last moderately swollen, constriction rather wide, followed by a single well defined high ridge close behind the expanded portion of the aperture where it is defined by a sharp narrow costulate rib. The expanded portion anterior to this is longitudinally waved on surface, produced by two deep triangular grooves situated well within the aperture and on outer margin. Sutural tube short. Aperture oblique; peristome round, slightly angular above. Operculum, pale horny, concave.

Major diam. 0·14,″ minor diam. 0·10,″ alt. 0·09,″ sutural tube 0·42.″

Habitat.—Kopamedza Peak Naga Hill, 8—9,000 feet, in forest.

This shell belongs to the same group as the last and is very close to *A. crenatus*, mihi (vide plate III, fig. 5, J. A. S. B., Pt. II, 1871), but the longer sutural tube and the strongly crenated peristome of *crenatus* mark the distinction.

Alycæus serratus, n. sp., Pl. III, Fig. 6.

Shell very closely umbilicated, turbinate, rather thin, pale corneous or dark brown, finely costulated on tumid portion of last whorl, rest of shell smooth with shining surface, suture moderately impressed. Spire conoid, apex pointed. Whorls 4, rounded, the last very slightly tumid, constricted and enlarged into a low recurved ridge. Sutural tube moderate. Aperture sub-vertical, circular, very finely notched on lower and outer margin; peristome double, thick, the outer reflected on the inner margin. Operculum thin, pale horny, flat in front.

Major diam. 0·10," minor diam. 0·09," alt. 0·09," sutural tube 0·75."

Habitat.—Laisen Trigl. station, Munipur Hills; rare, some eight specimens only having been found.

In the thickened rounded form of the peristome this species assimilates to *A. conicus*, but the minute notches on the inner margin are peculiar and unlike what is seen in any form I am acquainted with. It seems intermediate between the above and *A. diagonius*.

Alycæus multirugosus, n. sp., Pl. III, Fig. 7.

Shell depressedly sub-turbinate, rather openly umbilicated, translucent, pale corneous, smooth glistening surface, very minute ribbing near sutural tube. Spire flatly conoid; whorls 4, flat, the last very little swollen, constricted and enlarged again towards the aperture into a zigzag-shaped ridge or what might be described as three parallel and connected ridges. Sutural tube short. Aperture oblique, circular; peristome double, both continuous and the outer slightly reflected. Operculum...... ?

Major diam. 0·12," minor diam. 0·08," alt. 0·08," sutural tube 0.037."

Habitat.—Hills at head of the Lanier River, Naga Hills, about 5—6,000 feet, rare.

A close ally of *A. Khasiacus*, mihi, but a much smaller shell; the many ridged area near constriction, however, is a wide departure from that form. A large var. of *A. Khasiacus* occurred at Gaziphima and, as an instance of local variability in this genus, a few of the specimens have a slight tendency to a fimbriated peristome as in *A. crenatus*, mihi.

Alycæus (Dioryx) graphicus, W. Blf., var. minor, Pl. III, Fig. 8.

This shell is much smaller than *graphicus* from the Khasi Hills, &c., and is longer in spire with close costulation throughout.

The differences though persistent in Naga Hill specimens are not sufficient to make the form distinct.

Major diam. 0·10," alt. 0·12."

Alycæus Burtii, n. sp., Plate III, Fig. 9.

Shell turbinate, openly umbilicated, thick, pale ochreous; shallow but well marked ribbing on swell of last whorl and finely costulated on the apex. Spire conoid, apex sharp, suture well impressed. Whorls 5, the last moderately swollen, constriction very slight, short, and smooth up to the peristome, sutural tube moderate, rather large at base. Aperture oblique, laterally oval, angular on inner upper margin, with 4 well marked notches on the outer margin; peristome thickened, double, well reflected, inner lip continuous.

Major diam. 0·22," minor diam. 0·19," alt. 0·15."

Habitat.—Foot of the Bhutan Himalaya at the debouchement of the Barowli River, Assam; collected by Mr. J. Burt, to whom my thanks are due for this and some other interesting shells.

It is close to *A. polygonoma*, but the form of constriction is slightly different, the peristome is well crenulated, and the sculpture stronger. At Kamakia hill near Gowhatty, I obtained specimens of an *Alycæus* still nearer in form to *polygonoma*, only that the sutural tube is but about half the length, ending abruptly, while in *polygonoma* it is long and thread-like. I shall describe it in my next paper.

A. crenatus was found as far east as Shiroifurar, also at Kezakenomih and Yémai.

A. Ingrami, var. is the commonest form in the Naga Hills and has a great range in altitude, being found at Dimapur in the Dunsiri valley under 300 feet and as high as 7,000 feet at Khúnho Peak on the Burrail range, also at Laisen Hill and Sikhámi, and on the east side of the Munipur valley on the slopes of Nongmaiching and Múngching.

A. Nagaensis I have from Kezakenomih, Kopamedza, Prowi, Laisen, and Nongmaiching.

A. Khasiacus occurred as far east as Kopamedza Peak, where it was associated with the nearly allied form above described, *A. multirugosus*.

A. urnula, Bens. is a very abundant shell all along the Burrail range, it retains the type form more persistently than any species of the genus known to me. Very fine large speeimens were collected at Kezakenomih, Naga Hills; dimensions, alt. 0·20," diam. 0·20".

A. diagonius and *A. crispatus*, I found again in the Dunsiri valley, Dimapur, and lower spurs of the eastern Burrail.

A. prosectus, Bens., so common in the Khasi Hills, is very rare in the eastern Naga Hills and I procured 2 or 3 specimens only; these shew a transition, for they are not quite identical with the type form from Teria Ghat.

Explanation of Plate III.

Fig. 1, 1*a*, 1*b*, 1c, 1*d*, *Alycæus inflatus.*
Fig. 2, 2*a*, 2*b*, „ *strigatus.*
Fig. 3, 3*a*, 3*b*, „ *Stoliczkii.*
Fig. 4, 4*a*, 4*b*, „ *globulus.*
Fig. 5, 5*a*, 5*b*, „ *bicrenatus.*
Fig. 6, 6*a*, 6*b*, „ *serratus.*
Fig. 7, 7*a*, „ *multirugosus.*
Fig. 8, 8*a*, „ (*Dioryx*) *graphicus, var. minor.*
Fig. 9, 9*a*, „ *Burtii.*

J. Smit lith

M&N Hanhart imp

LAYARDIA ROBIGINOSA.

GARRULAX ALBOSUPERCILIARIS

Godwin Austen, del. Maclure & Macdonald imp.

SIBIA PULCHELLA.

Godwin Austen del. Maclure & Macdonald, imp

J. Smit. lith. M & N. Hanhart. imp

TURDINUS GAROENSIS.

Godwin-Austen, del.

1. CISTICOLA MUNIPURENSIS. Nat Size
2. PRINIA RUFULA

Maclure & Macdonald imp.

Godwin-Austen, del. Maclure & Macdonald imp.

1. CISTICOLA MUNIPURENSIS Nat Size
2. PRINIA RUFULA

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Plate V

Godwin-Austen, del.

1. CISTICOLA MELANOCEPHALA. Nat Size.
2 „ SCHÆNICOLA. „

Maclure & Macdonald

Fourth list of birds principally from the Naga Hills and Munipur, including others from the Khasi, Garo, and Tipperah Hills.—*By Major* H. H. Godwin-Austen, *F. R. G. S., F. Z. S., &c., Deputy Superintendent, Topographical Survey of India.*

(With Plates IV—X).

(Read May 6th, 1874).

In adverting to the hope expressed in my former papers, that the lists of birds from the N. E. frontier might be added to by members of the Survey Party ; I have to thank several members of it for the aid they afforded, and especially are my thanks due to Mr. Wm. Robert, who was working during the field season of 1872-73 in the Garo Hills.

I must remind all connected with these survey operations that as they penetrate to the eastward, no finer field for ornithological research can be now found in India, as is shewn by the many beautiful new forms, that I was fortunate enough to obtain during my visit to the Naga Hills and Munipur in the winter of 1872-73. Ten of these have been described by me in the P. Z. S., one in the 'Annals and Magazine of Natural History,' and Mr. Gould has described one in the 'Birds of Asia.' I have introduced these descriptions again to render the paper of more use to ornithologists in India, into whose hands it is likely to fall.

This fourth list contains 112 species, which with 380 before recorded brings the number collected up to 492.

I have adhered to my former resolve not to bring into the list any bird which has not been actually bagged, the record of species seen on the wing, especially of the smaller duller birds, not being of any real value. Thus some very common forms are still absent. A few corrections have to be made in my former lists and some further detail is necessary regarding two or three birds that were brought into List No. 3, which was prepared somewhat hastily. I supply figures of seven of the new species, which will go some way, I trust, towards counterbalancing the imperfections which the paper may contain.

In the determination of the species, I have received very cordial assistance from Lord Walden, whose fine collection from British India and Malayana aided most materially. In expressing thanks for assistance afforded, I must also include the name of Mr. R. B. Sharpe, in charge of the ornithological branch at the British Museum, who was always ready to place his time and the collection at my disposal.

GARRULAX ALBOSUPERCILIARIS.

Godwin-Austen, del.

Maclure & Macdonald, imp.

Godwin Austen, del.

Maclure & Macdonald, imp

SITTA NAGAENSIS.

20.* HIERAX EUTOLMOS, Hodg.

Garo Hills. Appears never to be a common bird anywhere. I received two skins from the above hills, where it was obtained by Mr. Wm. Robert. I never saw it on the east of the Khasi Hills, where it appears to be replaced by *H. melanoleucos*, Blyth. Their habits are Shrike-like; they sit on isolated dead trees in the forest clearings and sally off from time to time to seize some insect.

37. LIMNAETUS KIENIERII, De Sparre.

This rare and handsome Hawk Eagle was obtained for me by Mr. W. Robert of the Topographical Survey in the Naga Hills during the cold season.

Length of wing 15·75," tail 10," tarsus 3·95," bill from gape 1·5." There is a fine specimen set up in the British Museum. Rare everywhere it appears to have a great range.

56*a*. MILVUS MELANOTIS, Tem. and Schl.

I obtained this species in February in the Munipur valley; but it was not numerous.

80. GLAUCIDIUM BRODIÆI, Burton.

Naga Hills. This bird is not common in these hills; its monotonous call at night is not so often heard as about Mussoorie in the N. W. Provinces.

82*a*. HIRUNDO CAHIRICA, Sav. = HIRUNDO TYTLERI, Jerdon.

My specimens from Munipur are evidently identical with Jerdon's bird observed at Dacca in June, it was the only form in Munipur in February and March, and very numerous at Imphal the capital; it was then commencing to breed. Darjeeling specimens in the collection of Lord Walden are still more like *Cahirica* from Egypt.

†W. 4·6," T. 3·4, t". 0.4," Bf. 0·3."

Hirundo gutturalis, Scop. is the form I obtained in the Naga Hills at about 5000 feet in January and February, and recorded from the Khasi Hills as *H. rustica* in my first list. Specimen from Naga Hills measures, W. 4·5," T. 4·3," t. 0·45," Bf. 0 3." At Shillong I did not notice them in any number until about July.

* The numbers refer to those in "Jerdon's Birds of India."

† Throughout this paper L. stands for Length, W. Wing, T. tail, t. tarsus, Bf. bill at front, Bg. bill at gape.

100*a*. CYPSELUS SUBFURCATUS, Blyth.

This is, I think, the first record of the occurrence of this species within the Indian area. I observed a few pairs in June breeding in the cliffs that overhang the falls of the "Umkrau" at Shillong. They were not easy to obtain, and the first I shot fell into grass so far down that it was never found; however, a day or two after I secured one, and after this they soon left the place. I could not get at the nests. My specimen agrees with those from Amoy and Malacca in Lord Walden's collection.

Wing, 5·1," t. 0·5," bf. 0·23." It will probably be found in all similar deep valleys with precipitous sides that occur in the Khási hills.

108*a*. CAPRIMULGUS JOTAKA, ♀, Schlegel.

I shot this bird near the Umshirpi falls on the 29th May. It got up off the path and immediately settled again about 10 yards off on the open path, on again putting it up it did the same. Captain Badgley, who was walking behind me, called out that he had found the eggs. I then put the bird up a third time and brought her down. The eggs were laid close in under the rock on side of the path lying on the bare ground with no signs of any thing in the way of preparation for them or the young. The two eggs are of a dull white, blotched with three shades of umber and one shade of ashy brown: in the one they are distributed pretty evenly throughout and this is symmetrical in form, the minor axis being in the centre of the length: in the other the markings are mostly confined to the larger end and the shape is rounder:

1st.	major axis	1·22,	minor axis	0·88."
2nd.	"	1·19,"	"	0·91."

Another ♀ was obtained by me near the village of Sopvomah in the Naga Hills, in January, at an elevation of 5000 feet, which, Lord Walden tells me, is identical with Japanese and Burmese individuals.

Caprimulgus is a common bird at Shillong during May and part of June, after which I did not hear their chukking noise so often, and at the time I started for Calcutta in August, they had apparently left the vicinity of the station owing probably to the increased rain-fall.

114. CAPRIMULGUS MONTICOLUS, Franklin.

From the Garo Hills.

W. 7·55," T. 4·85," t. 0· 83."

122. NYCTIORNIS ATHERTONI, Jard. and Selby.

Garo and Naga Hills.

126. EURYSTOMUS ORIENTALIS, Lin.

This beautiful Roller is essentially a forest bird and was seen on several occasions on the Dunsiri. They frequented the trees that surround the large tanks at Dimapur, and I shot my specimens there.

140. HOMRAIUS BICORNIS, Lin.

Several fine specimens were brought in by Captain Badgley and Mr. Chennell from the Tipperah Hills. In the Naga Hills I observed four large Hornbills, which I believe were this species, near Tellizo Peak, in January,—the only Hornbills seen in that part of the hills, no fruit then being ripe. In the low Dunsiri forest, at that season of the year, Hornbills are very numerous.

The Tipperah birds were very fine, their dimensions greatly exceeding those given in Jerdon's 'Birds of India;' the largest measured as follows:

Wing 21·5," tail 19·0, tarsus, 3·0"

Length of bill along commissure to gape, ...	12·0"
Bill in a straight line from point to gape, ...	10.75"
Length of bill over culmen to posterior of casque, ...	16·5"
Depth of bill at centre of casque (highest part), ...	4·5"
Length of casque, ...	7·0"
Breadth of casque at base, ...	3·68"

Orange pink above, pinkish yellow on side of upper mandible and very red at the point; the lower is wax-yellow.

156. PICUS CATHPHARIUS, Hodgson.

One specimen was got in the Nágá Hills in the rather open country near Sikhami.

♂ Description. Upper parts pure black. Primary coverts tipped white secondary wholly white, forming a very large wing patch. The white spots on both webs of the alars are arranged thus:

Primaries.	1st	2nd	3rd	4th	5th	6th	all the rest.
Inner web.	2	3	3	4	4	4	4
Outer web.	1	5	6	6	6	5	4
			tipped white				

Tail coloured diagonally buff on 3 outer tail feathers, which have a subterminal black spot, and the two outer either with a narrow black bar or two spots. Both above and below the eye pure white, buffish on the ear-coverts and frontal band; white at base of lower mandible, becoming buff on lower throat, and pale ochre on breast and abdomen, much streaked with black particularly so on former. A black band from base of lower mandible, down side of neck, fading into the streaks of the upper breast. Occiput and side of neck crimson extending round behind ear-coverts and crossing the black line from the gape forming a gorget in front. Under tail-coverts pale crimson.

It is called "Khupi woi ru" by the Anghámi Nágás.

161. HYPOPICUS HYPERYTHRUS, Vigors.

Naga Hills.

Wing black, the primary coverts tipped white and the primaries spotted on outer-web. Tail black, two outer feathers barred black at tip, the antepenultimate tipped brown and with a single white spot. Bill pale yellow beneath.

168. MULLERIPICUS PULVERULENTUS, Temm.

Mr. Wm. Robert sent me this large form from the Garo Hills.

Bill greenish grey, lower mandible pale at tip.

176. VENILIA PYRRHOTIS, Hodgs.

Naga Hills.

177. GECINULUS GRANTIA, McClelland.

♂ and ♀ from Garo Hills.

The female wants the dull crimson on fore part of head and there is less yellow in the dull green of head and neck, the former in front is dull ochraceous.

201. CUCULUS POLIOCEPHALUS, Latham.

This bird was very abundant at Shillong in the early summer months, and I obtained it in every phase of coloration from the intense rufous to the pure ashy. The peculiar loud call is heard all over the Pine forests and I observed that sometimes the bird when perching sat along the branch, after the manner of *Caprimulgus.*

205. HIEROCOCCYX VARIUS, Vahl.

Garo Hills.

211*a*. CHRYSOCOCCYX XANTHORHYNCHOS, Horsfd.

This lovely bird from Hill Tipperah was obtained there by Mr. Ross Mangles, by whom it was given to me.

212. COCCYSTES MELANOLEUCOS, Gmel.

Was rather a common bird at Shillong in June. I have often witnessed the noisy way in which the males chase the female and Blyth's description is very true; a female measured—

L. 12·6," W. 5·9," T. 7·25," *t.* 1·15," *Bf.* 0·8;" irides very dark brown, legs pale plumbeous. The contents of the stomach of this bird were 3 of the large hairy caterpillars (3½ inches long) so common on the grass-lands in the Khasi Hills. This female had at least 10 eggs in ovary, which presented no very great difference of gradation in size. The cæca were 0·95" in length, intestine 11·5."

213. Coccystes coromandus, Lin.

I have received this bird from the Garo Hills and from Hill Tipperah.

227. Æthopyga gouldiæ, Vigors.

♂ obtained at Mezimih, Naga Hills, at head of the Lanier River, at 6000 feet. L. 5·8." W. 2·08," T. 3·18, *t.* 0·55," *Bf.* 0·58." It has a steel blue spot below the ear-coverts not noticed by Jerdon. The crimson extends over the eye as a supercilium and the lores are black.

228. Æthopyga ignicauda, Hodg.

This was rather a common bird in the Naga Hills at 5000 feet in January; generally seen in vicinity of the villages, in its winter dress. In my specimen the breast is not dashed with red at all, being quite plain orange yellow towards abdomen, and the female has no red about her at all. My female specimen has a slight trace of red just appearing on the feathers of the nape and back of neck. I fancy they ascend to breed about 9000 feet. *Saturata* was common at that altitude in April.

237. Dicæum chrysorhœum, Temm.

On the Samaguting ridge, *Nectarinidæ* were very common in the winter months, and I obtained this comparatively rare bird near the station in December. The irides are bright red, legs black.

L. 3·9," W. 2 3," T. 1·4," *t.* 0·52," Bf. 0·4."

233*a*. Leptocoma hasselti, Temminck.

From Hill Tipperah; added to my collection by Mr. Ross Mangles, B. C. S.

242. Pachyglossa melanoxantha, Hodgson.

Shot at Sopvomah, Naga Hills, in December.

I was fortunate in discovering this curious form so far to the eastward in a new locality, it having been hitherto only known from Nipal and, I think, Ceylon. Jerdon says that the upper tail-coverts are green, in my specimen they are concolorous with the back. The irides are red and the legs dark plumbeous. Bill black.

Wing 2·9," T. 1·8," *t.* 0·6," Bf. 0·3."

Description. Above, all dull dusky grey, tail darker and brighter. Wing black, the secondaries sepia-brown. Sides of head same as the back. A white streak extends from base of bill down the centre of throat, some white about the sides of breast. Lower breast, abdomen, and under tail-coverts bright yellow. The two outer tail-feathers with a white spot on inner web close to the tip. Inside wing white.

244. CERTHIA NIPALENSIS, Hodgs.

A single specimen from the Naga Hills.

248*a*. SITTA NAGAENSIS, Godwin-Austen, Plate IV.

Was first noticed at Sopvomah in the Nágá Hills last winter and I obtained several specimens on the watershed at about 6000 feet. It has been described by me in the P. Z. S., 1874. I give a drawing and description.

Description. Above slaty blue, wings and centre tail feathers same colour but paler. Quills dull pale black. A black streak through lores extending to ear-coverts and down side of neck. Beneath dull dirty white, purer on chin and throat, with a few white feathers bounding the ear-coverts. Flanks thighs and under tail-coverts dark rusty chesnut, all the latter with a terminal white spot. Outer tail feathers black, a white patch on inner web of the three outer, which are tipped grey and terminally black on outer web, white on middle portion of the outer web of the outermost tail feather.

Bill black above, grey below. Irides dark brown; legs green black.

L. 4.9," W. 3·0," T. 1·75," *t.* 0·68," *Bf.* 0·58." spread of foot 1·2."

260*a*. LANIUS COLLURIOIDES, Lesson = HYPOLEUCOS, Blyth.

Found in the Iril valley, Munipur, in February and March, rare; this and *L. tephronotus* were the only Shrikes seen in Munipur. L. 7·5," W. 3·5," T. 3·8," *t.* 1·0," *Bf.* 0·58."

286. CHIBIA HOTTENTOTA, Lin.

Garo and Khasi Hills.

289. TCHITREA AFFINIS, A. Hay.

Samaguting, April. ♂ in full plumage.

L. 8·5," W. 3·6," T. 11·25," *t.* 0·58," *Bf.* 0·65."

310. MUSCICAPULA SUPERCILIARIS, Jerdon.

Young agrees with a drawing by Dr. Jerdon of the above in immature plumage; my specimen is from the Naga Hills.

331. MUSCICAPULA ŒSTIGMA, Hodgs.

Dr. Jerdon had told me that he obtained this rare Fly-catcher in the isolated dense patches of forest, on the north side of Shillong Peak in the

Khasi Hills; on my return to Shillong I looked for and found it tolerably numerous, getting some 8 specimens in May and June.

♂ Description. Above, side of neck, and upper breast cyaneous blue; wings and tail are black edged with same. A narrowish white line from base of lower bill to breast, which, with abdomen and under tail-coverts, is pure white; legs dark brown; bill black.

L. 4·5," W. 2·4," T. 1·78,' t. 0·6," *Bf.* 0·42."

I did not obtain a female, but it would appear, from a drawing by Dr. Jerdon, to be dull olivaceous above with white throat and breast.

323*a*. Erythrosterna sordida, n. sp.

Three specimens of this bird were shot under Japvo Peak in January; having failed to identify it, I believe it to be undescribed.

Description. Above dull olivaceous brown, ochraceous on rump and upper tail-feathers. Tail umber-brown slightly tinged with ochre on outer web. Quills same as tail and pale-edged. The primary and secondary coverts very slightly tipped pale so as to form an inconspicuous bar on the wing. A pale ring round eye. Lores and ear-coverts dull grey with a rufous tinge. Beneath dull lutescent, darker on flanks. Centre of abdomen and under tail-coverts white.

L. 5·25," W. 2·6," T. 2·4," *t.* 0·5," Bf. 0·23." It is somewhat similar to *E. leucura* but the white basal half of the tail feathers in this last-named bird distinguishes it at once.

322. Siphia erythraca, Blyth and Jerdon.

This rare bird occurred under Japvo Peak, Naga Hills, at 6000 feet.

L. 5·0," W. 2·85," T. 2·2," *t.* 0·6," Bf. 0·35." A single specimen was procured by Jerdon at Darjeeling.

325. Erythrosterna acornaus, Hodg.

I have this sombre coloured grey Fly-catcher from the Ihang valley in Munipur and from Shillong in the Khasi Hills; the specimen from the former locality measures, L. 4·0," W. 2·2," T. 1·6," *t.* 0.58," *Bf.* 0·33."

326. Erythrosterna maculata, Tickell.

Obtained in the Naga Hills by Mr. Wm. Robert, extending its range considerably to the eastward.

346. Pitta cucullata, Hartlaub.

Given to me among other specimens from the Tipperah Hills by Mr. Ross Mangles. It is worthy of remark that now after 3 years of collecting I have never seen a *Pitta* on or near the northern range of hills south of the Brahmaputra (commencing with the Garos, and thence to the eastward) save the large dull coloured form of Ground Thrush, *Hydrornis Nipalensis* of Hodgson, which occurs on the Burrail range.

346*u*. Pitta cyanea, Blyth.

Given to me by Mr. Chennell of the Topographical Survey, who obtained it in Hill Tipperah. It is one of the most beautiful of these richly coloured Ground Thrushes.

366. Planesticus fuscatus, Pall.

This bird, which agrees well with Jerdon's description, I shot on the Peak of Japvo, the highest point of the Burrail range just under 10,000 feet, during some hard weather in the early part of January; only one specimen was secured.

Description. Above umber-brown darker on the head, the feathers dark centered; rump ferruginous. Wing and tail dusky brown, coverts and secondaries edged pale rufous; a well-marked supercilium white, becoming broader behind the eye. Lores dark brown, ear-coverts the same but lighter. A rufous tinge on lower side of the neck; chin and throat sullied white, with an indistinct stripe, commencing as spots, extending from base of bill, down side of neck, and round to the ear-coverts. A gorget on breast grey brown, with rufous tinge near shoulder of wing and spotted with dark umber. Lower breast and belly pure white; under tail-coverts pinky ferruginous and pale tipped. Flanks and thighs tinged rufous the former spotted brown. Under wing-coverts rich ferruginous. The inside of quills grey.

Length 8·5," Tail 3·4," *t.* 1·3," *Bf.* 0·62." Irides dark brown; bill black above, dull yellow below; legs dull brown.

This bird much resembles *G. unicolor*, but is not so plainly coloured on the back.

373*a*. Paradoxornis Austeni, n. sp., Gould.

At Kuchai in the Naga Hills, at about 6000 feet elevation, in April, I obtained two specimens of this bird; I afterwards procured three at Shillong in the summer. They differed so much from my original specimens of *P. flavirostris* shot in the low marshy country at the base of the hills that I was inclined to consider them distinct. Mr. Gould, to whom I shewed these specimens and who had figured *P. flavirostris* from the original specimens sent home, pronounced them to be new to him, and has described and figured the species in the 'Birds of Asia,' under the above title. Not having his description, I will only mention that the chief points of difference lie in the pale nearly white colour of the under parts, the paler brown of the back, and a markedly different distribution of the black on side of head and breast.

My specimens measured—

L. 7·8," W. 3·3," T. 4·1," t. 1·05," Bf. 0·67," Bg. 0·4;" which dimensions are smaller than those of *P. flavirostris.*

Legs plumbeous with a slight tinge of green; bill yellow.

385. Pyctorhis Sinensis, Gmel.

This Babbler is very common in Munipur; dimensions of a specimen were:

L. 7·0," W. 2·6," T. 3·9" t. 1·05," Bf. 0·48."

390*b*. Turdinus Garoensis, n. sp., Plate VIII.

Above pale rufescent brown, rather richer on head, wings, and tail; feathers of head pale-shafted. Beneath, all pale fulvous, and whitish on abdomen.

L. 4·5;" W. 2.4;" T. 2·1;" t. 1·0;" Bf. 0·5."

Bill is brown above, pale ochre below, legs pale corneous. Tarsus and claws strong, the hind toe and claw long. It was among the birds collected by Mr. Wm. Robert in the Garo Hills, to whom is due the credit of its discovery.

This bird is very similar in coloration to *T. Abbotti;* but the bill differs much in the form of the nostrils, which have, as in *Pnoepyga*, a lunular cover. This and *Turdinus brevicaudatus* would be, perhaps, better placed after *Pnoepyga*, with which they are closely linked through *Pnoepyga longicaudata.*

400. Pomatorhinus ruficollis, Hodg.

This is the most abundant form of the genus in the Naga Hills, loving the damp shady sides of the forest-clad hills. It is called by the Anghami Nagas "Moh mera." In coloration it is very close to *P. leucogaster*, Gould, but is much smaller. I give a description with measurements.

Above, olive green rather rusty on back of neck, head darker, tail uniform with back and distinctly barred. A white supercilium, 1·6 inches in length, extends from base of bill to far back on neck. Lores and ear-coverts black, a rufous patch on side of neck behind the latter. Wings coloured like back and tail. Throat pure white sullied on breast with a few pale brown streaks. Flanks, abdomen, and under tail-coverts pale olivaceous; inside of wing grey. Bill yellow; irides red-brown; legs yellowish grey.

L. 7·25," W. 3·0," T. 3·4," t. 1·09," Bf. 0·8."

408. Garrulax cerulatus, Hodg.

This would appear to be a rather common Laughing Thrush in the Naga Hills; and I saw specimens that had been caught by bird-lime, the natives then still further spoil them by pulling out the quills and tail-feathers. Jerdon does not mention the grey on lower part of the ear-covert which forms a pale spot; nude space round the eye dark grey, and a rufous patch from base of bill to under the eye.

L. 10·5," W. 4·0," T. 4·75," t. 1·6," Bf. 0·90."

409*c*. Garrulax albosuperciliaris, Godwin-Austen, Plate VI.

Described in the P. Z. S. for 1874 as follows: "Above head and forehead reddish umber-brown paling on back of neck into dull olivaceous brown of the rump and whole of the wing; tail pale red brown; lores, a patch below eye, under ear-coverts, and supercilium which extends backwards for 1½ inches from the lores, white; upper portion of ear-coverts dark brown; chin and throat ruddy brown, paling on the breast into very pale dingy olivaceous, and into pale earthy ochre on abdomen and flanks; under tail-coverts rufous."

Bill black; legs fleshy brown; irides dull red.

Length 9·0," W. 3·8," T. 4·2," t. 1·38," bill at front 0·7."

One specimen obtained in the Munipur valley, near Kaibi.

This dull coloured *Garrulax* is very similar in coloration to *G. rufifrons*, Sw. from Java, which is a larger bird and has no white supercilium nor white lower ear-coverts. Another similar form is *P. cinereifrons*, Blyth, from Ceylon.

409*b*. Garrulax galbanus, Godwin-Austen.

Figured and described in P. Z. S. for 1874 as follows: "Above pale pure olivaceous on head, with a brown tinge on the back; tail pale ashy-brown, the four central feathers tipped umber brown and barred, the four outer of the same colour in middle and broadly tipped with white; wing concolorous with back; quills pale umber brown edged grey. Very narrow frontal band, base of lower mandible, lores through eyes and ear coverts rich black; beneath dull yellow, purer on the throat passing into the olivaceous on the flanks; under tail-coverts white. Bill black; legs ash grey; irides red brown."

L. 9·0," W. 3·65," T. 4·1," t. 1·35," Bf. 0·8."

I first obtained this very handsome bird in the Munipur valley under the Koupru range, in February 1873. It associates in large flocks of from fifty to eighty or more, very noisy, following each other in a long string through the high grass, which they seem to frequent and prefer to the denser forest. When on the flight the white of their tail-feathers and under tail-coverts makes them very conspicuous. I observed it, also, on the head waters of the Barak and other streams that flow into the Munipur valley on the north-east. The nearest allied species is *G. gularis*, McClelland, which is also yellow on the breast; but is dark slate grey above, with rufous on upper tail-coverts, flanks, abdomen, and vent.

413*a*. Garrulax merulinus, Blyth.

This fine dull plumaged bird was obtained at the head of the Thobal valley in March; it presents a good deal the character of *Trichastoma Abbotti* in its coloration, and approaches *Turdus* in the spotted breast. No description being included in Jerdon's 'Birds of India' I give one here. It was described by Blyth (J. A. S. B., Vol. XX., p. 521 for 1851) from Cherrapoonjee.

Above umber with a rufescent tinge, head darker brown; wings and tail dark brown, both plain, the former having no pale edges. Forehead pale grey, a very narrow short white streak above the ear-coverts, commencing just behind the eye. Beneath dull pale rufescent ochre, the throat and upper breast spotted dull black, each feather having the black spot at the central extremity. Under tail-coverts rusty. Inside of wing and underside of tail feathers grey. Tarsus very strong. Bill thick and blunt, grey horny. Legs dull fleshy purple. Irides pale reddish brown, nude skin round the eye grey.

In Anghami Naga "Moh mépeh."

418*a*. Trochalopteron cineraceum, Godwin-Austen.

Described in the P. Z. S. for 1874, with plate.

Above pale ashy olivaceous, greyer on the tail which is black for 0·7 inches at the terminal end, then tipped broadly white. Quills pale black, edged hoary grey; the secondaries tipped black, and their square tips edged white in keeping with the tail. Primary coverts near the bastard wing black forming a wing spot. Top of head black, extending in a narrow line down back of neck; lores and a broad band over eyes and ear-coverts dingy white; a few pure white feathers below eyes merging into ear-coverts; a narrow black line extends from posterior corner of eye over the ear-coverts and a moustachial streak of the same colour merges into indistinct spots. Chin white with a few black streaks; breast and under parts sullied white with a slight vinous tinge on the former and a dash of ruddy rufous on side of the neck, ochraceous on belly and under tail-coverts.

Bill pale yellow shaded dark above; legs fleshy brown; irides pale ruddy ochre.

Length 8·75″, W. 3·22″, T. 4·0″, t. 1·25″, Bf. 0·68″.

In general style of coloration this bird approaches *T. variegatun*, Vigors. Its yellow bill and much smaller, weaker legs and feet, make it a very marked form of this genus.

Anghami Nagas call it "Lèhú."

426*a*. Trochalopteron virgatum, Godwin-Austen.

Described in P. Z. S., for 1874, as follows:

Head dark rufous brown, olivaceous on back, paler and greyer on rump; tail olive brown, with a slight tinge of rusty on basal half, finely and indistinctly barred; wing, three first quills grey on outer web, the rest and secondaries pale ferruginous, merging into rich chesnut at their base; coverts of the latter colour, narrowly tipped ochre, feathers of the winglet conspicuously white centred. Lores chesnut, a white supercilium; ear coverts pale rusty; chin and throat rich dark chesnut; breast and abdomen bright ochraceous; under tail-coverts darker brown. As viewed from below, the tail is grey brown, each feather faintly tipped with white.

All the feathers of the head, upper back flanks, and breast are centred white or pale ochre, and those of head and neck are rigid.

Bill black; legs pinky grey; irides pale brown.

L. 9·0″, W. 3·5″, T. 4·85″, t. 1·3″, Bf. 0·6″.

I obtained a single specimen near the village of Rázámi under the Kopamedza ridge at 5,000 feet in Naga Hills in the month of January. Starting just after sunrise for the peak above the village, I observed first one and then another bird, not familiar to me, cross the path in front into some thick scrub. In this we could only perceive their whereabouts now and then by the moving twigs. Followed about, they became separated and the specimen in my collection got into a low tree where it uttered a very sweet call of a few notes, which was answered by its mate; my Shikari then managed to get sight of it and shot it. I never saw the species again.

This strikingly plumaged bird is very close to *T. setafer*, Hodgson, with which I have compared it, but it differs materially. *T. lineatum*, Vigors, is another allied form which extends to the N. W. Himalayah while *setafer* is from Nipal and Bhutan.

427*a*. Actinodura Waldeni, Godwin-Austen.

Described P. Z. S. for 1874, with figure by Smit., it is thus described.

Head full crested, extending back for more than an inch, hairy grey edged pale; back rich brown, with a greenish hue, becoming more rufous on the rump and upper tail-coverts; base of tail feathers chesnut, for half their length narrowly barred with black, then black for terminal inch, the three outer tipped white; quills black, outer web chesnut at base, then barred with black, and the narrow terminal portion grey; primary coverts black, the winglet feathers grey, barred black; ear coverts hoary; side of head hair grey; chin, breast, and abdomen rufous brown, paler on chin and throat, the whole having a streaky appearance, the feathers being centered with a darker shade.

Bill grey; legs and feet fleshy brown; irides pale grey.

L. 8·0″, W. 3·48″, T. 3·45″, t. 1·2″, Bf. 0·62″.

I first shot this bird on the peak of Japvo at about 9000 feet on the Burrail range, Naga Hills. It keeps to the tops of the forest trees.

This is a small form of *A. Egertoni*, Gould, which occurs in the same locality; every character is repeated in the two forms, modified yet each distinct; no better example of gradual change in size and coloration could well be found.

430*b*. SIBIA PULCHELLA, Godwin-Austen, Pl. VII.

I shot two specimens only of this new and beautiful subdued coloured *Sibia* in April 1873, when making the ascent of the Peak of Khunho, Eastern Burrail range, Naga Hills, at about 8000 feet. In companies of about half a dozen, they haunted the tops of the Rhododendron trees, busily searching for insects in the flowers, and covering their foreheads and throats with the pollen.

I described it in the 'Annals and Mag. of Nat. History,' February, 1874, as follows.

Description. Above ashy grey, bluer on the head, the two centre tail feathers umber-brown terminating (each colour $\frac{3}{4}$ inch) in rich black, followed sharply by dark grey. The outer tail feathers are tipped in like manner with grey, but the black increases on each feather outwards, and on the last extends to its base. Shoulders of wing blue grey, with a bar of pale chocolate-brown coming in at the base of the black primary and secondary coverts. Quills grey-black, the primaries edged pale hoary blue; the secondaries blue grey, the last three are umber brown and the two last are edged narrowly on outer web with black. A narrow frontal band and lores black extending both over and below the eye to base of the ear-coverts. Beneath ashy blue with a vinous brown tinge upon the lower breast and abdomen. Bill black; legs horny brown; irides ?

Length 9·5″, W. 4·1″, T. 4·85″, t. 1·3″, Bf. 0·75″.

In the general distribution of the coloration and in form it resembles *S. gracilis*, which is extremely common in the same hills, but seldom met with above 6000 feet.

437*a*. MALACOCIRCUS (LAYARDIA) ROBIGINOSUS, Godwin-Austen, Pl. V.

I have described this in P. Z. S. for 1874: "Above rich rusty brown, darker on the head, with black shafts to the feathers; wings and tail of same colour, the latter distinctly barred; lores white, beneath pale rufescent, nearly white under chin, and pale on centre of abdomen.

Bill black, well curved; legs pale corneous or dull grey brown; irides nearly white.

L. 9·5″, W. 3·0″, T. 4·8″, t. 1·6″, Bf. 0.62″.

The first two specimens of this bird I shot in long grass near the Logtak Lake, Munipur, and again obtained specimens near Kaibi in the same valley. It is essentially a grass-bird, with all the habits of *M. terricolor*, Hodgson. It associates about a dozen together, flying through the grass, one after the other, in a scattered line, never abiding long in one place. A near ally of this bird, *M. subrufus* from Malabar, is not so intensely rufous, has no white on the throat, is greyish on the head, and has a yellow lower mandible.

538*a*. PRINIA RUFULA, Godwin-Austen, Pl. IX, Fig. 1.

Described in P. Z. S. for 1874. I copy the original description from that Journal. Above, head ashy brown, becoming more russet on back and pale rufous on rump and upper tail coverts ; tail brown indistinctly barred, tipped white on the outer tail-feathers with a subterminal dark spot ; wing dark brown, with pale rusty brown edgings to primaries and secondaries ; lores, round eye and ear-coverts pale ash, below chin sullied white, greyer white on breast ; ochraceous on abdomen ; flanks and thighs pale brown.

Bill black, both above and below ; legs pale corneous, with darker claws ; irides ruddy ochre.

L. 4·75″, W. 1·82″, T. 2·4″, t. 0·75″, Bf. 0·4″.

This species was common in the Naga Hills and Munipur, and replaces *Hodgsoni*, Blyth, on the Khasi Hills side. It is quite distinct from *P. gracilis*, Franklin, which has a marked pale rufous forehead, and can be distinguished at a glance from the former bird, which is remarkably ashy with dark ear-coverts.

539*a*. CISTICOLA MELANOCEPHALA, And.=RUFICOLLIS Walden, Pl. X, Fig. 1.

I obtained several specimens of this form in the Munipur Hills, where it appeared common in the grassy valleys at head of the Barak ; some specimens do not shew the rufous on the neck so much as others. My specimens are identical with Lord Walden's from Assam, named by him *ruficollis*, but Dr. Anderson's title has priority.

539*b*. CISTICOLA MUNIPURENSIS, Godwin-Austen, Pl. IX, Fig. 2.

Described in P. Z. S. 1874 ; the original description follows.

"Above dark umber brown, feathers margined pale ochre on head, broader and more rufous on back ; upper tail-coverts plain rufous brown, the feathers on nape are paler rufous and dark shafting is subdued ; tail dark umber, the two centre feathers margined rufous brown, viewed from below tipped whitish, with subterminal dark spots ; white on chin, throat, and centre of abdomen, rufescent on breast and flanks. Pale round eye.

Bill black above, pale beneath ; legs fleshy brown.

L. 4·25″, W. 2·0″, T. 1·65″, t. 0·76″, Bf. 0·40″.

I obtained four specimens of this species on the reedy sides of the Logtak Lake, Munipur valley. It differs on comparison with *C. schœnicola* (Pl. X, fig. 2) and *melanocephala*, which I also obtained, being intermediate in coloration, and may be known at once by the dark edging along the shafts of the centre tail-feathers, which in *melanocephala* are wholly dark, and in *schœnicola* are banded broadly rufous, terminating in black and white. It is very near *Cis. russica*, Wall., from the Island of Bouroo, Malay Archipelago, which is more rufous on the head and breast.

471*a*. Oriolus tenuirostris, Blyth.

Two specimens were shot by my collector in a thick wood near Lumlangtong or Bishunpur, Munipur, on the 18th February.

♂ L. 10·0″, W. 5·8″, T. 3·65″, t. 1·0″, Bf. 1·2″.

481. Pratincola caprata, Lin.

♀ In open grass of Munipur valley, in February; may be known at once from *Indica* and *leucura* by its rufous upper tail-coverts.

500. Ruticilla aurorea, Pallas.

This Redstart was numerous in the stubble of the rice-fields bordering the Barak valley near its sources in the Naga Hills, during the month of January.

531*a*. Orthotomus flavoviridis, Moore, = edela apud Blyth.

The common Malaccan Tailor-bird, I met with in the forest of the Dunsiri near Dimapur, and it agrees well with Malayan specimens. The bill alone being rather shorter and more slender.

The discovery of this bird in Assam extends its range considerably.

W. 1·85″, T. 1·70″, t. 0·70″, Bf. 0·60″.

I also got it at the base of the Garo Hills near Shushang, so that it, no doubt, extends all through Tipperah, Arracan, &c.

538. Prinia Hodgsoni, Blyth.

This little Wren-warbler is common enough in the hills about Shillong.

Jerdon's description being short, I give that of the Khasi form in more detail.

Description. Above ashy brown, greyer on head, tail pale brown indistinctly barred, with black subterminal spots and white tipped. Wings pale brown edged pale rufescent. Pure white on chin, grey on throat and breast and white on abdomen and under tail-coverts. Some specimens have a faint tinge of ochre on the flanks and thighs. Orbits brown, irides orange ochre. Bill black above and below, legs yellow brown.

L. 4·35″, W. 18·2, T 2·15″, t. 0·68″, Bf. 0·4″.

538*b*. Prinia rufescens, Blyth.

This bird agrees with specimens of *P. rufescens* from upper Burmah collected by Dr. Anderson when on the Yunan Mission, but it is somewhat larger and more intensely rufous.

W. 1·85, T. 2·55, t. 0·9″, Bf. 0·4″.

542. Graminicola bengalensis, Jerdon.

This bird is not easy to bag, it shifts about through the grass seldom rising, and if once scared gets low down near the ground and hides. I obtained one specimen at the head of the Barak valley, Munipur.

548. Suya fuliginosa, Hodgson.

Is quite distinct from *S. atrogularis*, and I obtained several specimens at Shillong.

Bill above black, beneath palish, legs pale flesh, feet brown. Lores and supercilium pale. Irides ochre, tarsus stout.

L. 6·4″, W. 2·0″, T. 3·27 to 4·4, t. 0·8″, Bf. 0·42.

Suya atrogularis, Moore, its nearest ally, has the bill black above, dark horny below, legs orange fleshy, irides pale ochre, white on upper margin of eye and a few of the dark ashy feathers of the supercilium tipped white.

552*a*. Neornis assimilis, Hodgson.

I shot this bird both in the Naga Hills and at Shillong; it is Blyth's *Drymœca brevicauda*. As it is a bird little known, a description here may be useful.

Above brownish olivaceous, tail umber brown and rather more rusty brown on wing, pale line through lores over eye. Below dusky whity brown, paler on chin. A pale ring round eye, and a slight tinge of yellow on inside of shoulder of wing.

L. 4·75″, W. 2·1″, T. 2·3″, t. 0·8″, Bf. 0·38″.

568. Reguloides erochroa, Hodgson.

Naga Hills. February.

568*a*. Reguloides fulvoventer, n. sp.

Above centre of head, light yellow green bounded on either side by broad dusky bands; and nape pale greenish ash. Pure ash on back, upper tail-coverts grass green as well as the two central tail feathers and outer edge of all the others. The two outermost as viewed from below have a narrow pale yellow edging on outer web. Shoulder of wing ash grey, coverts ash brown with a narrow white bar. Quills dusky brown, the secondaries well marked with grass green. A pale yellow supercilium. Ear-coverts pale, chin very pale yellow; throat, breast, and abdomen pale pearly white, under tail-coverts bright yellow.

L. about 3·75″, W. 2·0″, T. 1·4, t. 0·70″, Bf. 0·4″.

Bill above dark brown, below orange; legs and feet grey. This Warbler is so distinct from any I have been able to look over, that I think it is a distinct species. I obtained it when in the low country of the Dunsiri, Assam.

566. REGULOIDES CHLORONOTUS, var. Hodgson.

This form was very common in the opener forests on the slopes of the Burrail range.

W. 1·85″, T. 1·35″, t. 0·7″, Bf. 0·25″.

It is very similar to *chloronotus*, but the band on rump in my three skins is nearly white.

574. ABRORNIS FLAVIVENTRIS, Jerdon.

From the Garo Hills; one specimen only.

578. ABRORNIS CASTANEOCEPS, Hodgson.

This pretty little *Abrornis* I saw several times in the Naga Hills when the forest was pretty open, and I shot a specimen at the head of the Iril valley in Munipur; I believe it has only been previously procured in Nipal and Sikkim.

Description. Crown of head dark chesnut with some darker feathers towards nape, which is dark ash. Back grassy green, upper tail-coverts pale yellow; centre tail feathers pale dusky brown, the two outer white with a dusky edging on the terminal ⅔rds. of their length. Wing grass green, the coverts tipped yellow forming one distinct and lower band and one indistinct upper one. Beneath, chin and breast bluish white. Flanks, inside shoulder of wing, belly and under tail-coverts canary-yellow. Bill above dark brown, below orange; legs olive brown.

L. 3·6″, W. 1·95″, T. 1·6″, t. 0·66″, Bf. 0·29″.

588*a*. ENICURUS LECHENAULTII, Temm. = CHINENSIS, Gould.

This bird was given to me by Capt. Badgley of the Topographical Survey, who shot it in the Lushai Hills in company with *G. immaculatus*. Obtaining this species in this locality so far west is very interesting, and marks its extreme limit on the Indian side.

Length about 10″, W. 4·2″, T. 5·8″, t. 1·28″, Bf. 0·9″.

The measurements of the Hill Tipperah *E. immaculatus*, Hodgson, are—

Length about 8″, W. 3·6″, T. 4·9″, t. 1·1″, Bf. 0·61″.

589. MOTACILLA MADERASPATANA, Briss.

On the upper Barak river, in February, a pair were shot.

595. NEMORICOLA INDICA, Gmel.

Shillong, Khasi Hills.

614. Leiothrix luteus, Scopoli.

Shillong, Khasi Hills.

It is not so common on these hills as *L. argentauris*, and I seldom came across it.

618. Minla ignotincta, Hodgson.

Was very numerous in the woods about Sikhamih, Naga Hills, in January.

622. Proparus vinipectus, Hodg.

This "Plain brown hill Tit" was only seen on the highest part of the Burrail range on Japvo Peak, about 9,000 feet.

Bill black, irides pale ochre, legs and feet pale umber-grey.

L. 4·5″, W. 2·2″, T. 2·1″, t. 0.9″, Bf. 0·3″.

624. Ixulus castaniceps, Horsfield.

This is not an uncommon bird in the Naga Hills east of the Burrail at 5—6,000 feet, and as there is no description of it in Jerdon I give one here. Above dark olivaceous, tail brown, forehead rufous merging into the olivaceous brown of the top of head. Wing umber-brown. A white supercilium from above eye extending to the neck, fading into some streaky buff and black feathers behind the ear-coverts. A black band borders the white above. Lores and ear-coverts sooty. Chin, throat, and upper breast buffy white, sullied white on abdomen, flanks olivaceous. Irides dark red-brown; legs and feet pale fleshy. Bill grey-brown, feathers of head scale-like.

L. 5·58″, W. 2·2″, T. 2·5″, t. 0·95″, Bf. 0·45″.

628. Yuhina nigrimentum, Hodg.

Sent to me by Mr. Robert from the Naga Hills.

632. Sylviparus modestus, Burton.

This very small form of Tit was numerous, in April, on the high parts of the Eastern Burrail range, just under the peaks of Japvo and Khunho, in small parties together. It moves rapidly and actively about the upper branches, and round and up perpendicular branches like *Sasia*, which its long hind-toe enables it to do. It was busy feeding about the Rhododendrons then in bloom.

The tips of the secondary coverts are pale, forming an inconspicuous band on wing; feathers of the head rather stiff, broad, and long, nearly hiding the bright yellow supercilium.

L. 3·5″, W. 2·3″, T. 1·5″, t. 0·58″.

634. Œgithaliscus erythrocephalus, Vigors.

Legs orange, irides yellow-ochre or yellow.

W. 1·87″, T. 2·05″, t. 0·6″, Bf. 0·2″.

Naga Hills, several specimens obtained near Kohimah in January.

644. Parus monticolus, Vigors.

Common enough in the Naga Hills.

The outer web of the outer tail-feather is white.

660. Corvus culminatus, Sykes.

Shot in the Naga Hills, the only Crow seen there, and at Sopvomah was extremely numerous in January, associating together in large flocks.

672*a*. Urocissa magnirostris, Blyth.

Shot at Sikhami, Naga Hills, at 5,000 feet, in February.

L. 26″, W. 7·4″, T. 17″, t. 2·15″, Bf. 1·46″.

Irides dark brown, bill and legs orange red. Primaries dull cobalt-blue.

691. Saraglossa spiloptera, Vigors.

Both ♂ and ♀ received from Garo Hills from Mr. W. Robert.

699*a*. Munia subundulata, Godwin-Austen.

Described in P. Z. S. for 1874.

"♂. Above pale umber-brown, darker on the head, pale grey on rump, a few feathers edged paler; the upper tail-coverts dull yellow; tail-feathers olivaceous umber-brown, faintly edged with same yellow tint; quills pale chesnut on outer web, umber-brown on the inner, and indistinctly barred. Sides of head umber-brown becoming dark chesnut on chin and throat; breast and flanks white, feathers very narrowly barred or margined rufous-brown; abdomen and under tail-coverts dull white, the latter sparingly streaked with brown; feathers of the back finely pale-shafted."

Bill dark grey; feet plumbeous; irides red.

L. 4·3″, W. 2·10″, T. 1·70″, t. 0·55″, Bf. 0·45″.

♀ is a duller brown above, with no white shafts to the feathers, a distinct green tinge upon the tail feathers, otherwise as in *M. undulata*.

Change of coloration in young males commences on the centre of the throat, extending towards the base of bill into the dark chesnut, and towards the breast into the undulated colouring of those parts.

Obtained in the Munipur valley, both on the Logtak Lake and head of the Barak river. It is a very close to, but distinct from *M. undulata*, Latham, in which the undulations are broad, the general coloration is more rufous, and the tail more pointed. It is also close and intermediate to *M. nisoria* from Java and Malacca; but in that bird the tail-coverts are grey, with no trace of the fulvescent tinge common to the two continental forms. Lord Walden was the first to notice it as distinct, in specimens in his collection received from Burmah which are identical with my own from Munipur, and he kindly allowed me to describe it.

703. MUNIA MALABARICA, Lin.

Specimens were obtained at Kooshtia, in November.

708. PASSER CINNAMOMEUS, Gould.

Under Burrail range, Naga Hills; not often seen. At Shillong it is commoner.

L. 5·2″, W. 2·63″, T. 1·98″, t. 0.68, Bf. 0·42″.

710. PASSER MONTANUS, Lin.

Garo and Khasi Hills.

719. EMBERIZA FUCATA, Pallas.

This bird from head of the Barak valley differs from Jerdon's description in colour of legs and feet, which have no tinge of yellow, being a dull flesh-colour. The outer tail-feather is white on basal end, extending as a diagonal bar through inner to the outer web; the penultimate is tipped white on inner web. Centre tail-feathers rufous with black centre, and the rump is rufescent with small black streaks.

L. 6·45, W. 2.9″, T. 2·62″, t. 0·85″, Bf. 0·42″.

724. MELOPHUS MELANICTERUS, Gmelin.

During February and March, this handsome Bunting was very numerous in the high grass skirting the river Iril, Munipur valley, particularly about Kaibi.

♂ L. 6·5″, W. 3·35″, T. 2·85″, t. 0·75″, Bf. 0·48″.

762. ALAUDALA RAYTAL, Buch. Hamilton.

Occurs abundantly on the sandy churs of the Brahmaputra, and I shot it near Gwalpara, in November.

L. 5·25″, W. 3·35″, T. 2·0″, t. 0·75″, Bf. 0·40″.

On the same churs, among low bushes, *Pratincola leucura* was very common; *Cotyle sinensis* and *Prinia flaviventris* were also procured.

771. TRERON NIPALENSIS, Hodgson.

I have compared my specimens with the above from Sumatra and Malacca, and they are identical. It was not uncommon in the Dunsiri forest between Dimapur and Golaghat, and I shot it again on the road to Shillong near Gowhatty. It does not appear to range above 1,000 feet.

♂ measures L. 10″, W. 5·55″, T. 3·86′, t. 0·83″, Bf. 0·56″.

782. ALSOCOMUS PUNICEUS, Tickell.

This beautiful Wood-pigeon was shot at the hot springs of the Namba on the Dunsiri river in April. These springs are saline and attract enormous numbers of *Carpophagæ (insignis* and *sylvatica)* to their waters to drink;

and when the above bird was picked up, a quantity of the saline water poured out of its mouth.

797. Turtur humilis, Temminck.

Garo Hills.

806*a*. Ceriornis Blythii, Jerdon.

♂ described in the J. A. S. B. 1870, p. 60.

This bird is very difficult to obtain, and I failed to get the female, which has never yet been seen by any European. I heard them in the forest on the ascent to Khunho, but although I offered 20 Rs. for a bird, the Nagas only once succeeded in getting one; this, a male, was snared near the village of Viswémah, but thinking that I wanted the feathers only, the natives had, to my utter disgust, picked and eaten it. Another male was brought to Captain Butler, the Political Agent of the Naga Hills, when passing through the village of Jotsomah (also under the Burrail range), but it had been skinned so badly that it was falling all to pieces and the most we could do was to save a few of the better pieces of the skin for the sake of the feathers. The Burrail range is the extreme western limit of this bird, and it has not been got even there, west of the peak of Paona, where the specimen in my collection was obtained by Mr. Wm. Robert, a most assiduous collector, whom I have to thank for very many good birds. Its haunts are in the dense forest from 6000 to 10,000 feet, and this renders it such a difficult bird to bag, and the only chance of shooting a specimen would be by coming upon it suddenly along a more open bit of ridge, or in one of the higher clearings. It was unknown to the Nagas of Asalu. It probably extends some distance to the eastward until it meets its near ally *C. Caboti*. Jerdon was the first to notice it in the 'Ibis' (1870, p. 147) from the Suddya Hills.

823*a*. Bambusicola Hopkinsoni, nov. sp., Godwin-Austen.

♂ Description. Above head plain dull brown, becoming rufous on back of neck, back dull olivaceous grey. The feathers of upper back and scapulars centered with dark chesnut, the secondary coverts more broadly so and terminated in black. The feathers of the back have one or more small white spots on the outer margin, giving the back a well-speckled appearance. The rump feathers are indistinctly barred white with a single black spot and increase in size to the upper tail-coverts where the spots are conspicuous, heart-shaped with chesnut centres. Quills ruddy chesnut, the secondaries and tertiaries mottled with dark brown. Tail ruddy-brown, feathers narrowly barred with pale ochre having dark mottled edgings. Lores pale buff extending as a supercilium; ear-coverts, chin, and upper throat pale ferruginous; a black streak extends from posterior margin of the eye down side of neck; from lower part of neck for a short distance the feathers are centred rufous with pale spots on outer margin, rest of breast buff, lighter on abdomen and sides; barred on centre of breast and flanks with black, the barring not shewn but each feather has a terminal black heart-shaped spot, which is a conspicuous character.

Legs pale grey with green tinge; bill pale horny-black, pale beneath, irides dark brown.

L. 14·5," W. 6·25," T. 5·0," t. 1·2," Bf. 0·9."

Through the kindness of Dr. J. Anderson, I have examined a specimen of *B. Fytchii* ♀ from the Yunan Hills, and with this the Khasi bird is evidently very closely allied, if indeed it should not turn out to be identical; but between my bird and *B. Fytchii* there are differences which, though perhaps small, separate them, and until birds of the same sex are placed side by side, we cannot well decide whether they are two *good* species or not. To begin the enumeration of the points of difference, the Yunan bird (A) is much smaller than the Khasi one (B):

(A) *B. Fytchii*, t. 1·7," mid-toe 1·7".

(B) *B. Hopkinsoni*, t. 2·1," " 2·1".

Other dimensions of (B.) L. 14·5," W. 6.25" T. 5" Bf. 0·9".

In (B) the feathers on the flanks have the black terminal spot invariably heart-shaped, whereas in (A ♀) the corresponding feather is a diamond form (*vide* also the figure of ♂ in P. Z. S., 1871, Pl. XI).

In (A) the whole of the lower back is plain olivaceous with a few of the longest upper tail-coverts having a black triangular (isosceles-shaped) terminal spot followed by a white base.

In (B) these spots are much larger and broader and extend up over the rump, and the feathers are more distinctly barred with brown and have a rufous tinge at the base.

In (B), and I think this is the most important difference, all the feathers of the upper back are spotted with white, and this feature extends to the wing coverts and shoulder of wing. In (A) there is no tendency to this coloration nor is there any trace of it in the plate in the P. Z. S.

(A.) is dark brown on chin, (B.) very pale.

(A.) tail not distinctly barred, (B.) tail well-barred and the pale bars edged with black.

(A.) tail beneath dull brown, (B.) tail ruddy brown.

However, whether they be separable or not, and a larger series will decide this, one important point is finding this bird so far to the westward, within Indian limits; it has never before been recorded. My specimen was shot at Shillong on grassy slopes at 5000 feet. Before I had seen the bird in hand, I had twice seen it running on the pathway and noticed its very different flight from that of the Black Partridge, which at first I thought it was. Now that attention is called to it, other specimens will no doubt turn up.

825*b*. Arboricola intermedia, Blyth.

In my 2nd list I recorded *A. rufogularis*, Blyth, from N. Cachar; this I now find, on obtaining another specimen in the Naga Hills, to be *intermedia*, originally described as probably from Arakan (J. A. S. B., XXIV, p. 377). But *A. rufogularis* will still remain on the list with a new locality, the Naga Hills, where Captain Butler obtained a ♀, which at the time I could not make out from never having met with it before. *Intermedia* may be known at once by the plain, unbarred back and by the absence of the black separating the rufous of the neck from the grey of the breast; it is in front spotless, but has large round black spots on the side of neck. Dimensions of *intermedia*, Blyth, from Naga Hills:

W. 5·75," T. 2·6," t. 1·7," Bf. 0·7, mid-toe and -claw, 1·82."

Legs red. Bill black.

A. rufogularis, ♀, from Naga Hills, legs pale fleshy violet, measures—

W. 5·32," T. 2·5," t. 1·58," Bf. 0·5," mid-toe and -claw, 1·75."

I found the nest of *Arboricola* in the forest at the head of the Jhiri River, N. Cachar, constructed close in under the large root of a tree near the base; it was lined with dry leaves which then (March) strewed the ground and contained three eggs of a light brown colour.

833. Turnix ocellatus, Scop.

Shillong, Khasi Hills.

834. Turnix Dussumierii, Temm.

Naga Hills.

835. Turnix Sykesii, A. Smith.

Khasi Hills.

895. Totanus stagnatilis, Bechstein.

Munipur, in March.

908*a*. Porzana bicolor, Walden.

The original specimen, from which the description was made by Lord Walden, came from Darjiling. It was very interesting to find it again occurring in the Khasi Hills (June). I got it in a small piece of marshy ground in the station of Shillong, together with the species of *Porzana* that follow. Bill glaucous green with slight tinge of red near base of mandibles and tipped grey; irides crimson-red, orbits red; legs pale dullish vermillion.

L. 8·75," W. 4·4," T. 2·4," t. 1·5," Bf. 0.9."

Mid-toe and -claw, 1·75," hind-toe and -claw, 0·65."

Two specimens were brought to me alive by a Khasia with one egg, which he said was that of this bird; it measures 1·4" in major diameter, 1·0″ in minor diameter, is of a creamy white colour, unspotted on the smaller end, distantly so on the lower ⅔rds., closely on the larger end, the spots all pale grey, with light and dark shades of sepia. The birds did not live long in confinement, although they ate greedily of earthworms.

Captain Elwes tells me that he procured this bird in the interior of Sikkim, at Choongtam, at an elevation of 5000 feet, in September 1870; to him therefore belongs the credit of being the first to discover it. This specimen, with others, was lent by him to Mr. A. O. Hume for description, but the box containing them appears to have been lost on its way to Agra. Captain Elwes found this Rail in rice-fields which are the highest in Sikkim; my bird was found in similar ground, and at the same elevation.

911. Porzana fusca, Linnæus.

Obtained at Shillong in June.

L. 7·5,″ W. 4·0,″ T. 2·2,″ t. 1·35, Bf. 0·75.″

Mid-toe and -claw 1·6″. Bill dull dark green, orbits vermillion, irides orange, legs pale vermillion. The under tail-coverts are dark umber-grey in my specimen (not olivaceous as stated in Jerdon), and closely barred with white.

913. Rallus striatus, Linnæus.

Dimensions are smaller than those given in Jerdon, but the bird does not differ in coloration from specimens from the rest of India.

L. 9·5,″ W. 4·75,″ T. 2·0,″ t. 1·65,″ Bf. 1·4.″

Mid-toe and-claw 1·8,″ hind-toe and-claw 0·62,″ irides sienna-brown, legs and feet ash-grey. Bill pink at base, pale grey-brown at tip, brown above.

The bill is much lengthened, and in the presence of a shield-like expansion at base above, approaches nearer to the Water Hens (*Gallinula*) than other Rails. The tarsus is very stout and the feet are shorter and stouter than in *Porzana*.

It occurred in the same swamp with the two preceding forms.

917. Mycteria australis, Shaw.

Bisnath, Assam; in December.

920. Ciconia leucocephala, Gmelin.

On Brahmaputra.

949. Anser indicus, Gmelin.

In large flocks on the Logtak Lake, in February; they leave the water to feed in the stubble of the rice-fields in the morning and evening.

955. CASARCA LEUCOPTERA, Blyth.

I got this bird at Dimapur on the Dunsiri River; it appears to prefer sluggish streams like this flowing through forest, for I once flushed this bird in such a haunt in the interior of the Garo Hills. I am informed by Mr. James of the Police at Samaguting that it breeds on the Dunsiri, and that he had shot the young birds. It is called the "Deo Hans" in Assam. Mr. J. Burt of Tezpur informs me that the white-winged Sheldrake perches on trees, and that one was killed thus sitting by Mr. J. Martin of Paniputa Tea plantation near Tezpur.

The habits and haunts of this species are as completely the reverse of its congeners *rutila* &c. as they well can be.

962. DAFILA ACUTA, Lin.

Tolerably abundant on the Beels in Munipur, in February.

963. MARECA PENELOPE, Linn.

Very numerous in Munipur, in February.

971. FULIGULA CRISTATA, Ray.

Munipur, on the Lamphel.

975. PODICEPS PHILIPPENSIS, Gmelin.

Beels, Munipur.

Anas pœcilorhyncha, Pennant was a very common duck on the Logtak Lake, in February. I have nowhere seen it so numerous.

General notes on other species.

The specimens of *Ephialtes* that I have hitherto procured in the Naga Hills and Asalu, are undoubtedly *lempigi*, Horsfield, like birds from Java, &c., of which the very rufous one mentioned in my first list is in that particular phase of plumage.

Micropternus phaioceps, Blyth.

I have two specimens in my possession, one of which is from the Tipperah Hills, the other from Dimapur, Assam; both are much darker and much more distinctly barred on back than others, and have at the same time stronger bills; and both are smeared all over the head, tail, and feet with some dark gummy substance that they are evidently fond of getting into.

Cyanops Asiatica, Lath.

I notice that all the specimens in my collection from these Eastern Hills, have a small triangular patch of scarlet (0·3″ wide) at the gape, a point not noticed in any description I can find, nor is it shewn in the figure of this species in "The Marshalls'" monograph of the Barbets, Pl. 26. I pointed this out to Lord Walden, and having looked at his specimens from the N. W. Provinces and Nipal, found in them the slightest trace of a few very minute red feathers near the gape; these are so small that in a stuffed specimen they might be easily overlooked; in birds from Assam and Munipur this red spot is so well developed that it could not escape attention.

Eumyias melanops, Vigors.

Breeds in the Khasi Hills, on the Shillong or northern side, in April. Young birds well-fledged were brought in to me in the middle of May.

Harpactes Hodgsoni.

Two specimens of this species, from the Garo Hills, have the crown of the head whitish-grey mixed with pink and whitish towards the nape, in other respects they are identical with the above species. Are they in immature plumage?

Pomatorhinus McClellandi.

Birds from the Naga Hills, I notice, have a longer bill, and the spottings on the breast are darker and occasionally form a demi-collar.

I have received a specimen of *Arachnechthra Asiatica*, Latham (= *carrucaria*, Lin.) from Hill Tipperah, which I considered at first to be *intermedia*, Hume. However, on comparing it carefully with specimens from Candeish Gwalior, Manbhoom, Umbala, Lower Bengal, Garo Hills, and Tonghú, I can detect no difference whatever in coloration, and their bills run so close in size that I do not consider it a species that will stand,—certainly not on the very small and sole difference of a slightly longer bill. If such single characters are to be allowed weight, we should have species multiplied *ad infinitum*, and if the Tipperah form of *A. Asiatica* should be larger, it is sufficient to notice the peculiarity as a large variety, but why encumber nomenclature, when no other differences exist, with another name and create a new species.

A female *Niltava* in young plumage shot under the peak of Japvo, Naga Hills, in January, when it would nearly have arrived at maturity, differs so much from the dimensions of *N. grandis* (to which it is nearest in size) and *N. sundara* that I am inclined to consider it an intermediate new form. Females of *grandis* and *sundara*, irrespective of size, have a very similar coloration; the species I have before me, differs slightly from both, a difference it is not easy to explain in writing, and so often to be noticed in allied forms. The inside of the wing is pearly grey, and the tail is not so ruddy dark a brown as in *grandis*. A young *grandis* ♀ in my collection, with the head still well spotted with pale rufous, closely equals in size birds in full plumage, with the greyer head and nape. My bird has no sign of the blue shoulder-spot, and the first primary is proportionably much smaller and shorter than in undoubted young *grandis*. I give a full description so that the next collector visiting the Naga Hills may be on the look out for an intermediate form of *Niltava*, and if such there be, obtain the male.

Description. *Niltava* ? ♀ of first year. Above olivaceous with an ochre tinge. Ashy on head, more rufous on upper tail-coverts. Tail ruddy dark brown. A pale ring round eyes, less conspicuous above than below, wing feathers closed, umber brown. Lores tinged pale rufous. Beneath chin pale rufous, with a few pale grey bars, breast to abdomen rufescent ashy, thighs pale ash-brown, a pale dull streak extends from chin to upper breast, ending suddenly, abdomen sordid white, under tail coverts pale ochre brown, darker centered and tipped pale, inside shoulder of wing dull ochre. Quills inside pearly-grey. Shot in underwood on ascent to Japvo peak January 1873, three were seen together. The bill is black, shorter and stouter than in *grandis*. Irides dark brown.

N. grandis. = L. —, W. 3·95″, T. 3·9″, t. 0·92″, Bf. 0.52′.
N. ? = L. 7·4″ W. 3·9″, T. 3·[illegible]″, t. 0·78″, Bf. 0·44″.
N. sundara. = L. — W. 3·1″, T. 2·5′, t. ·80″, Bf. 0·42″.

Pnoepyga longicaudata, Moore.

Is very numerous in August in the large woods below the peak of Shillong, and I got several in that locality. There can be no doubt that the bird in Griffith's collection came from the north-east frontier, and not from Afghanistan. It is a shy bird keeping to the dense underwood. The irides are dark crimson.

358*a*. *Turdulus pallens*, Pallas.

Was frequently noticed in the Naga Hills, and I obtained a specimen on Japvo Peak, close under 10,000 feet, in January. They agree well with specimens in Lord Walden's collection.

Above pale umber-brown, a white supercilium extends to over the ear-coverts. Lores and ear-coverts dark umber. A white patch under eye, and white on chin extending down centre of throat to upper breast, very narrowly defined in some birds; side of throat first mottled with umber passing into two indistinct streaks on either side. Breast pale rufous-brown above, white below to abdomen. Under tail-coverts pure white. Flanks rusty; no rufous inside wing, which is all grey.

L. 9·0″, W. 5·0″, T. 3 6″, t. 1·2″, Bf. 0 7″.

A nest of *Pycnonotus pygæus*, Hodg., brought in by my shikari at Shillong in June, contained 3 eggs of a pale madder ground, spotted and speckled with darker madder-brown, pale neutral grey, and a few dark brown spots,—all pretty evenly distributed.

The nest is 4 inches across, neatly made with a foundation of dry old leaves and broad blades of grass; the sides of thin stalks of a thistle and thin sticks, and lined within with very fine grass; taken in a low tree.

Spizixos canifrons breeds in the neighbourhood of Shillong, in May. Young birds are seen in June.

Enicurus nigrifrons of 1st List, Vol. XXXIX., Pt. II., p. 107, is *E. maculatus*, Vigors, in immature plumage.

584 of same list is, I find, *guttatus*, Gould, in which the white markings on the back are all circular, this would appear to replace *maculatus* in all these Eastern Hills, for I have never yet shot a specimen, like this last north-west form.

Up to March, when we left Munipur, I did not observe any Parrots or Hornbills in any part of the valley, or hills bounding it. The natives say that later in the season parrots are very numerous and do considerable injury to the crops. Of Swifts I saw only one, a large species, which I failed to secure. *Cypselus infumatus*, Sclater, occurred in the Naga villages, and was very numerous in the large one of Padhang. *Pnoepyga* must be rare, for I did not get a single skin anywhere in N. E. Munipur. The country gets much drier on that side and the forest less dense, with a good deal of grass. Buntings were very plentiful and *Emberiza pusilla* appeared everywhere to be the commonest bird in the Naga Hills, at 3—5,000 feet.

In the pine forest that covers the slopes of the hills descending into the Umiam valley, one of my men marked a nest on June 25th; I proceeded to the spot soon after I had heard of it, and on coming up to the tree, a pine, saw the female fly off out of the head of it. But the nest was so well hidden by the boughs of the fir, that it was quite invisible from below. The bird after a short time came back, and I then saw it was *Sibia gracilis*, but was very shy and seeing us went off again, and hung about the trees at a distance of some 50 yards; while thus waiting, some 4 or 5 others were also seen. The female, however, would not venture back, and I sent one of my Goorkhas up, to cut off the head of the fir, nest and all, first taking out the eggs.* It contained three of a pale sea-green, with ash-brown streakings and blotchings all over.

The nest was constructed of dry grass, moss, and rootlets, and the green spinules of the fir were worked into it, fixing it most firmly in its place in the crown of the pine, where it was much forked.

Sibia has habits very like *Phyllornis*: they hang about the outer branches much in the same manner, and there is again a certain likeness in general coloration between *S. gracilis* and *Otocomptsa jocosa* barring the colored under tail-coverts of the last. However, in *Sibia* the form of

* This nest is in the Indian Museum.

nostril is very different. I have heards *gracilis* rather noisy in the spring, uttering a loud single note, repeated three or four times in succession.

453*a*. *Phyllornis Cochinchinensis.*

Of 2nd List is *P. chlorocephalus*, Walden; I obtained another pair at Dimapur, on the Dunsiri River, in December.

It was described by Lord Walden from Burmah; its extreme known western range is, therefore, now the Garo Hills.

Trochalopteron Austeni, Jerdon.

Was bagged again near the eastern extension of the main water-shed, on Kopamedza Peak, at the same altitude as before. It has been beautifully figured by Gould in the 'Birds of Asia,' Plate 187.

Explanation of the Plates.

Pl. IV. *Sitta Nagaensis*, Godwin-Austen, p. 157.
Pl. V. *Malacocircus* (*Layardia*) *robiginosus*, Godwin-Austen, p. 164.
Pl. VI. *Garrulax albosuperciliaris*, Godwin-Austen, p. 161.
Pl. VII. *Sibia pulchella*, Godwin-Austen, p. 164.
Pl. VIII. *Turdinus Garoensis*, n. sp., p. 160.
Pl. IX. Fig. 1. *Cisticola Munipurensis*, Godwin-Austen, p. 165.
——— Fig. 2. *Prinia rufula*, Godwin-Austen, p. 165.
Pl. X. Fig. 1. *Cisticola melanocephala*, And., p. 165.
——— Fig. 2. *Cisticola schœnicola*, Bonap., p. 165.

Descriptions of a few Indian Plants.—*By* S. Kurz.

(Received Nov. 1st, 1874.)

1. Miliusa tristis, Kurz in Journ. As. Soc. Beng., 1874, 58.

Arbor novellis fulvo-puberulis; folia ampla, oblonga, petiolo 1-2 lin. longo puberulo suffulta, abrupte acuminata, basi acuta et subobliqua, chartacea, glabra v. subtus secus reticulationem laxam parce puberula; flores solitarii, axillares et oppositifolii, pedicellis $\frac{1}{2}$ pollicaribus fulvo-pubescentibus unibracteatis; calyx corollaque appresse fulvo-pubescentes; sepala ovato-subulata, c. 2 lin. longa; petala exteriora duplo longiora, lanceolata, acuminata, interiora $\frac{3}{4}$-1 poll. longa, oblonga, obtusiuscula.—*Ava.*

2. Mitrephora vandæflora, Kurz in Journ. As. Soc. Beng., 1874, 57.

Arbor decidua, novellis ramulisque pubescentibus; folia oblonga v. ovato-oblonga ad elliptica, 5-6 poll. longa, petiolo brevi puberulo, basi rotundata v. acuta, chartacea v. subcoriacea, acuminata v. acuta, v. utrinque minute puberula v. supra nitida et subtus secus nervos minute puberula; flores plus quam poll. in diametro, pedicellis poll. longis sursum incrassatis fulvo-tomentosis sub calycis basi bracteâ semi-amplexicauli rotundatâ vestitis suffulti et vulgo 2-ni v. plures e pedunculis reductis lateralibus crassis squamatis erumpentes; sepala rotundata, dense fulvo-pubescentia; petala 3 exteriora lineari-oblonga, undulata, extus parce fulvo-pubescentia, flava v. flava et rubescenti-striata, interiora ungui brevi et lato, conniventia, extus puberula, secus margines tomentosa, flava, apice albo- et rubro-punctata.—*Pegu; Martabania.*

N. B. *Melodorum parviflorum*, Scheffer = *M. latifolium*, Hf. and Th.; *Melod. Bancanum*, ejusd. = *M. manubriatum*, Hf. and Th.

3. Capparis Sikkimensis, sp. nov.

Frutex scandens, habitu *C. Roxburghii*, novellis parce pubescentibus, mox glaber; folia elliptica ad elliptico-ovata, basi subacuta, obtusiuscula, petiolo gracili parce appresse pubescente $\frac{1}{2}$-$\frac{3}{4}$ poll. longo suffulta, 2-3 poll. longa, coriacea, glabra; flores mediocres, pedicellis poll. circiter longis appresse pubescentibus suffulti, umbellati; pedunculi 1-1$\frac{1}{4}$ poll. longi, parce appresse pubescentes, compressiusculi, ex foliorum superiorum axillis erumpentes et sæpius in paniculam terminalem dispositi; sepala concavo-ovali-rotundata, minute puberula et secus margines hyalinos tomentella, $\frac{1}{3}$ poll. longa; petala intus lanata, extus glabra; ovarium ovoideum, acutum, et gynophorum 1$\frac{1}{2}$-2 poll. longum glabra.—*Sikkim-Himalaya*, 4000-5000 ped. s. m.

4. Schima monticola, Kurz in Journ. As. Soc. Beng., 1874, 90.

Arbor glabra, gemmis sericeo-pubescentibus, ramulis parce lenticellatis; folia oblonga v. elliptico-oblonga, basi rotundata v. obtusa, 3-4 poll.

longa, petiolo ⅓-¾ pollicari lato suffulta, acuta v. subobtusa, grosse crenato-serrata, valde coriacea, supra nitida, glabra, reticulatione indistinctâ impressâ ; capsulæ depresso-globosæ, pedunculo crasso lenticellato 1½ poll. longo suffultæ.—*Martabania.*

5. Pterospermum cinnamomeum, Kurz in Journ. As. Soc. Beng., 1874, 120.

Arbor, novellis ferrugineo-tomentosis ; folia oblique oblonga ad ovato-oblonga, basi uno latere inæquali-cordata v. rotundata, altero acuta, petiolo crasso 1-2 lin. longo tomentoso suffulta, 2½-5 lin. longa, acuminata v. cuspidata, chartacea, supra glabra et nitentia, subtus dense fulvo- v. cinnamomeo-raro canescenti- tomentosa ; stipulæ subulatæ, usque ad poll. longæ, simplices v. frequentius basi appendice cucullatâ auctæ ; flores magni, albi, pedunculis ½-1 poll. longis fulvo-flocсoso-tomentosis suffulti, solitarii, axillares ; bracteolæ subulatæ basi cucullato-appendiculatæ ; sepala c. 1½ poll. longa v. paullo longiora, linearia, extus 3-nervia et fulvo-tomentosa, intus subglabra ; filamenta et stylus glaber ; ovarium dense fulvo-villosum ; capsulæ oblongæ, obtuse 5-gonæ, utrinque attenuatæ, lignosæ, 2 poll. longæ, fugacissime ferrugineo- v. fulvo-tomentosæ.—*Martaban ; Tenasserim.*

6. Elæocarpus simplex, Kurz in Journ. As. Soc. Beng., 1874, 132.

Arbor gemmis parce sericeo-puberulis ; folia oblonga v. oblongo-lanceolata, petiolo pollicari glabro geniculato-incrassato suffulta, basi obtusa, 5-6 poll. longa, obtusa v. obtusiuscule acuminata, chartacea, crenato-dentata, glabra ; flores majusculi, pedicellis poll. longis v. longioribus glabris, in racemos laxos axillares sub anthesi ebracteatos foliis breviores dispositi ; sepala c. 6 lin. longa, lineari-lanceolata, acuminata, glabra, intus secus marginem angustum velutina ; petala æquilonga, lato-cuneata, vulgo bifida, lobis sectis et valde fimbriatis, extus parce sericea, intus basin versus sericea, villosa ; antheræ glabræ ; ovarium argenteo-tomentosum. *Tenasserim.*

7. Elæocarpus littoralis, T. and B. ap. Kurz in Journ. As. Soc. Beng., 1874, 132.

Arbor glabra ; folia obovato-oblonga, in petiolum gracilem ½-1 poll. longum continuum attenuata, 3-5 poll. longa, repando-serrata, obtusa, valde coriacea, glabra, supra nitentia ; flores majusculi, pedicellis pollicaribus parce puberis, in racemos axillares puberos foliis paullo brevioribus collecti ; sepala lineari-lanceolata, 6-7 lin. longa, canescenti-velutina ; petala æquilonga, cuneato-oblonga, extus dorso sericeo-pubescentia, secta et fimbriata ; antheræ puberulæ ; ovarium fulvo-villosum ; drupæ c. pollicem longæ, oblongæ, læves, putamine valde lacunoso-tuberculato compressiusculo. *Tenasserim.*

8. E. HYGROPHILUS, Kurz in Journ. As. Soc. Beng, 1874, 133.

Arbor gemmis argenteo-sericeis; folia obovato- ad cuneato-oblonga, petiolo ¼-½ pollicari glabro geniculato-incrassato suffulta, basi attenuata, 2-3 poll. longa, obtusa v. rotundata, crenato-serrata, chartacea, glabra; flores parvi, pedicellis 2½-3 lin. longis parce argenteo-sericeis, racemos argenteo-sericeos glabrescentes axillares foliorum longitudine v. breviores efficientes; sepala 3 lin. longa, lanceolata, acuta, sericea, glabrescentia; petala paullo longiora, lato-cuneata, usque ad mediam partem fimbriata, glabra; antheræ puberulæ; ovarium sericeo-tomentosum.—*Pegu; Martaban; Tenasserim.*

N. B. *Elæocarpus Acronodia*, Mast. species est valde diversa et nequaquam cum *Acronodia punctata*, Bl. conjungenda. *E. punctatus*, Masters, *Parinarii* est species; *E. glabrescens*, Mast. = *E. Jackiana*, Wall. (*Monocera ferruginea*, Jack.); *E. pedunculatus*, Wall = *E. Palembanicus*, Miq.

9. MELIA BIRMANICA, nov. sp.

Arbor novellis canescenti v. flavescenti furfuraceo-tomentosis; folia bipinnata, petiolo longo et tereti, pinnis 5-3-paribus; foliola ovata v. ovato-lanceolata, basi rotundata v. acuta, sæpius sub-inæqualia, 1½-2 poll. longa, breviter acuminata, integra, petiolulis brevibus gracilibus vulgo puberulis suffulta; flores virescenti-albi, parviusculi, pedicellis brevissimis furfuraceo-tomentosi v. subsessiles, in paniculas flavescenti- v. canescenti-furfuraceo-tomentosas corymbiformes axillares folio breviores dispositi; calyx profunde 5-fidus, lobis oblongo-lanceolatis acutis farinaceo-puberulis; petala c. 3 lin. longa, extus velutina, intus dense puberula; tubus stamineus c. 2 lin. tantum longus, albus, intus pilosus et apice inter antheras valde lanata; drupæ globosæ v. subglobosæ, c. 1 poll. crassæ v. crassiores, flavescentes, læves, putamine obtuse 5-8-angulari et 5-8-loculari globoso.—*Martaban.*

10. SCHMIEDELIA CHARTACEA, nov. sp.

Frutex novellis appresse puberulis; folia uni-foliata, petiolo 1-1½ pollicari utrinque incrassato suffulta, oblonga ad oblongo-lanceolata, brevissime petiolulata, basi acuta, grosse et remote repando-serrata, ½-1½ ped. longa, chartacea, acuminata, glabra; flores parvi, fasciculati, pedicellis capillaribus ¼-½ lin. longis suffulti et racemos graciles axillares folio breviores formantes; sepala ½ lin. longa, concavo-rotundata, parce ciliolata; baccæ solitariæ raro binæ, pisi majoris magnitudine, læves, coccineæ.—*Sikkim.*

N. B. Fructus *N. hypoleuci*, Ky. in diario hocce (1871, 50) ad *N. lappaceum* probabiliter referendi sunt; fructus veri *N. hypoleuci*, a me nuper in Martabania collecti, iis *Euphoriæ Litchi* simillimi.

11. Aspidopterys Helferiana, Kurz in Journ. As. Soc. Beng., 1874, 137.

Frutex scandens, novellis appresse fulvo-pubescentibus; folia orbiculari-ovata ad lato-obovalia, breviter cuspidata v. apiculata, petiolo $\frac{1}{3}$-$\frac{3}{4}$ pollicari pubescente glabrescente suffulta, 3-5 poll. longa, vulgo glauco-viridia; flores parvi, glabri, pedicellis c. 2 lin. longis glabris filiformibus, paniculam axillarem et terminalem laxam dum juvenilem ferrugineo-pubescentem mox glabrescentem formantes; petala c. 2 lin. longa; ovarium glaberrimum; gynobasis decidua; disci lobi vix rugosi; samaræ ovoideæ, pollicem circiter longæ, apice attenuato retusæ, hyalino-membranaceæ, pallide brunneæ, radiato-nervosæ, alato-cristatæ, glabræ.—*Tenasserim.*

12. Indigofera debilis, Grah. in Wall., Cat., 5466.

Herba annua v. perennis, $1\frac{1}{2}$-2-pedalis, sparse appresse hirsuta; stipulæ lineari-subulatæ, 3-4 lin. longæ; folia impari-pinnata, subsessilia, 1-$1\frac{1}{2}$ poll. longa; foliola 1-2-juga cum impari longius petiolulato, alterna, rhomboideo-obovata ad sublanceolata, brevissime petiolulata, basi subcuneato-attenuata, obtusiuscula et mucronata v. acuta, $\frac{1}{2}$-1 poll. longa, integra, membranacea, supra glabra, subtus tenuissime appresse pubescentia; flores minimi, brevissime pedicellati, bracteâ persistente subulatâ lineam longâ muniti, in racemum gracillimum parce pubescentem v. glabrum multiflorum axillarem folio multo longiorem digesti; calyx lin. longus, parce appresse pilosus, dentibus subulato-filiformibus; corolla paullo longior; legumina linearia, subcylindrica cum suturis pallide coloratis prominentibus, c. $\frac{1}{2}$ poll. longa, oblique acuminata, brunnea, parce appresse hirsuta, 5-6-sperma; semina cylindrico-oblonga, utrinque truncata.—*I. viscosæ* affinis.—*Ava.*

13. Desmodium (Phyllodium) grande, nov. sp.

Frutex erectus, ramulis molliter fulvo-tomentellis; stipulæ et stipellæ strictæ, breves, lineares, subulato-acuminatæ; folia pinnato-3 v. raro 1-foliata, petiolo $\frac{1}{2}$-1 pollicari fulvo-tomentoso suffulta; foliola 3-5 poll. longa, breviter petiolulata, ovata v. sub-ovata, longiuscule et obtusiuscule acuminata cum mucrone, integra, chartacea, supra puberula, subtus molliter sub-fulvo-pubescentia; flores...in racemos foliatos axillares et terminales digesti et paniculam terminalem efformantes; rhachis fulvo-tomentosa; folia floralia bifoliolata, petiolo 2-3 lin. longo tomentoso in aristam longam desinente suffulta; foliola oblique ovalia ad suborbicularia, retusa v. rotundata cum mucrone, puberula, pollicem circiter longa; legumina 2-3 articulata, tomentoso-pubescentia, iis *D. pulchelli* duplo majora.—*D. vestito* affine.—*Ava.*

N. B. Flores *Lespedezæ pinetorum* nec cyanei nec rosei, ut in diario hocce 1873, 231 descripti, sed flavescentes carinâ apice rosellâ.

14. Pueraria brachycarpa, Kurz in Journ. As. Soc. Beng., 1873, 232.

Herba perennis diffusa v. volubilis, ramis acute angularibus 2-4-pedalibus, secus angulos retrorse appresse hirsuta; stipulæ lanceolatæ, acuminatæ, parvæ; folia pinnato-3-foliolata, petiolo secus angulos retrorse appresse pubescente 1-1½ pollicari suffulta; foliola ovata ad ovato-lanceolata (lateralia valde obliqua), breviter petiolulata, acuminata, 1½-2½ poll. longa, chartacea, utrinque parce appresse hirsuta; flores desunt, racemos solitarios v. raro geminos strictos canescenti-pubescentes axillares formantes; bracteæ minutæ, subulatæ, persistentes; pedicelli sub fructu lin. circiter longi; calyx appresse pubescens, lineam fere longus, lobis acutis; legumina lineari-oblonga, torosa, compressa, pollicaria v. paullo longiora, 2½ lin. lata, pallida, parce appresse hirsutula, 5-6-sperma; semina transverse ovoidea, 2 lin. lata, olivacea.—*Pegu.*

N. B. *Phaseolus lucens*, Wall., *Ph. dolichoides*, Roxb., et *Ph. grandis*, Wall. apud Bentham Pl. Jungh. I 239 in adnot. endocarpio secedente dein semina arcte includente (quamobrem beat. Roxburghius semina arillata descripsit) gaudent et a me ad *Canavaliam* reducuntur.

15. Vigna brachycarpa, nov. sp.

Herba perennis, volubilis, habitu *V. vexillatæ*, caulibus filiformibus 3-4 ped. longis parce hirsutis; stipulæ peltato-lineari-oblongæ, 3-4 lin. longæ; folia pinnato-3-foliolata, petiolo gracili 1-1½ poll. longo hirsuto suffulta; foliola deltoideo-lanceolata ad linearia (lateralia vulgo inæqualia), breviter petiolulata, acuminata, 1-2 poll. longa, chartacea, utrinque parce hirsuta; flores minores, flavi, brevissime pedicellati, pauci, pedunculum gracilem parce hirsutum axillarem petiolis longiorem v. æquilongum terminantes; calyx amplus, 1½ lin. tantum altus, glaber, dentibus latis, acutis, brevibus; corolla c. ½ poll. longa; legumina lineari-oblonga, stricta, utrinque obtusiuscula, usque ad pollicem longa, 2½ lin. lata, compressa, nigrescentia, sparse sed longè hirsuta, polysperma; semina crassa, sub-4-gona, lin. lata et longa, opaca, nigra.—Arracan.

N. B. *Dolichos Gangeticus*, Roxb., generi *Vignæ* adnumerandus est.

16. Dunbaria podocarpa, nov. sp.

Herba perennis, volubilis, flavescenti puberula; folia pinnato-3-foliolata, petiolo flavescenti pubescenti ½-1 pollicari instructa; foliola lato-ovata (lateralia obliqua), petiolulis brevibus pubescentibus suffulta, acuminata, utrinque (imprimis subtus) puberula, subtus pallida, lutescentia, aurantiaco- v. luteo-resinosa; flores mediocres, pedicellis 2 lin. longis pubescentibus vulgo bini pedunculo brevissimo appresse fulvo-pubescenti axillari instructi; calyx c. 3 lin. altus, appresse flavo-pubescens, dentibus lanceolatis: ovarium stipitatum, appresse pubescens; legumina stipite 3-5 lin. longo suffulta, lineari-lanceolata, plana et vix torosa, acuminata, $1\frac{1}{2}$-2 poll. longa, 4 lin. lata, puberula, pleiosperma ; semina latiora quam longa, compressa, c. 2 lin. lata, nigra.—*Tenasserim.*

N. B. *Phaseolus fuscus*, Wall. *Dunbariis* est adnumerandus.

17. Atylosia candicans, (*Cajanus ? candicans*, Wall., Cat., 5576 et 5567).

Herba perennis, erecta, molliter albido-tomentella; folia pinnato-3-foliolata, petiolo 1-$1\frac{1}{2}$ pollicari pubescenti instructa ; foliola lato-ovata (lateralia obliqua), obtusiuscula v. obtusiuscule acuminata, 1-2 poll. longa, basi subcordata, utrinque pubescentia, subtus albida ; flores mediocres, pedicellis 2-3-lin. longis albo-pubescentibus, racemum albo-tomentosum axillarem folio breviorem efformantes ; calyx fere 5 lin. longus, albo-pilosus, usque ad basin fere 5-fidus, lobis linearibus, acuminatis; corolla calycis lobis paullo longior ; legumina transverse impressa et torosa, dense pilosa.—*Ava.*

N. B. *Dunbaria calycina*, Miq., *Atylosiæ* est species. *Dolichos tomentosus*, Roth (*D. bracteatus*, Wall., Cat., 554) *Rhynchosiæ* a me adnumeratur.

18. Flemingia sericans, nov. sp. (*F. nana*, Wall., Cat., 5747. B. non Roxb.).

Herba perennis, 2-$2\frac{1}{2}$-pedalis, caulibus angulatis canescenti-pubescentibus ; folia digitato-3-foliolata, petiolo crasso 3-angulari anguste alato $\frac{3}{4}$-1 poll. longo suffulta ; foliola magis minusve rhomboideo-ovato-lanceolata (lateralia obliqua), breviter petiolulata, obtusiuscula cum mucrone v. acuta, 2-3 poll. longa, utrinque molliter puberula, supra velutina, subtus sparse nigro-resinoso-punctata ; flores parvi, purpurascentes, pedicellis lin. longis v. subsessiles, racemos breviores v. longiores argenteo-sericeos solitarios v. fasciculatos axillares efficientes ; bracteæ parvæ, ovatæ, sericeæ, valde deciduæ ; calyx argenteo-sericeus, $2\frac{1}{2}$-3 lin. longus, lobis lineari-subulatis, infimo longissimo ; corolla glabra, paullo longior ; legumina ovoideo-oblonga, puberula, vix sparse coccineo-resinoso-punctata, vulgo 2-sperma.—*Prome ; Martaban.*

19. Mucuna biplicata, Teysman et Binnendyk, Cat. Hort. Bog., 1866, 261.

Legumen oblongum, sessile, c. 3-4 poll. longum, 1-3-spermum, utrinque bialatum, transverse plicatum, plicis duplici serie digestis apice horizontali chartaceo explanatis.—*Insula Borneo.*—Legumina vetusta tantum exstant, sed species distinctissima haud cum *M. anguina*, Wall. (= *M. monosperma*, Roxb.) conjungenda (cf Schoffer Obs. phyt. 91).

20. MUCUNA MOLLISSIMA, Teysman and Binnendyk, Cat. Hort. Bog., 1866, 261.

Frutex scandens, molliter pubescens; folia pinnatim 3-foliolata, petiolo piloso 1½-2½ pollicari suffulta; foliola rhomboideo-ovata, (lateralia valde obliqua), petiolulis 1-2 lin. longis pubescentibus instructa, obtusa cum mucrone v. acutiuscula, membranacea, 2-3 poll. longa, molliter pubescentia; stipellæ subulatæ, lin. longæ; flores mediocres, pedicellis 4-5 lin. longis pubescentibus, racemum longiuscule (1-2 poll. longum) pedunculatum pubescentem folio breviorem axillarem formantes; calyx velutinus cum setis fulvis urentibus interspersus, amplus, ⅓ poll. in diametro, dentibus 3 inferioribus triangulari-acutis, superioribus 2 connatis bi-denticulatis; corolla poll. longa, vexillo obovato-oblongo, breviter unguiculato alis longitudine æquans, carina paullo longior; legumina oblonga, 3-4 poll. longa, 5-6-sperma, brevissime stipitata, subvelutina et setis rigidis fulvis fragilibus deciduis obtecta, utrinque in alas 2 undulatas expansa, transverse et valde oblique simpliciter plicata, plicis magis minusve revolutis; semina lato-elliptica, plana, ½ circiter longa, nigra.—*Molluccos, Halmahaira*, in horto Bogoriensi culta.

21. PTEROCARPUS MACROCARPUS, nov. sp.

Arbor, novellis fulvo-pubescentibus, folia impari-pinnata, ½-¾ pedes longa, rachi fulvo-puberula; foliola ovata ad oblonga, 3-5-juga, alterna, petiolulo 1-2 lin. longo ferrugineo-pubescente suffulta, breviter et obtusiuscule acuminata, mucronata, 1½-2½ longa, integra, coriacea, novella subtus fulvo-pubescentia, glabrescentia et secus nervos puberula; flores mediocres, flavi, pedicellis 3-4 lin. longis fulvo-pubescentibus; in racemos simplices fulvo-pubescentes axillares digesti; calyx dense ferrugineo-velutinus, c. 3 lin. longus, basi sub-oblique attenuatus; corolla ultra 3 lin. longa, petalis undulato-crispatis; stamina diadelphia; ovarium villosum; legumina canescentia v. fulvescenti-velutina, irregulari-orbicularia, alis subplicatis 1½-2 poll. in diametro, basi inæquali sinuato-rotundata, acumine styloso minuto supra sinu basali protrudente.—*Martaban*; *Tenasserim*.

22. COMBRETUM DASYSTACHYUM, nov. sp.

Frutex scandens, habitu *C. Chinensis* sed partes omnes magis minusve pubescentes; folia opposita v. sæpius ternata, elliptico- ad obovato-oblonga, petiolo brevissimo crasso fulvo- v. ferrugineo-pubescente suffulta, acuminata, integra, 3-4 poll. longa, membranacea, supra sparse albo-puncticulata, subtus (secus nervos dense) pubescentia; flores parvi, albidi, sessiles, spicas satis robustas strictas patentes v. decurvas dense ferrugineo-tomentosas axillares folio breviores efformantes; calyx tubuloso-campanulatus; limbus 4-lobatus, intus dense fulvo-hispidus; petala lato-oblonga, cuneato-unguiculata, calycis lobis longiora; ovarium mox glabrescens, obsolete 4-gonum; fructus oblongi, 1½ poll. fere longi, pollicem lati, glabri, 4-alati, alis chartaceis semi-oblongis nucis diametro multo latioribus.—*Pegu; Martaban.*—*C. Chinensi*, Roxb. (*C. Griffithii*, Heurck and Muell-Arg. Obs. Bot. Plant. nov. 231) valde affine.

23. Combretum pyrifolium, (*Pentaptera pyrifolia*, Wall., Cat., 3985 non Presl.).

Frutex scandens, habitu *C. ovalifolii*, novellis ferrugineo-puberulis; folia parva, ovalia ad lato-oblonga et suborbicularia, opposita v. alterna, petiolo 3-4 lin. longo gracili suffulta, obtusa v. subretusa et mucronata, integra, chartacea, 1½-2 poll. longa, glabra, supra puncticulata; flores ..; spicæ puberulæ, solitariæ v. in paniculas graciles axillares v. breves terminales digestæ; fructus parviusculi, ½-¾ poll. longi, glabri, 5-4-alati, alis chartaceis semi-ovalibus nucis diametro latioribus.—*Ava*.

24. Combretum quadrangulare, nov. sp.

Frutex subscandens, argenteo-lepidotus et punctatus, ramulis acute 4-angularibus; folia opposita v. raro alterna, parva, obovato-cuneata v. raro ovata, petiolo brevi gracili lepidoto suffulta, vulgo obtusa v. subretusa et mucronata, integra, 1½-3 poll. longa, chartacea, utrinque (subtus sub-dense) argenteo-lepidota et punctata; flores parvi, albi?, bracteâ subulatâ fugacissimâ substructi, spicas solitarias v. binas simplices dense lepidotas axillares folio breviores formantes; calyx infundibuliformis, vix lin. longus, dense lepidotus, limbo 4-dentato intus dense fulvo-villoso; petala calycis dentibus 3-angularibus paullo longiora, obovata; stamina exserta; fructus parvi, ½-⅔ poll. longi et lati, suborbiculares, dense argenteo-lepidoti, 4-alati, alis chartaceis, nucis diametro latioribus.—*Tenasserim; Siam.*

N. B. *C. platyphyllum*, v. Heurck et Muell-Arg. Obs. Bot. Plant. Nov. 242 = *C. extensum*, Roxb.; *Anogeissus phillyreæfolia*, v. Heurck et Muell. Arg. l. c. 219. = *A. acuminatæ* varietas.

25. Lonicera leiantha, nov. sp.

Frutex glaber; folia ovata ad ovato-oblonga, basi acutâ decurrentia, petiolo 3-4 lin. longo suffulta, obtusiuscula, subcoriacea, 2-3 poll. longa, lævia, glabra, supra nitida; flores magni, 2½-2 poll. longi, glaberrimi, sessiles, bini v. solitarii pedunculo crasso stricto 3-4 lin. longo axillari suffulti; calycis tubus 3 lin. fere longus, lævis, limbo ample-infundibuliformi lin. fere longo leviter 4-dentato.—*Avæ montes.*—*L. longifloræ*, DC. affinis.

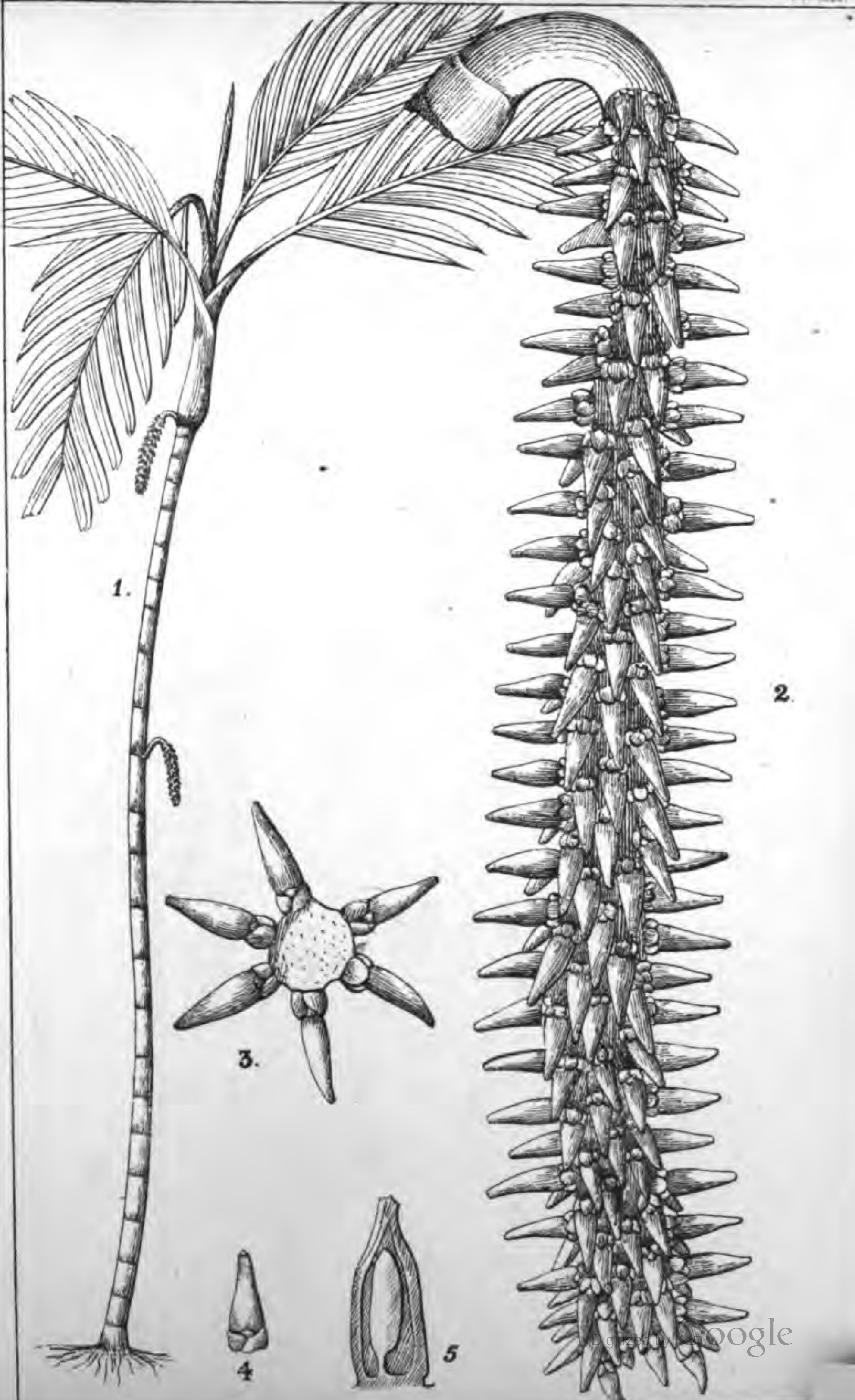
26. Rubia Sikkimensis, nov. sp.

Herba perennis *R. cordifoliæ* arcte affinis, aculeolato-scabra, caulibus anguste alato-angulatis; folia sessilia v. subsessilia, 4na v. sursum 3na verticillata, lanceolata ad elliptico-lanceolata, 3-5-nervia, acuminata, basi obtusa, imprimis secus nervos et margines retrorse aculeolata, 2-4 poll. longa, chartacea ; flores minuti, pedicellis semilineam longis suffulti, cymosuli, paniculas brachiatas axillares in paniculam majorem terminalem collectas formantes ; baccæ didymæ v. globosæ, pisi minimi magnitudine, glabræ, succulentæ.—*Sikkim-Himalaya.*

N. B.—*Psilobium capillare,* Kurz in Journ. As. Soc. Beng., 1872, 313 = *Morindopsis capillaris.*

27. Arnebia Tibetana, nov. sp.

Herba perennis magis minusve ramosa usque ad semipedem alta, appresse hispida (pilis rigidis albidis e tuberculis albis ortis) ; folia obovato-linearia ad lineari-oblonga et linearia, radicalia in petiolum longiorem v. breviorem decurrentia, caulina sessilia, obtusa v. obtusiuscula, crasse membranacea, appresse albo-hispida ½-1½ poll. longa ; flores verosimiliter flavi, sessiles, in spicas longiores v. breviores circinnatas terminales et laterales congesti et sæpius in paniculam spuriam albo-hirsutam collecti ; bracteæ calyce breviores, albo-hispidæ, lineares, obtusæ ; calyx albo-setosus, usque ad basin fere 5-partitus, segmentis 2 lin. circiter longis v. longioribus anguste linearibus ; corolla infundibuliformi-hypocraterimorpha, c. ½ poll. longa, lobis brevibus rotundatis ; antheræ fauci inserta ; nuces griseæ, 3-angulari-ovatæ, acutæ, tuberculatæ, lineam fere longæ, dorso obtuse carinatæ. *Tibetia occidentalis,* 12000-16000 p. s. m.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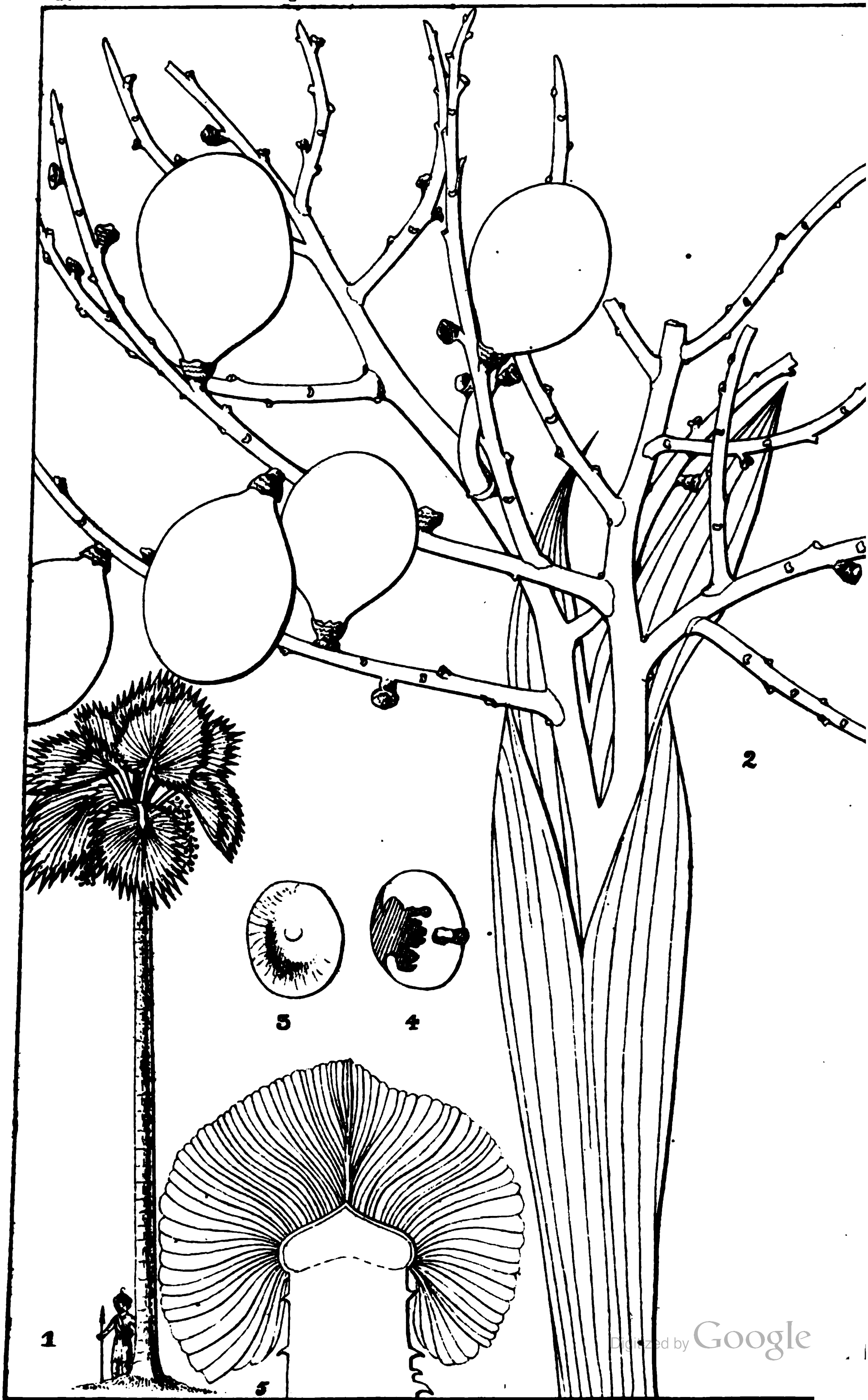

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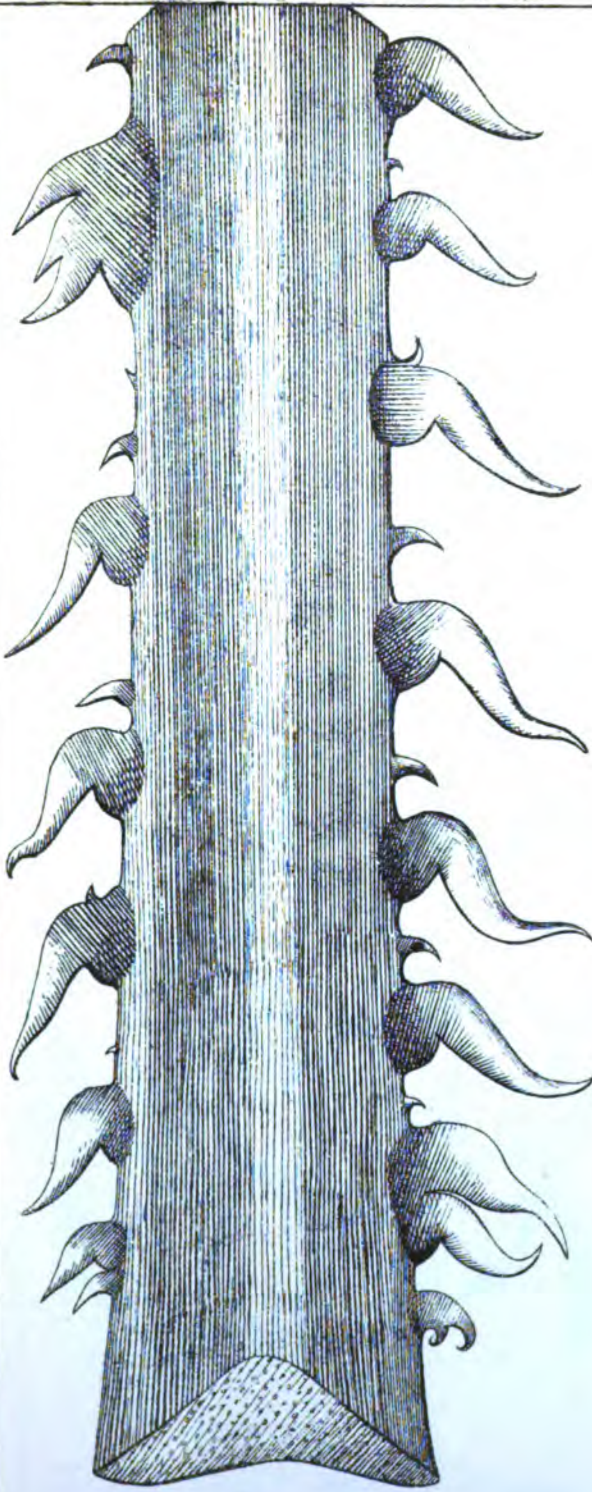

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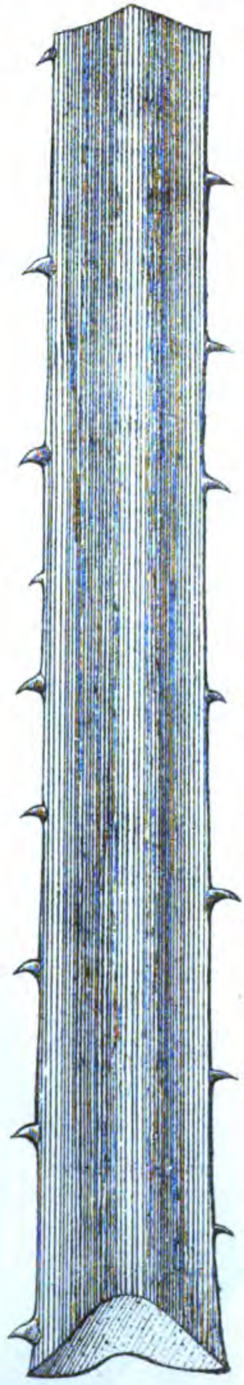

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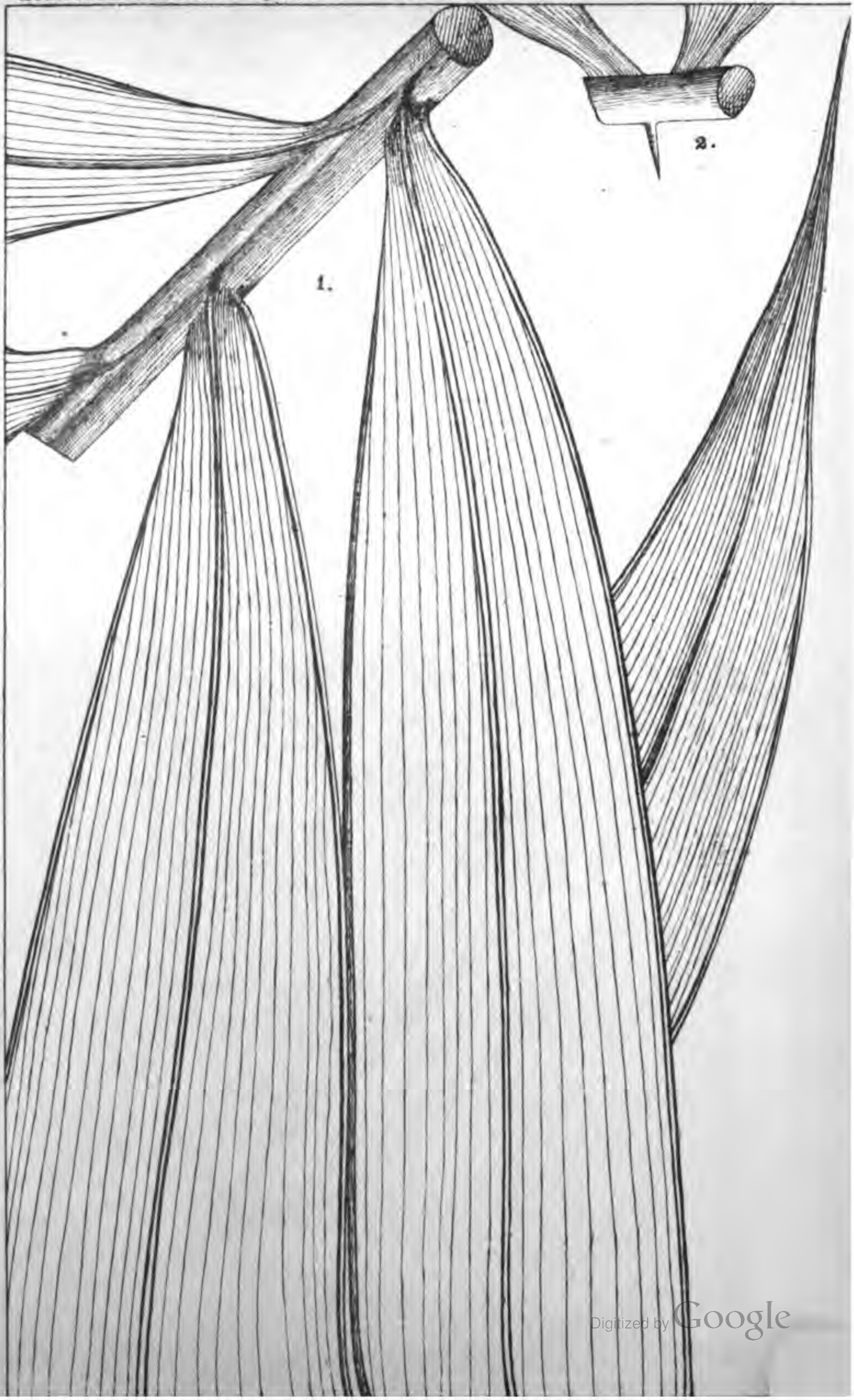
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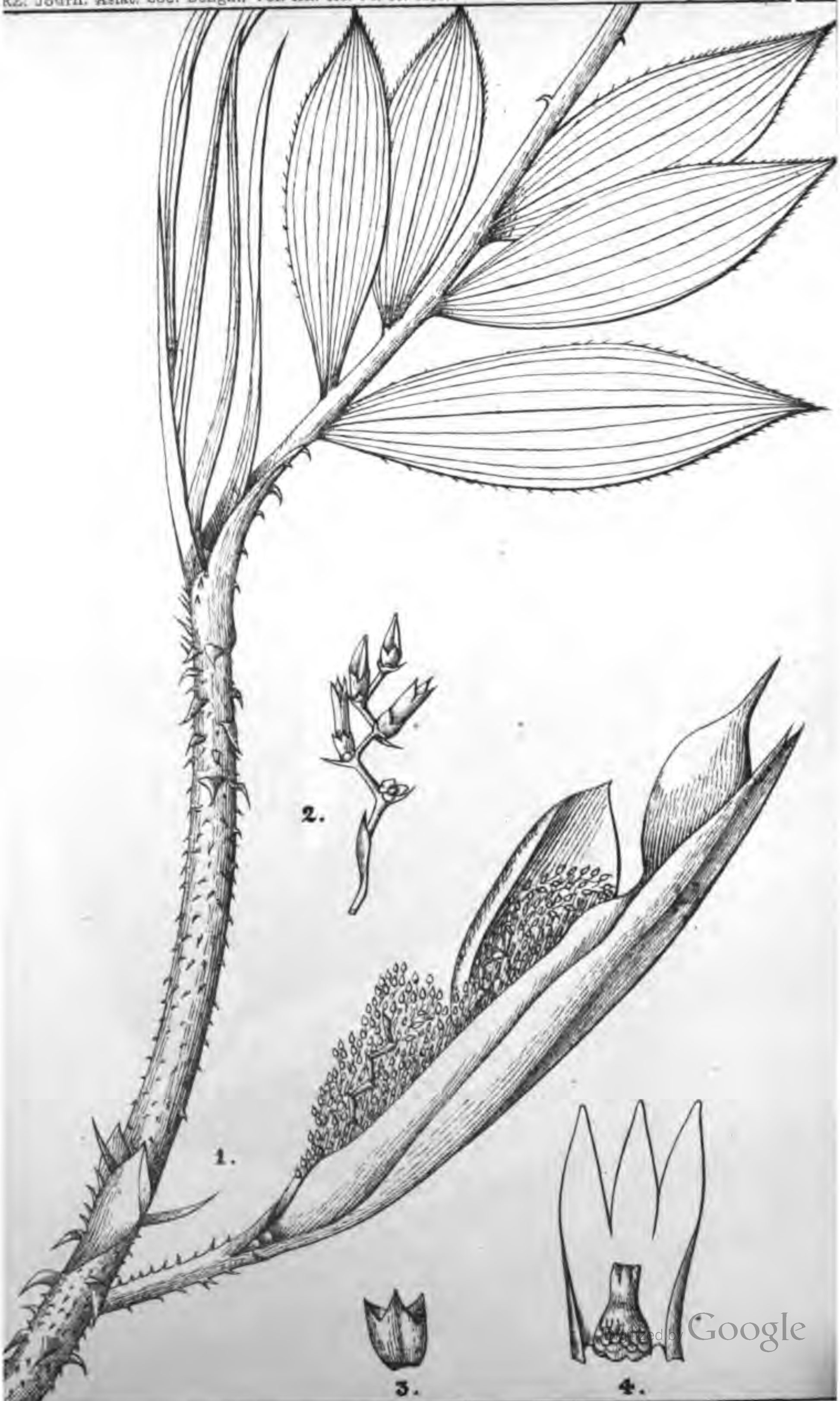
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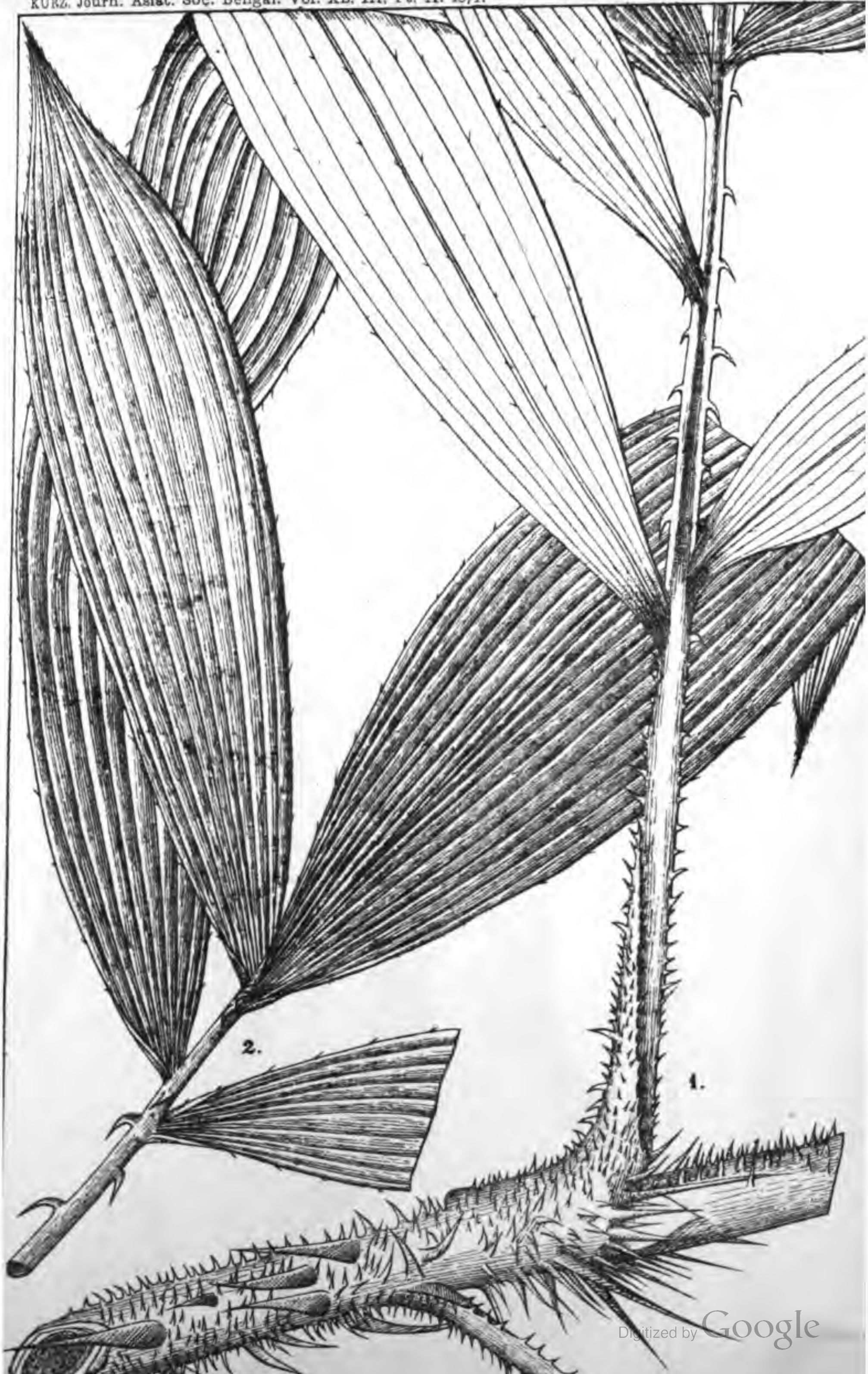
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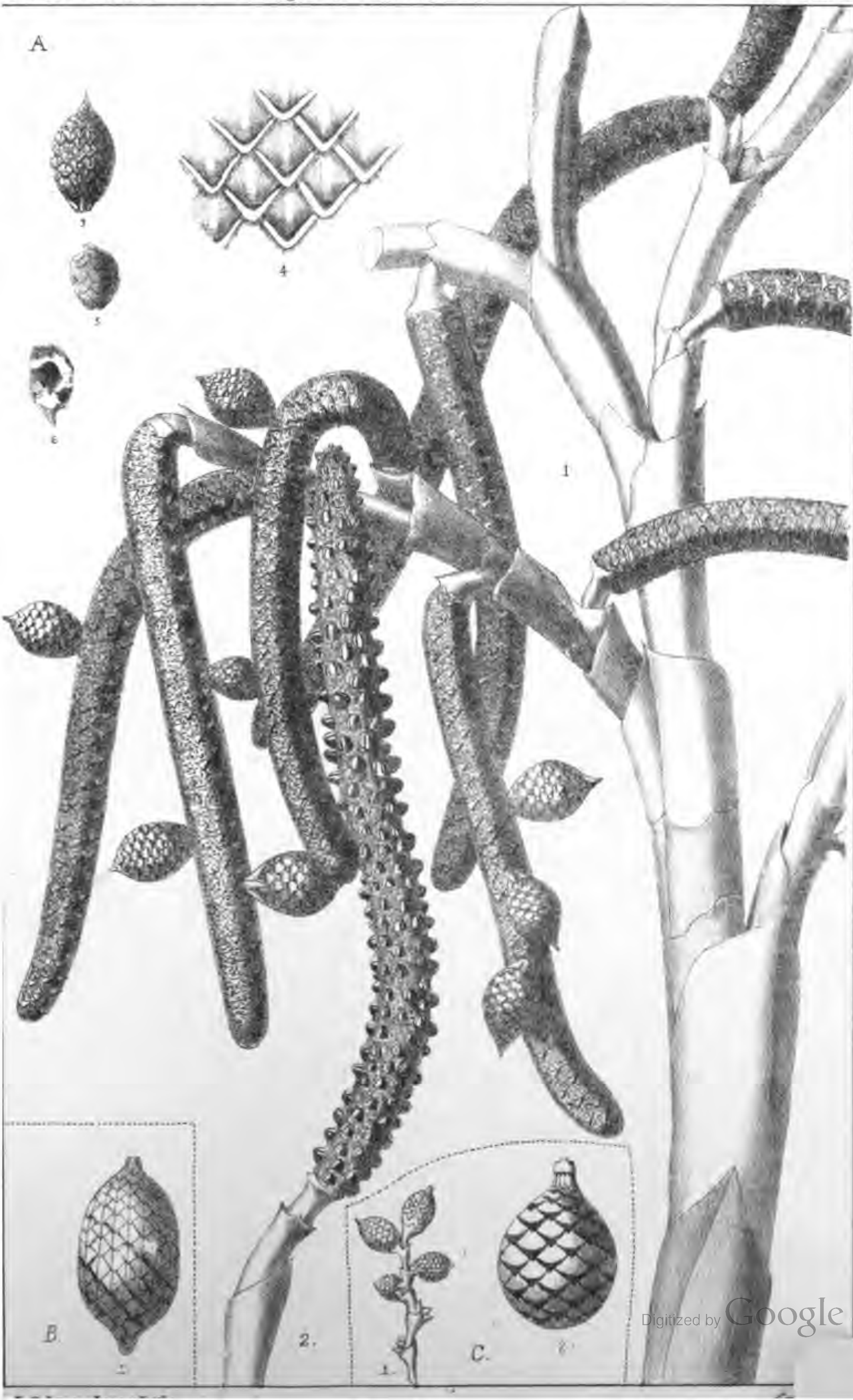
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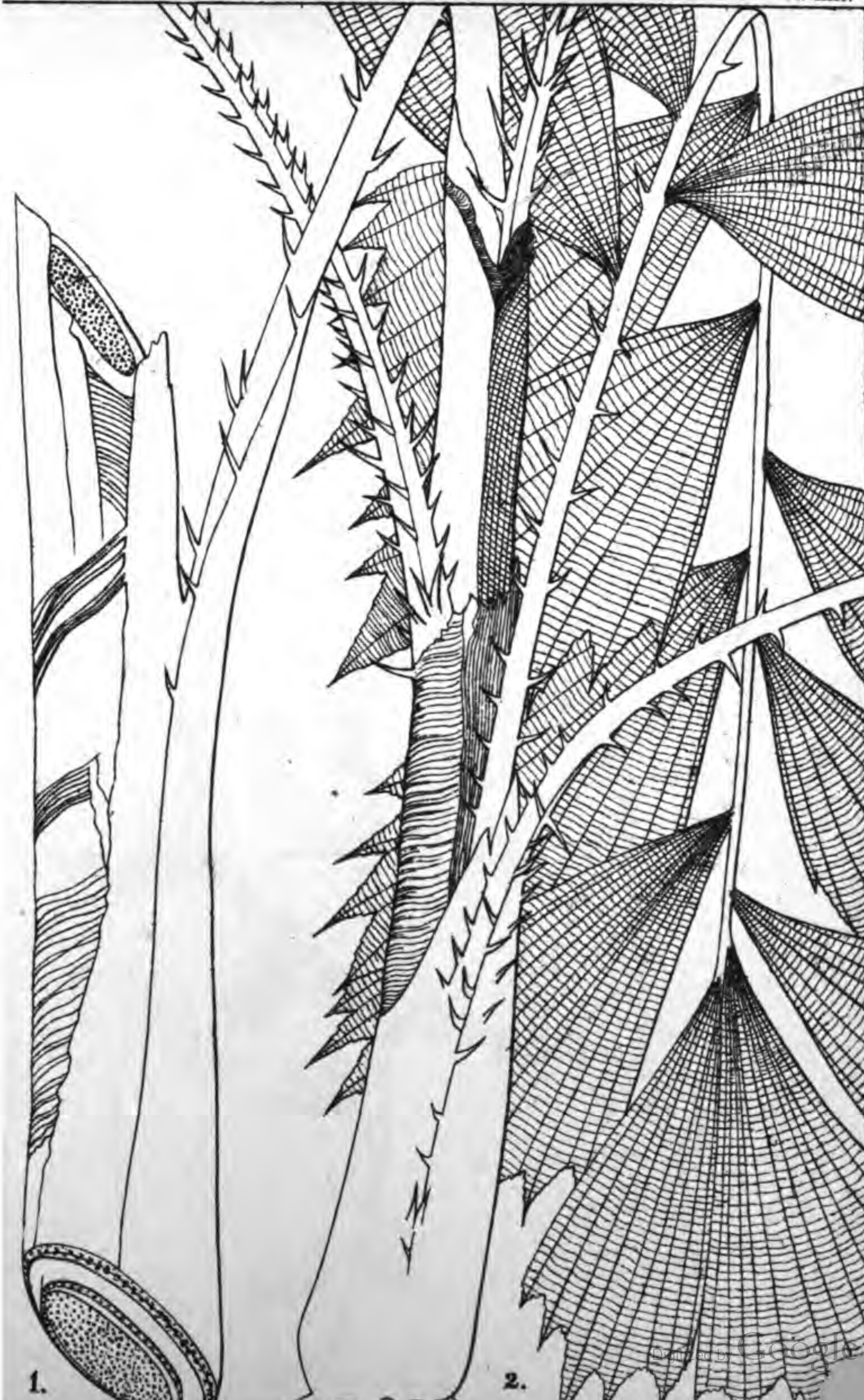

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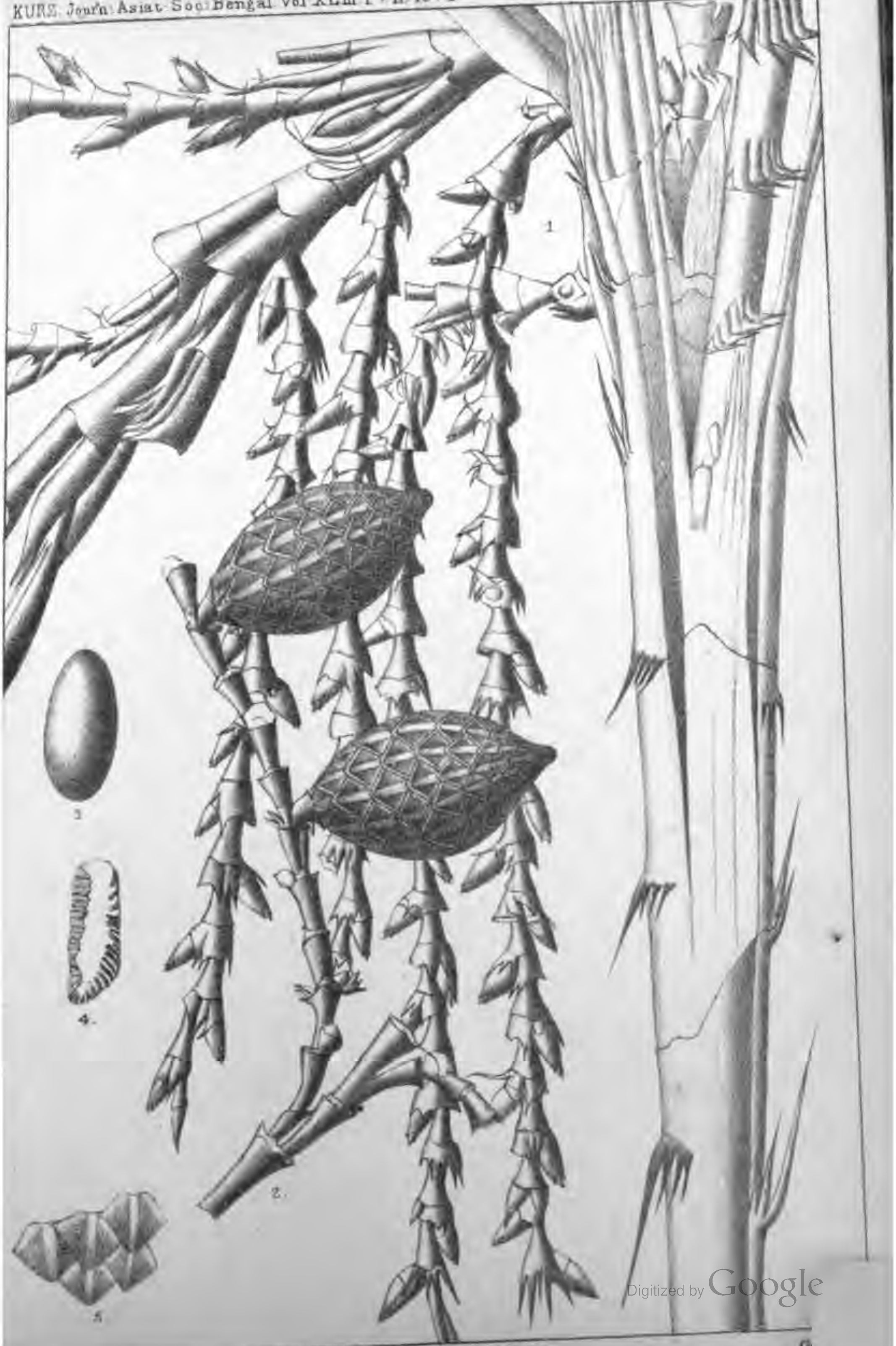
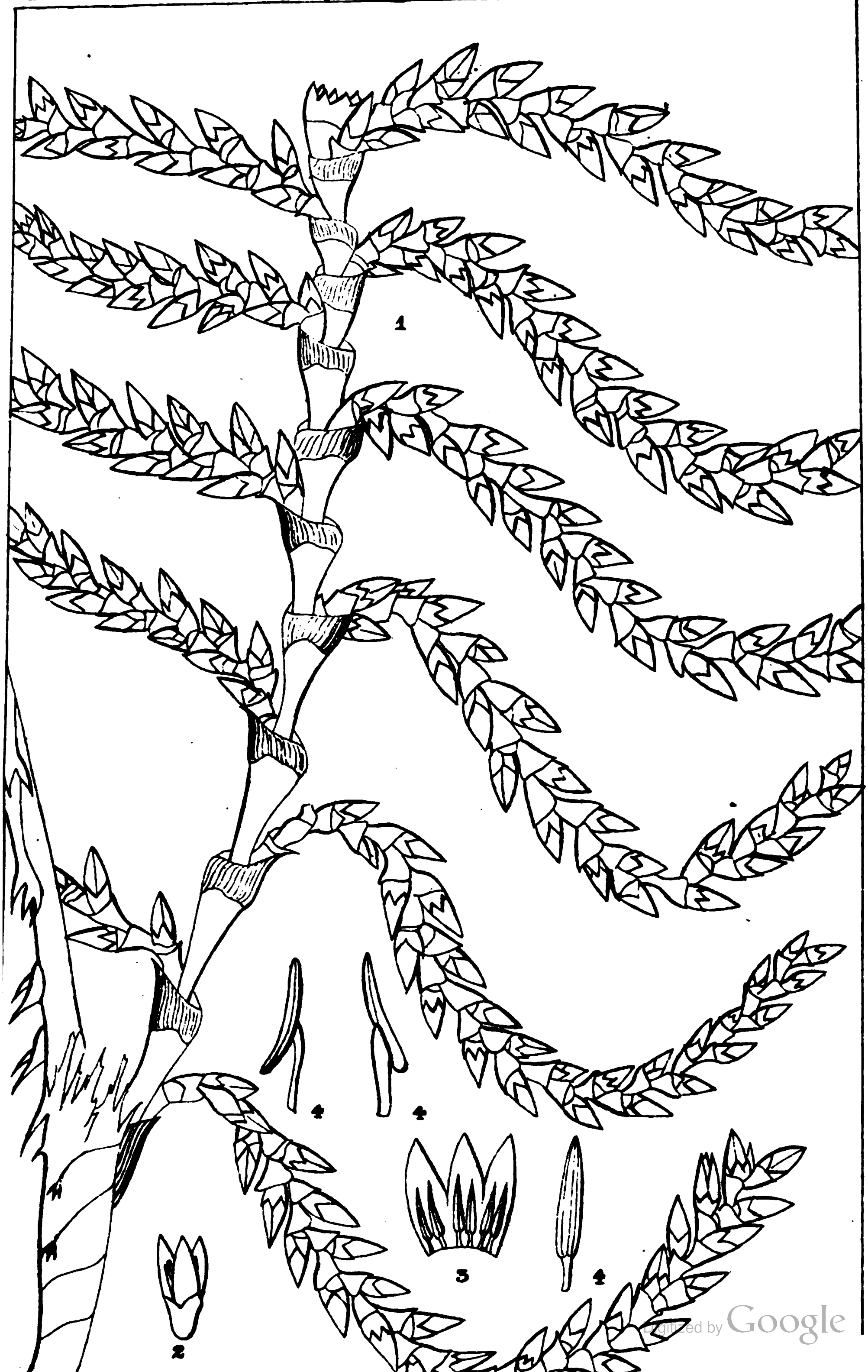


CALAMUS ERECTUS.



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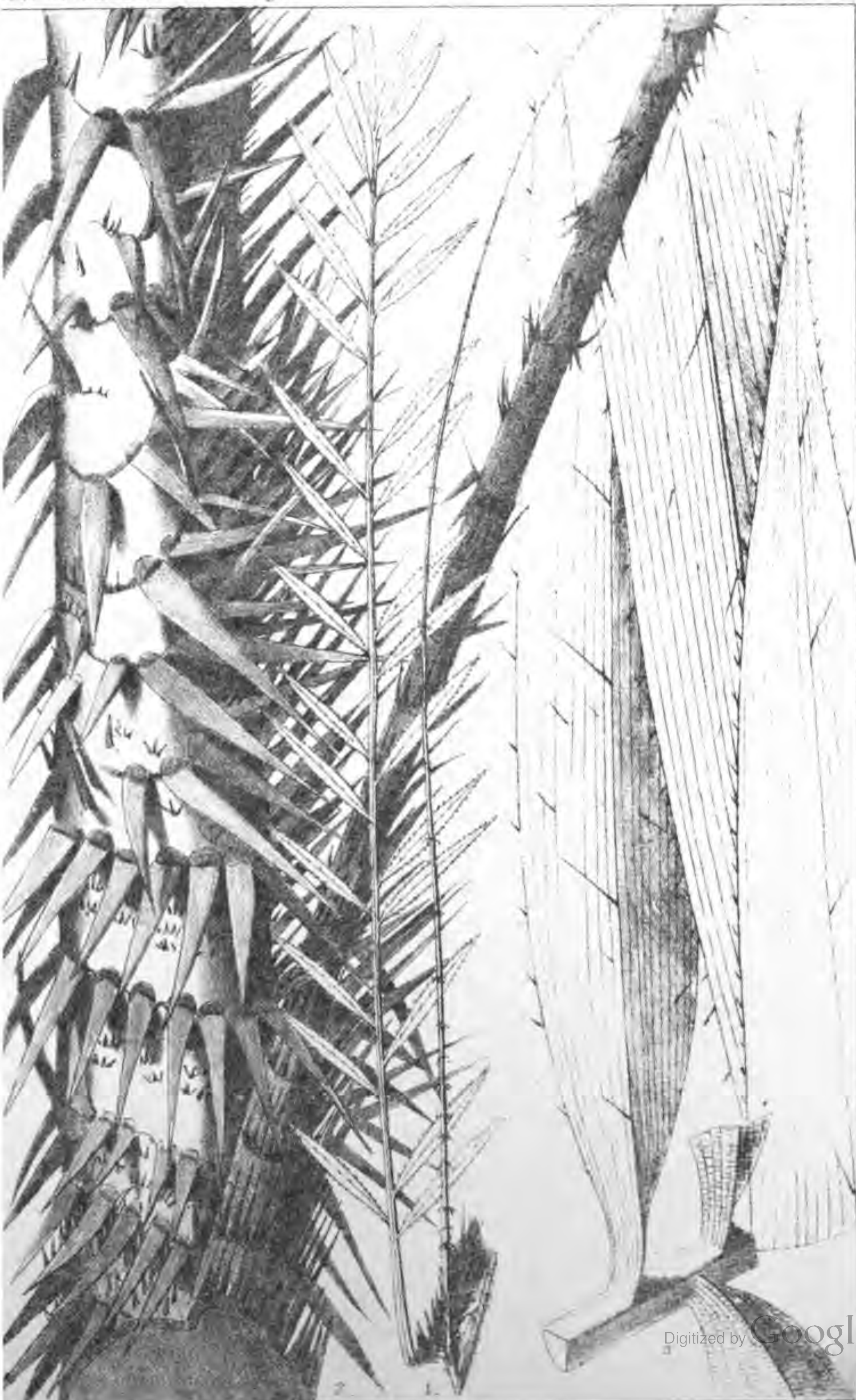
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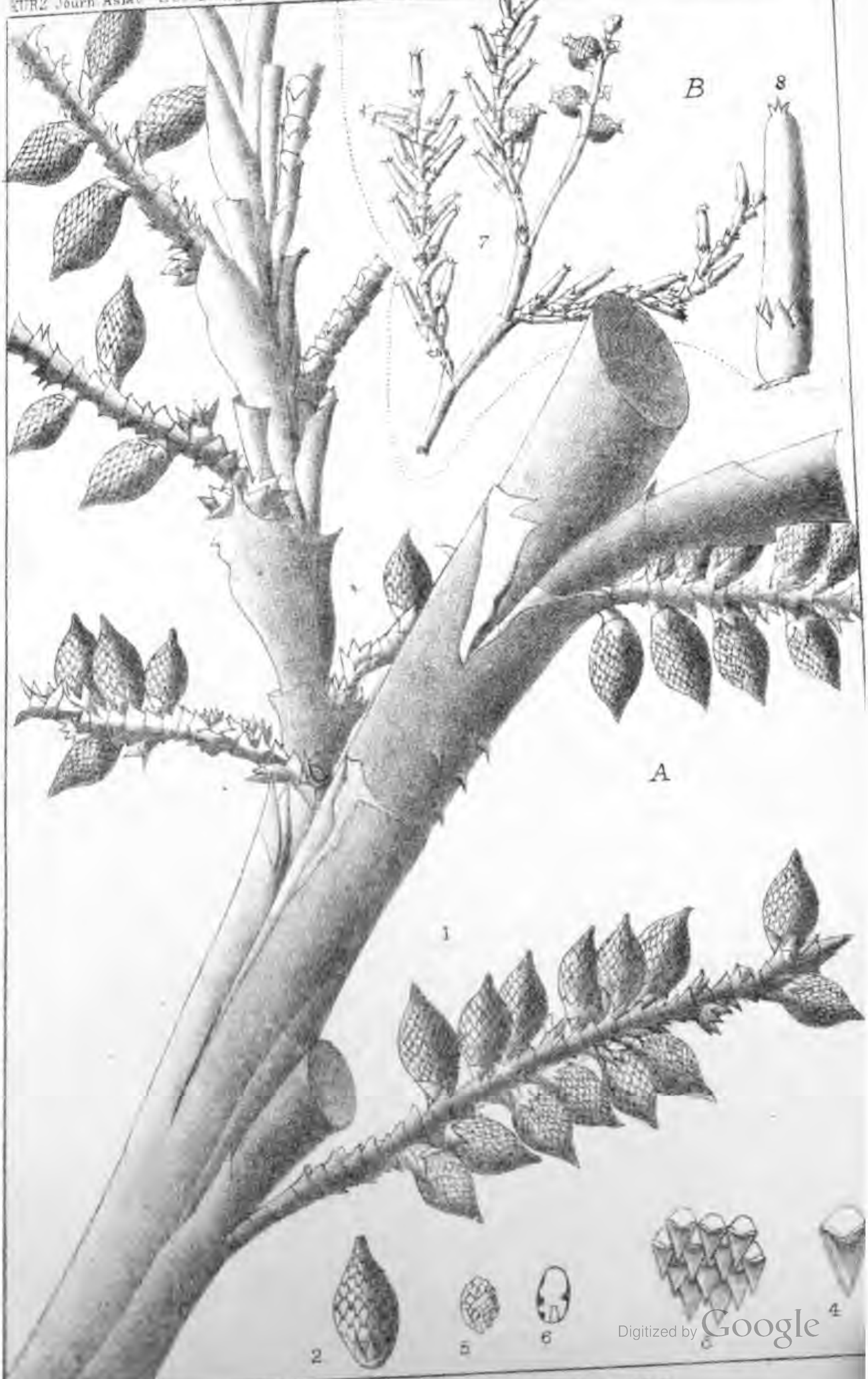
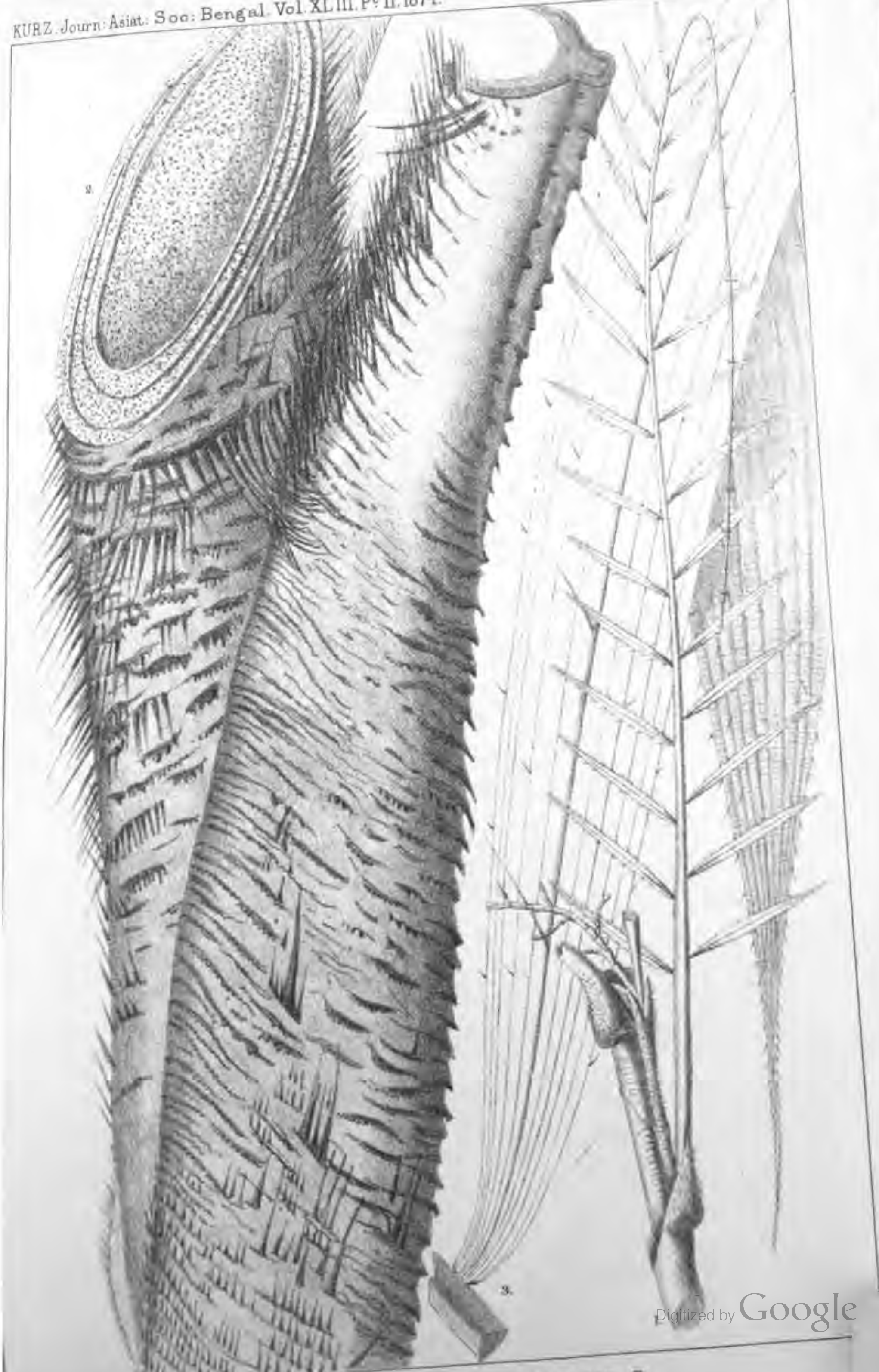
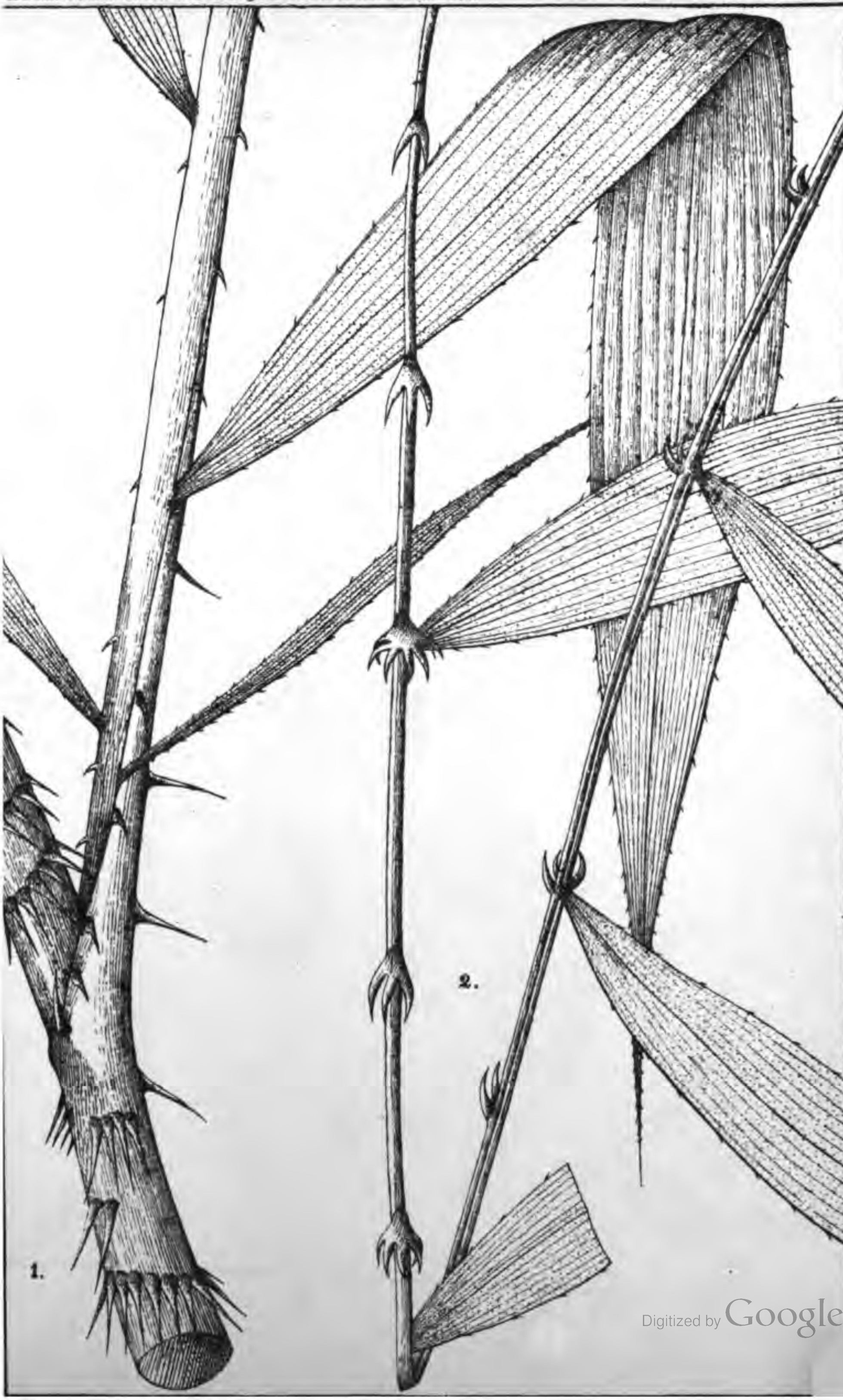


A. C. ANDAMANICUS; B. C. FASCICULATUS



...AMUS ANDAMANICUS, ♀.

CALAMUS PARADOXUS.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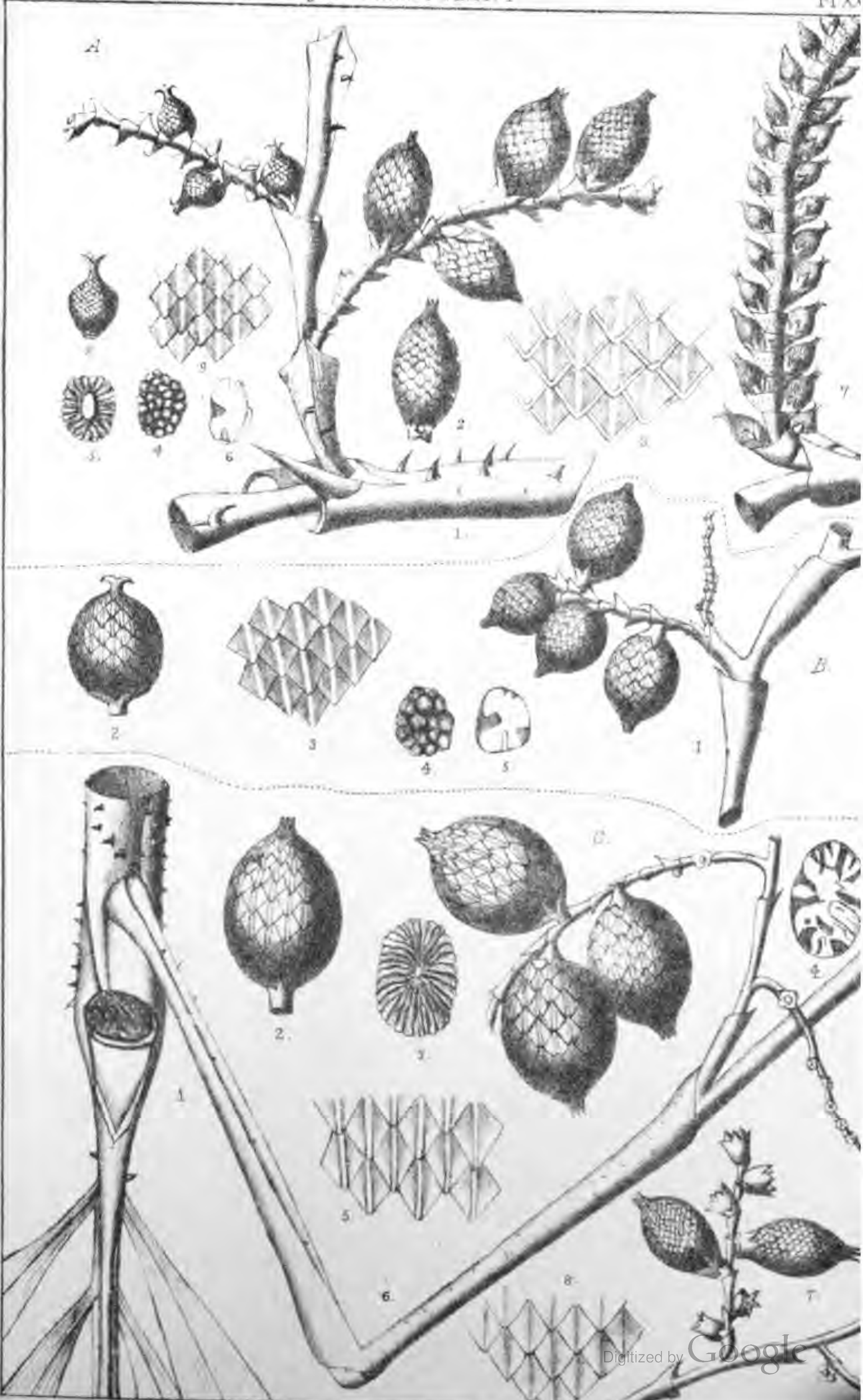
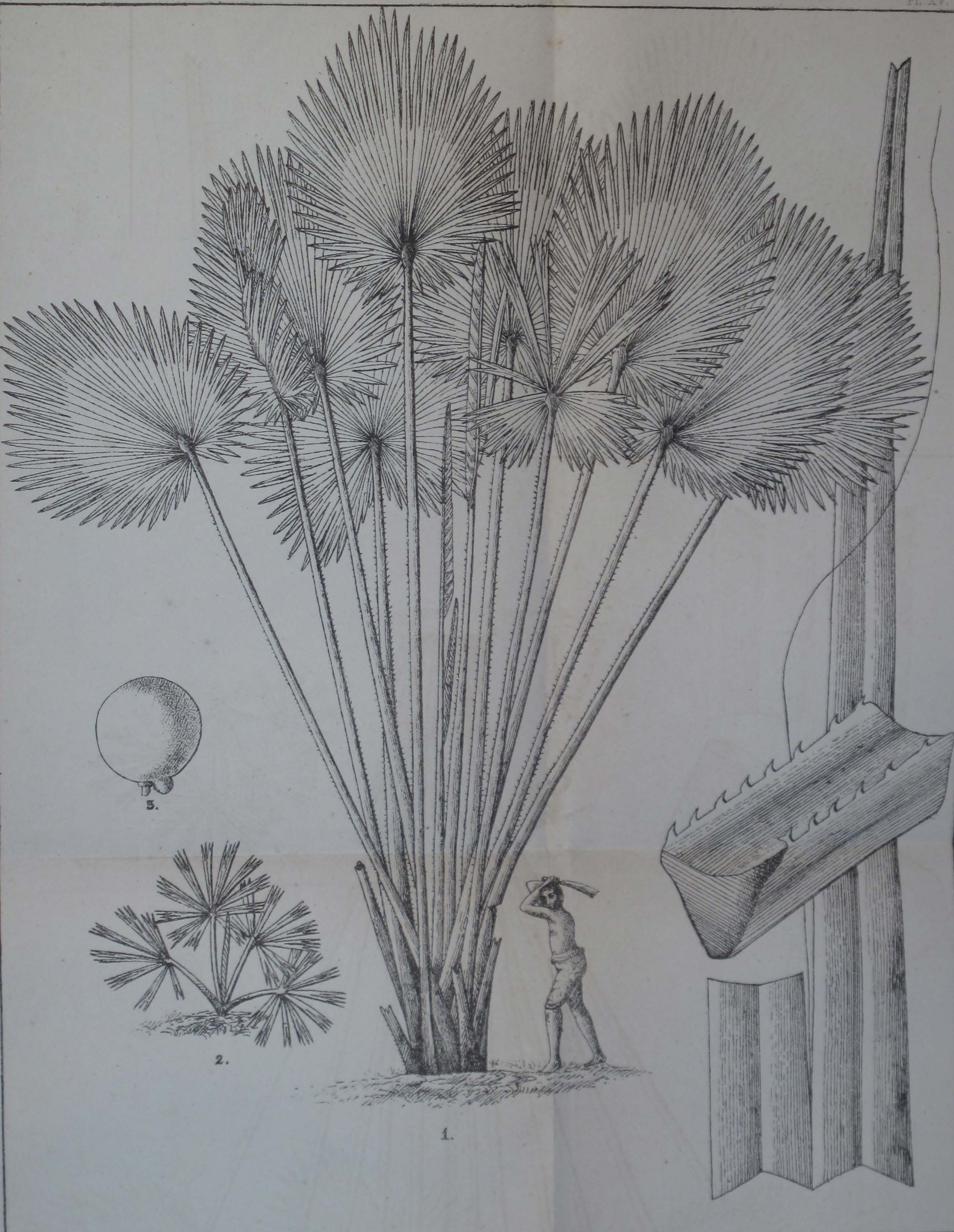


J. N. Dás. Lith. A Calamus latifolius. B C. tenuis. C C. fragili[s]



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CORYPHA MACROPODA

JOURNAL

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Part II.—PHYSICAL SCIENCE, &c.

No. IV.—1874.

Enumeration of Burmese Palms.—*By* S. Kurz.

(Received Oct. 12, read Dec. 3, 1873.)

(With Plates XII—XXXI.)

In working up my Burmese palms, I find that a few of them are new. I now propose to describe these and to give at the same time an enumeration of all the species that have hitherto been found in Burma, adding also a conspectus so as to facilitate their identification. The rattans, however, are in such a state of confusion that little can be done until the material for description becomes more complete and the almost inextricable synonymy of the described species has been properly cleared up.

I have not paid special attention to palms in the field, but a few remarks on variation may not be out of place here.

The size of the palms is often enough variable and, amongst the many examples, I shall mention only *Phoenix paludosa*, the stem of which varies in height from only 2 or 3 ft. up to 15 to 25 ft. Sobolification is a character of little value in my eyes. I look upon it rather as an idiosyncrasy, and, therefore, not even as a sufficient character on which to establish a variety. No doubt in very many species this character has become general and constant, but atavisms are not unfrequent. We know, for example, cases in which the common betel-nut palm has made as many as 7 shoots, and similar examples are not wanting (especially in *Phoenix*, *Cocos*, *Arenga*, *Euterpe*). *Areca triandra* has simple and soboliferous trunks with all intermediate states, and I have, therefore, unhesitatingly connected with it *A. laxa*, a species that differs in no structural points. *Caryota sobolifera* is another example wherein simple-stemmed and soboliferous plants may occasionally be found in the Burmese jungles not a dozen yards from one another. Species based upon such distinctions, if not also accompanied by structural differences, are in my opinion untenable, and grouping palm-species after such a character is simply misleading.

Again, the armature in *Calamus* would appear to me to be also subject to variation within certain limits. It certainly is often very different according to the age of the rattan itself, or accordingly as the sheaths come from the lower or upper parts of the plant. On the other hand, the *Calami* (including *Dæmonorops*) offer so many valuable characters in their spathes and spathules, nature of seeds, loræ and flagellæ, and, finally, in the scales and stamens, that we may confidently look forward to a sound and natural classification of the rattans so soon as the numerous book-species, often based upon incomplete pieces only, shall have been got rid of. The difference in the scales of the fruits of *Calamus* in different stages of growth is so far as possible illustrated in the present paper. The indument of the inflorescences and their spathes seems to afford valuable characters, especially to herbarium-botanists. The colour, however, of the same varies greatly in the same species, as for example in *A. gracilis*, in which some individuals have yellowish-white and bright scarlet *spadices*, while others have them greenish-purple.

Burmese palms are still very incompletely known, especially the rattans. While the distributional area of the leiocarpous palms is greater than one might have expected, that of the rattans is singularly restricted and limited. Thus I have been unable, in spite of all the pains I have taken, to identify several of my Burmese rattans with any of the 100 species or thereabouts already published. Only the more light-loving species, such as *C. Guruba*, *fasciculatus*, etc., have a wider distribution.

Burma and the Andamans contribute each a new type of *Calamus* in *C. tigrinus* and *C. Andamanicus*, which have the scales of their fruits furnished with fringed appendages as long as or longer than the scale itself.

I have, in the present paper, endeavoured to supplement my descriptions by the addition of figures, for it is irksome to recognise palms from descriptions only; a figure, moreover, allows considerably shortening of the description itself. The small size of the Society's Journal has, however, compelled me to introduce only the most important parts of these bulky plants.

SYNOPSIS OF THE GENERA AND SPECIES OF BURMESE PALMS.

SUBFAM. I. PALMÆ GENUINÆ.—Fruits not imbricate scaly, but smooth or variously rough or tubercled. Seeds without arillus. Usually erect, very rarely armed palms.

TRIB. I. NIPINÆ.—*Perianth of females reduced to a few scales. Ovaries* 3, *apocarpous. Male flowers in separate spadices surrounding the central female flower-head. Leaves pinnate.*

NIPA, *Rumph.*—Spathes many, sheathing, persistent. Female flowers on a central globular torus, surrounded by the male spadices. Male perianth 6-parted, complete, valvate in bud. Stamens united by threes. Drupes woody, angular-turbinate, collected into a large dense head. Albumen equable, hollow in centre. Soboliferous almost stemless palms.

N. fruticans, Wurmb. Only species.

TRIB. II. PINNATÆ.—*Perianth complete in both sexes. Leaves pinnate twice pinnate or pinnatisect, rarely almost entire. Erect palms.*

*** Spathes 1 or 2, more or less boat- or spindle-shaped.**

§ *Cocoineæ.*—Spathes 1 or 2, spindle-shaped or clavate. Ovary syncarpous. Putamen at base 3-porous. Leaves simply pinnate. (Probably better reduced again to a section of *Arecineæ.)*

COCOS, *L.*—Monoecious on the same spadix. Petals in females imbricate-convolute in bud. Ovary syncarpous, 3-celled, only one cell ovule-bearing. Drupe large, woody, containing a single one-seeded hard putamen. Albumen equable. Large simple-stemmed palms.

Cocos nucifera, L. Only species.

§ § *Arecineæ.*—Spathes 1 or 2, boat-shaped, caducous. Ovary syncarpous. Putamen not perforated. Pinnæ neither fascicled nor erose-toothed.

ARECA, *L.*—Flowers monoecious, their bases immersed in the cavities of the nude spadix. Stamens 3, 6, or numerous. Petals valvate in bud.

Albumen ruminate. Simple-stemmed or soboliferous palms. Pinnæ irregularly united into broader or narrower segments, rarely all connate in a 2-cleft blade.

Species.

Subg. 1. *Areca,* L.—Stamens 6 or 3. Stigmas 3. Female flowers lateral between the ramifications, rarely axillary. Spadix often twice ramified, the ultimate ramifications usually more or less filiform and covered by male flowers only.

× Stamens 6. Female flowers without bract.

Simple-stemmed, glabrous; drupes as large as a hen's egg, ...*A. Catechu,* L.

× × Stamens 3. Female flowers without bract.

Glabrous, simple-stemmed or soboliferous, ...*A. triandra,* Roxb.

Subg. 2. *Pinanga,* Bl.—Stamens numerous. Stigma 1. Female flowers in grooved series. Spadix simply ramified, or rarely undivided.

× Flowers distichous.

Cæspitose; spadix branched; sheaths, etc., slightly scurvy,...*A. costata.*

× × Flowers tristichous.

Simple-stemmed; spadix slender, ramified or simple; sheaths, etc., scurvy, ...*A. gracilis,* Roxb.

× × × Flowers 5—6-stichous.

Simple-stemmed; sheaths, etc., scurvy; spadix simple, fleshy, as thick as the finger, ...*A. hexasticha,* Kurz.

§ § § *Phoeniceæ.*—Spathes 1 or 2, boat-shaped, persistent. Ovary apocarpous, consisting of 3 distinct carpels. Pinnæ often fascicled.

Phoenix, *L.*—Dioecious. Corolla in males valvate, in females imbricate in bud. Drupes sappy, solitary. Albumen equable. Simple-stemmed or stoloniferous palms, sometimes stemless. The lower pinnæ reduced to spines.

Species.

* Spathes smooth; flowers supported by a small subulate bract.

Stemless; petioles rather long and slender, spiny-armed, ...*P. acaulis,* Roxb.

* * Spathes covered with a brown scurf; flowers without a bract.

Simple-stemmed, robust; petioles very short and dilated, spiny-armed; drupes about an inch long,....................................*P. sylvestris,* Roxb.

Soboliferous, slender; petioles long and slender, spiny-armed; drupes about ½ an inch long, ...*P. paludosa,* Roxb.

*** * Spathes several, tubular or sheathing. Ovary syncarpous.**

§ § § § *Caryoteæ.*—Spathes several, tubular or sheathing, persistent. Pinnæ of the leaves often fascicled, jagged or erose-toothed.

ARENGA, *Lab.*—Flowers monoecious in different spadices. Petals of both sexes valvate in bud. Stamens indefinite. Ovary 3-celled. Drupe depressed-3-angular, rather dry, 3-seeded. Albumen equable. Simple-stemmed rarely soboliferous palms. Leaves simply pinnate, the pinnæ linear, at base auricled at one or both sides.

Arenga saccharifera, Lab. Only species.

WALLICHIA, *Roxb.*—Flowers monoecious in different spadices, rarely dioecious. Petals in both sexes valvate in bud. Stamens often definite. Ovary 2-celled. Drupe sappy, usually 2-seeded. Albumen equable. Often stemless low palms. Leaves simply pinnate, the segments wedge-shaped.

Species.

Spadices smaller, the male spikes almost filiform ; male flowers yellowish ; calyx tubular, about a line long, ... *W. caryotoides*, Roxb.

Spadices very ample, the male spikes thick and rigid ; male flowers purplish or green ; calyx minute, cup-shaped, only about ½ lin. long, ... *W. disticha*, T. And.

As preceding, but the male calyx tubular, nearly a line long, ... *W. densiflora*, Mart.

CARYOTA, *L.*—Flowers monoecious on the same spadix. Stamens indefinite. Petals in males valvate, in females imbricate in bud. Ovary 1- or 2-celled. Drupe 1- or 2-seeded, sappy. Albumen ruminate. Simple-stemmed or soboliferous palms. Leaves bipinnate.

Species.

Simple-stemmed ; male petals about ½ inch long by 3 to 4 lin. broad, ... *C. urens*, L.

Usually soboliferous ; male petals about 4 lin. long and only 1½ lin. broad ; anthers mucronate or emarginate, ... *C. sobolifera*, Wall.

TRIB. III. FLABELLATÆ.—*Leaves fan-shaped. Perianth complete in both sexes. Erect palms.*

§ *Borassinæ.*—Ovary syncarpous, 2—4-celled, with as many ovules. Drupes 2—4-celled, with as many seeds.

Borassus, *L.*—Spathes several, incomplete. Male spadix catkin-shaped. Corolla imbricate in bud. Drupe large, fleshy-fibrous, 3-seeded. Seeds pomaceous, with a pore at their apex. Lofty palms. Pinnæ connate, and forming a blade.

Borassus flabelliformis, L. Only species.

§ § *Coryphinæ.*—Ovary apocarpous, consisting of 3 free or at apex united carpels (or only the styles united), usually only one of the carpels coming to perfection.

Licuala, *Rumph.*—Inflorescence axillary. Flowers hermaphrodite, solitary or by 2 or 3 together. Corolla 3-parted. Stamens perigynous, the filaments inserted at the throat of the corolla and united into a ring. Drupe sappy. Usually small simple-stemmed or tufted palms. Pinnæ all free to the base, or by 2 or several united into broader or narrower flabellate segments.

Species.

× Flowers large. Leaves peltately flabellate.

Calyx about ¼ to ⅓ inch long, ...*L. peltata*, Roxb.

× × Flowers small. Calyx not above 2 lin. long. Leaves palmately flabellate.

Trunk 4 to 8 ft. long; petioles aculeate, bordered along their whole length; calyx about a line long, ...*L. paludosa*, Griff.

Almost stemless; petioles unarmed at the upper third of their length; calyx 1½ lin. long, ...*L. longipes*, Griff.

Chamærops, *L.*—Inflorescence axillary. Flowers polygamous, several together. Corolla 3-parted. Stamens hypogynous. Drupe sappy. Albumen with a longitudinal furrow. Simple-stemmed or tufted palms. Pinnæ all connate and forming a blade.

Chamærops Khasyana, Griff. Only species.

Livistona, *R. Br.*—Inflorescence axillary. Flowers hermaphrodite, clustered. Corolla 3-parted. Stamens perigynous. Drupe sappy. Albumen with a cavity filled up with the intruding integuments. Embryo dorsal. Erect palms perennially flowering. Pinnæ connate and forming a blade.

Livistona speciosa, Kurz. Only species.

Corypha, *L.*—Inflorescence terminal. Secondary and tertiary spathes many. Flowers hermaphrodite, clustered. Corolla consisting of 3 free petals. Stamens hypogynous. Drupe corticate. Albumen hollow in centre or solid. Embryo apical. Lofty or rarely stemless palms, flowering once only and then dying off. Pinnæ connate and forming a blade.

Species.

* Simple-stemmed often lofty palms. Petioles comparatively short.

Trunk annular or almost even; drupes the size of a wood-apple, ...*C. umbraculifera*, L.

Trunk marked by the spiral scars of the fallen spirally arranged leaves; drupes the size of a cherry, ...*C. Gebanga*, Bl.

* * Stemless.

Petioles 18 to 25 ft. long; drupes the size of a cherry, *C. macropoda*, Kz.

Subfam. II. CALAMEÆ.—Fruits covered by retrorsely imbricate scales. Seeds often spuriously arillate. Usually armed climbers, rarely erect or unarmed.

Trib. I. Flabellatæ.—Leaves fan-shaped. Nearly all American.

Trib. II. Pinnatæ.—Leaves pinnate.

* Flowers spirally arranged, forming a more or less dense cylindrical catkin-like spike.

Korthalsia, *Bl.*—Spikes villous-bracteoled or the bracteoles glabrous, forming elongate panicles. Spathes tubular. Albumen ruminate. Scandent palms, sparingly armed.

Species.

Spines on the petioles almost straight, 3 to 4 lin. long; drupes obovoid, ½ inch long, ...*K. scaphigera*, Mart.

Spines on the petioles short, reflexed; drupes turbinate (globular), the size of a small pea, ...*K. laciniosa*, Mart.

Zalacca, *Rumph.*—Spikes villous-bracteoled, forming elongate panicles. Spathes elongate, cleft to the base. Seeds arillate. Albumen equable. Stemless or almost stemless erect palms, more or less armed.

Zalacca Wallichiana, Mart. Only species.

* * Flowers distichous (very rarely spuriously unilateral).

Calamus, *L.*—Flowers usually sessile, solitary in the spathules, or rarely in a short curved spikelet exserted from the spathule, forming elongate more or less pendulous panicles. Spathes tubular or flattened out from a tubular base, persistent. Spathules cymbiform or tubular. Seeds arillate. Albumen equable, but often pitted or erose on the outside. Scandent, rarely erect rattan-palms, more or less fearfully armed.

Species.

* Drupes sessile, *i. e.*, the perianth more or less spreading and adhering to the base of the fruit. Spathules of the spikes much imbricated, the exserted part cymbiform, shorter than broad, more or less truncate.

O Scales of fruit without a conspicuous appendage.

Δ Pinnæ equidistant. No leaf-tendrils.

Erect, tufted; pinnæ white beneath. No tendrils whatever, ...*C. arborescens*, Griff.

Erect, tufted; leaves uniformily green, without (but the sheaths and spadices with) tendrils, ...*C. erectus*, Roxb.

Δ Δ Pinnæ fascicled or interruptedly approximate.

Young stems, etc., whitish powdery; leaves without tendrils; pinnæ interruptedly fascicled; drupes globular, straw-coloured, ...*C. fasciculatus*, Roxb.

Glabrous; leaves tendril-bearing; pinnæ broad, alternately approximate; drupes oblong, brown, ...*C. latifolius*, Roxb.

O O Scales of fruits produced into a fringed appendage as long or longer than the crustaceous scale itself.

Leaves tendril-bearing; inflorescence without tendril; drupes ½ inch long, uniformily brown,.................................*C. Andamanicus*, Kurz.

Leaves without tendrils; inflorescence with tendrils; drupes an inch long or somewhat longer, dark and pale brown variegated, *C. tigrinus*, Kurz.

* * Drupes seated on the erect indurated thick pedicel-like perianth. Spathules usually long-exserted and tubular, rarely cymbiform and imbricate, usually not truncate.

O Spathules imbricate, broader than long, truncate.

Leaves without tendrils; pinnæ equidistant; drupes globular, ⅓ inch thick, straw-coloured,..*C. tenuis*, Roxb.

O O Spathules exserted and rather elongate.

× Spathes with a short acute limb only.

Leaves not tendril-bearing; pinnæ interruptedly-approximate; drupes ellipsoid, straw-coloured, nearly an inch long,...............*C. gracilis*, Roxb.

Leaves not tendril-bearing; pinnæ equidistant, narrow; spathes green, very thin, compressed-tubular, almost unarmed, ...*C. Helferianus*, Kurz.

Leaves tendril-bearing; pinnæ distant, alternately approximate; male flowers in recurved small spikelets or fascicles exserted from the spathules, ...*C. paradoxus*, Kurz.

× × Lower spathes expanded into a flat elongate limb, tubular at the short base only.

Leaves not tendril-bearing; pinnæ narrow, equidistant; drupes globular, the size of a pea, the scales straw-coloured with blackish-brown borders, ...*C. Guruba*, Ham.

DÆMONOROPS, *Bl.*—Flowers usually pedicelled, naked or nearly so. Spathes cleft to the base, deciduous, the outer one boat-shaped. Spathules incomplete, reduced to bracteoles. Spadix erect, stiff, never tendril-bearing. Albumen usually ruminate. Scandent rattan-palms, more or less fearfully armed.

Species.

* Spathes unarmed or nearly so.

Leaves not tendril-bearing; pinnæ interruptedly-approximate, white beneath, ...*D. hypoleucus*, Kurz.

* * Spathes (at least the outermost one) much armed with thorns or spines.

Leaves uniformly green; sheaths and spathes outside fearfully armed with flat glossy black spines; drupes globular, the size of a cherry, ...*D. grandis*, Griff.

PLECTOCOMIA, *Bl.*—Flowers in small naked racemes or spikes, hidden by the imbricate distichous secondary spathes, the latter forming long tail-shaped one-sided panicled pendulous catkins. Spathes many, tubular. Drupes retrorsely hispid. Albumen equable. Scandent often lofty rattan-palms, more or less armed.

Plectocomia macrostachya, Kurz. Only species

ENUMERATION OF THE SPECIES.

NIPA, *Rumph.*

1. N. FRUTICANS, *Wurmb. in Verh. Bat. Genootsch.*, *I*, 349; *Lab. in Mém. Mus.*, *V*, 297, *t.* 21-22; *Roxb*, *Fl. Ind.*, *III*, 650; *Mart.*, *Palm.*, 305, *t.* 108, 171-172; *Bl. Rumph. III*, 76, *t.* 105, 164—165; *Griff.*, *Not. Monocot.*, 168, *t.* 244-247; *Miq.*, *Fl. Ind. Bat.*, *III*, 150.

HAB. Common along the estuaries of the rivers, and in tidal forests all along the shores, from Chittagong down to Tenasserim and the Andamans.

Dane of the Burmese.

Cocos, *L.*

2. C. NUCIFERA, *L., Fl. Zeyl.*, 391; *Roxb., Corom. Pl., I*, 52, *t.* 37, *et Fl. Ind., III*, 614; *Mart., Palm.*, 123, *t.* 62-63 *et t.* 88, *f.* 3-6; *Miq., Fl. Ind. Bat., III*, 64.

HAB. Generally cultivated all over Burma, more especially within the influence of the sea, and also wild along the sandy beaches of the Cocos islands. Fl. C. S., Fr. H. S.

Ung is the Burmese name of the cocos-palm.

Areca, *L.*

3. A. CATECHU, *L., sp. pl.*, 1189; *Roxb., Corom. Pl., I*, 54, *t.* 75 *et Fl. Ind., III*, 615; *Hayne, Arzney Gew., VII, t.* 35; *Mart., Palm.*, 169 *et* 311, *t.* 182 *et t.* 149, *f.* 4, *t. Z, X, f.* 11.; *Bl. Rumph., II*, 65, *t.* 102 *A, et t.* 104; *Miq., Fl. Ind. Bat., III*, 8; *Griff., Ind. Palm.*, 147, *et in Macl. Calc. Journ., V*, 450; *Scheff., Group. d. Arec.*, 9.

HAB. Frequently cultivated by the Burmans and Karens, especially in Martaban and Tenasserim.

Kunti is the Burmese name.

4. A. TRIANDRA, *Roxb., Fl. Ind., III*, 617; *Griff., Ind. Palm.*, 148, *t.* 230, *A, et in Macl. Calc. Journ., V*, 451; *Mart., Palm.*, 171, *t.* 149, *f.* 1-3; *Scheff., Group. d. Arec.*, 16. (*A. laxa, Ham. in Mem. Wern. Soc., V*, 309; *Griff., Ind. Palm.*, 149, *et in Macl. Calc. Journ., V*, 452; *Scheff., Group. Arec.*, 17; *A. pumila, Bl. Rumph., II*, 71, *t.* 99 *et* 102, *non Mart. nec Griff., Scheff. Group. d' Arec.*, 15).

HAB. Not unfrequent in the evergreen tropical forests from Martaban down to Tenasserim and the Andamans; also in Chittagong. Fl. H. and R. S.; Fr. the following year.

Tau Kunti (wild betel-palm) is the Burmese name of this as of all other wild species of *Areca;* the Andamanese call it *abaradah.*

5. A. COSTATA, (*Pinanga costata, Bl. Rumph., II*, 80, *t.* 109; *Pinanga Kuhlii, Bl. Rumph., II*, 82, *t. III, Scheff., Group. d. Arec.*, 34; *Seaforthia Kuhlii, Mart., Palm.*, 185, *t.* 6, *t. Z, f.* 4 *et* 5).

HAB. In the evergreen tropical forests of the Andamans, around Mount Harriet, and probably elsewhere. - Fr. June.

I have changed the specific name according to a rule laid down in De Candolle's 'Laws of Botanical Nomenclature.' Dr. Scheffer and a very few others object to this rule, but to me it appears a sound one inasmuch as it rigorously compels an author to adopt a name which otherwise would be altered either out of pedantry or personal feelings, for illustrations of which Dutch literature especially furnishes examples enough. The rule is exact and therefore truly scientific, admitting of no exception but in cases of absolute absurdity*: it prescribes with almost mathematical precision the ultimate change. Why, for example, should we call *Guatteria pallida*, Bl., at present *Marsypopetalum ceratosanthes*, Scheff., and not *M. pallidum?* or why should the well-known *Fimbristylis diphylla*, with its pageful of synonyms, be rechristened *F. polymorpha*, Boeck.? The objection raised on account of increase of names *absque necessitate* is a feeble one, and cannot counterbalance the advantages of a strict rule against arbitrary acts.

6. A. GRACILIS, *Roxb., Fl. Ind., III*, 619; *Griff., Ind. Palm.*, 154, *t.* 232, *A—C, et in Macl. Calc. Journ., V*, 459.

HAB. Frequent in the evergreen tropical forests, especially in marshy places, from Chittagong, Pegu, and Martaban down to Tenasserim. Fl. H. and R. S,; Fr. the following year.

Dr. Scheffer identifies this species with Blume's *Pinanga patula; P. patula*, however, has distichous flowers, quite different fruits, and smooth sheaths and spadices. Again, *A. disticha*, Roxb. (of which *Ptychosperma simplicifrons*, Miq. is an exact synonym), which has a hispid spadix and scurvy sheaths and spathes, is also reduced to his *Pinanga patula*—a course in which I cannot follow him.

7. A. HEXASTICHA, *n. sp.*, Pl. XII.

A slender simple-stemmed gregarious palm, 20 to 30 feet high, the stem 3 to 4 in. in girth, the sheaths, etc. thinly scaly-rough, soon turning glabrous; leaves 3 to 5 feet long, pinnate with the end-pinnæ confluent, on a short (3 to 4 in. long) scaly-rough petiole broadly sheathing at the base; pinnæ linear, somewhat falcate, 1 to 1½ feet long, alternate, 2- to 3-ribbed and many-nerved, the lower ones acuminate, the upper and terminal ones crenate-lobed and ending in as many bluntish and shortly 2-lobed lobes as there are ribs: flowers sessile, spirally arranged in 5, higher up in 6, grooved rows along the simple reflexed spike up to a foot long, the rachis as thick as the finger, fleshy; female perianth (in young fruit) very much like that of *A. gracilis*, the sepals and petals almost conform, broad-oval, blunt or bluntish, about a line long or a little longer; staminodes apparently

* If in such cases a rule were to be established to the effect that a species thus changed in name should be called after the author who first named and described it, the cases of doubt would be reduced to a minimum. Dr. Mueller Arg. has given some additional rules in his "Nomenclatoric fragments" defending his harpagean principles adopted in the 15th vol. of De Candolle's Prodromus, but I think that few, if any, right-minded men would refuse to adopt a MS. name, if they have knowledge of the same or if they have the plant, authentically named, at their disposal. On the other side, I fully agree that MS. names, the plants of which are inaccessible to an author, even if published but not characterized, are truly valueless "nomina chartacea," and as such reducible to species described at a later date. No one will ever persuade me to spend a few thousand rupees on a journey to Europe for the purpose of unearthing MS. names!

none; unripe fruits fibrous-fleshy, smooth, spindle-shaped, and narrowed at apex.

HAB. In marshy places of the evergreen tropical forests of the southern parts of the Pegu Yomah, as for example between Kyauzoo and Kya Eng (Pazwoondoung-valley).

PHOENIX, *L.*

8. PH. ACAULIS, *Roxb.*, *Hort. Beng*, 73 *et Fl. Ind.*, *III*, 783; *Griff. in Macl. Calc. Journ.*, *V*, 345 *et Ind. Palm.*, 137, *t.* 128; *Mart.*, *Palm.*, *t.* 136.

HAB. Frequent in the Eng-forests all over Pegu, Prome, and Martaban. Fl. March—Apr.; Fr. May—June.

This species is called in Burma *Thenboung* like all others of the genus.

9. PH. SYLVESTRIS, *Roxb.*, *Hort. Beng.*, 73 *et Fl. Ind.*, *III*, 787; *Griff. in Macl. Calc. Journ.*, *V*, 350 *et Ind. Palm.*, 141, *t.* 228; *A. Mart.*, *Palm.*, *t.* 136.

HAB. Chittagong, cultivated only; said to be also cultivated in Ava. Fl. begin of H. S.; Fr. C. S.

As indeed Griffith remarks, *Ph. dactylifera*, L., differs hardly, and possibly solely by larger fruits. The fact that *Ph. dactylifera* will not succeed in the moister parts of India, may be an idiosyncrasy acquired by long cultivation in arid districts.

10. PH. PALUDOSA, *Roxb.*, *Hort. Beng.*, 73 *et Fl. Ind.*, *III*, 789; *Griff. in Macl. Calc. Journ.*, *V*, 353 *and Ind. Palm.*, 144, *t.* 229, *A—B.* (*Ph. Siamensis*, *Miq.*, *Palm. Archip. Ind.*, 14).

HAB. Common in the tidal forests all over Burma from Chittagong down to Upper Tenasserim and the Andamans. Fl. March—Apr.; Fr. June—Decb.

ARENGA, *Labill.*

11. A. SACCHARIFERA, *Lab.*, *Mém. l.' Inst.*, *IV*, 209.; *Mart.*, *Palm.*, 191, *t.* 108 *et t.* 161, *f.* 4, *t. Z*, *IV*, *f.* 11, *XVII*, *f.* 1; *Miq.*, *Fl. Ind. Bat.*, *III*, 35; *Griff. in Macl. Calc. Journ.*, *V*, 472 *and Ind. Palm.*, 164, *t.* 233, *A.*—(*Saggueru*s *Rumphii*, *Roxb.*, *Fl. Ind.*, *III*, 626).

HAB. Frequent in the evergreen tropical forests of Martaban and Tenasserim, also occasionally in those of the eastern slopes of the Pegu Yomah. Fl. all the year; Fr. the following year.

Toung-ong is the Burmese name. Griffith has been much blamed for having cut down the numerous areng-palms in the Calcutta Botanical Garden, and for having thus deprived the garden of one of its "ornaments." This censure must remain a matter of opinion, for I believe that few will be found who would detect any beauty in them, but many would rather concur with Rumphius, who compared the palm to a "ragged dirty drunken fellow."

Besides its well-known value for toddy, sugar, and fibre, this palm is especially adapted for the support of orchids, ferns, and other epiphytical plants, for which purpose it is highly recommendable to horticulturists in tropical climates.

WALLICHIA, *Roxb.*

12. W. CARYOTOIDES, *Roxb., Corom. Pl., III,* 91, *t.* 295; *Miq., Fl. Ind. Bat., III,* 34. (*Wrightia caryotoides, Roxb., Fl. Ind., III,* 621; *Harina caryotoides, Ham. in Wern Soc., V,* 317; *Griff. in Macl. Calc. Journ., V,* 485 *and Ind. Palm.,* 174, *t.* 237; *W. densiflora, Hook., Bot. Mag., t.* 4584, *vix Mart. nec Griff.*).

HAB. In the evergreen tropical and damp hill-forests of Martaban and Tenasserim; also in the hills of eastern Ava and Chittagong, up to 4000 feet elevation. Fl. R. S.; Fr. the following year.

Zanong is the Burmese name of this as also of the other species of the genus.

13. W. DENSIFLORA, *Mart., Palm., ed. I,* 189 *and suppl.,* 190. (*W. oblongifolia, Griff. in Macl. Calc. Journ., V,* 486, *and Ind. Palm.,* 175, *t.* 237, *A—C*).

HAB. Not frequent in the moister upper mixed and tropical evergreen forests of Arracan, apparently always on siliceous sandstone; also Chittagong. Fl. Apr.

13*b*. W. DISTICHA, *T. And. in Journ. Linn. Soc. Lond., XI,* 6.

HAB. Not unfrequent in the moister upper mixed forests of the eastern slopes of the Pegu Yomah, and on the spurs of the Kambala-toung. Fl. Apr.

The Burmese plant differs chiefly by much longer ($1\frac{1}{2}$-2 ft. long) pinnæ, and may possibly form a distinct species. It is also a much lower palm.

CARYOTA, *L.*

14. C. URENS, *L., Fl. Zeyl.,* 187; *Roxb., Fl. Ind., III,* 625; *Mart., Palm.,* 193, *t.* 107-108, 168 *and t. V, f.* 1-3 *and* 11; *Miq., Fl. Ind. Bat., III,* 41; *Griff. in Macl. Calc. Journ., V,* 478. *and Ind. Palm.,* 169.

HAB. Frequent in the upper mixed forests of the Pegu Yomah and Ava. Fl. Sept.

Burmese call this, as also the other species, *minbo.*

15. C. SOBOLIFERA, *Wall. in Mart. Palm.,* 194, *t.* 107, *f.* 2? *Miq., Fl. Ind. Bat., III,* 41? *Griff. in Macl. Calc. Journ., V,* 481 *and Ind. Palm.,* 171, *t.* 236 (*simple-stemmed*)? (*C. Cummingii, Lodd. ex Mart., Palm., III,* 159? *Bot. Mag., t.* 5762; *C. Griffithii, Beccari in Giorn. Ital.*).

Hab. Frequent in the evergreen tropical forests from Arracan down to the Andamans, and from Martaban down to Tenasserim. Fl. Fr. C. and H. S.

I entertain little doubt but that the *Caryota* so plentiful in the Burmese jungles is Loureiro's *C. mitis*, the more so as the same plant occurs also in Siam.

Borassus, *L.*

16. B. flabelliformis, *L., Mus. Cliff.*, 13; *Roxb., Corom. Pl., I*, 50, *t.* 71-72, *and Fl. Ind., III*, 790; *Mart., Palm.*, 219, *t.* 108, 121, 162; *Miq., Fl. Ind. Bat., III*, 45. (*B. sp., Griff., Not. Monoc.*, 167).

Hab. Frequently cultivated all over Burma, more especially, however, in Ava and Prome; along the sandy sea coast sometimes growing like wild, but also in the dry Prome-district the palm is freely springing up in jungles. Fl. March—Apr.; Fr. Close of rains.

Htan is the Burmese name of the palmyra.

Licuala, *Rumph.*

17. L. peltata, *Roxb., Fl. Ind., II*, 179; *Mart., Palm.*, 284, *t.* 134 *et* 162; *Griff., Palms*, 120, *t.* 222 *and in Macl. Calc. Journ., V*, 324.

Hab. Frequent in the evergreen tropical forests all over Burma from Chittagong, Pegu, and Martaban down to Tenasserim and the Andamans. Fl. begin of C. S.; Fr. H. S.

Zaloon of the Burmese; the Andamanese call it *gobol.*

18. L. paludosa, *Griff. in Mart. Palm.*, 318; *Macl. Calc. Journ.*, 323 *and Ind. Palm.*, 118, *t.* 221, *A—C.*

Hab. Frequent in the tidal forests and in marine swamps along the coast of the Andamans. Fr. Apr. May.

19. L. longipes, *Griff. in Mart. Palm.*, 318 *and in Macl. Calc. Journ., V*, 330 *and Ind. Palm.*, 125, *t.* 224, *A—B.*

Hab. Tenasserim, forests near Lainear, to the south of Mergui (Griff.). Fl. nearly the whole year.

Chamærops, *L.*

20. Ch. Khasyana, *Griff. in Macl. Calc. Journ., V*, 341 *and Ind. Palm.*, 134, *t.* 227, *A—B.*

Hab. Not unfrequent in the drier hill and pine forests of Martaban, and probably also in the Ava hills, at 4000 to 6500 feet elevation.

It remains to be shewn how this species differs from *Ch. Martiana, Wall.*, which is said to have yellow lepidote fruits.

Livistona, *R. Br.*

21. L. speciosa, *n. sp.*, Pls. XIII and XIV.

A lofty simple-stemmed palm, 50 to 70 feet high, the trunk 40 to 60 feet long by 3 to 5 feet girth, all parts glabrous; leaves palmately flabellate, about 6 to 7 feet across, plaited, the petiole up to an inch broad at base, armed with strong sharp falcately curved flattish blackish spines, the lower spines up to half an inch long and longer by 3 to 4 lines broad at base; the sheaths dividing into netted fibres; pinnæ all (the lateral ones up to half of their length, the central ones higher up) connate in a blade, linear, sharply 2-cleft at apex, the ribs compressed, prominent, the veins rather visible and transverse; flowers small, solitary or by 2 on a nipple-shaped very short and thick pedicel, racemose-spicate, forming a much branched smooth panicle-shaped, 2 to 4 feet long spadix, furnished at the base and along the primary axes with large fuscous quite smooth spathes; sepals and petals hardly a line long; drupes elliptically obovoid, ⅔ to nearly an inch long, dark blue, smooth, 1-seeded, seated on the short thick indurated perianth jointed with the nipple- or disk-shaped very short peduncle.

Hab. Frequent in the evergreen tropical forests of the eastern and southern slopes of the Pegu Yomah; Upper Tenasserim (Brandis). Fr. March—Apr.

Called *tau-htan* by the Burmese. Very similar to *L. Jenkinsiana*, Griff., but loftier, and differing chiefly by the smooth (not scurvy) spathes and in shape of fruits. The armature seems more developed in my species.

Corypha, *L.*

22. C. umbraculifera, *L., Hort. Cliff.*, 482; *Mart., Palm.*, 232, *t.* 108 *and* 127, *f.* 2. *Roxb., Fl. Ind*, *II*, 177; *Miq., Fl. Ind. Bat., III*, 49, *ecl. syn.* (*C. Talliera, Roxb, Corom. Pl., III*, 51, *t.* 255-256 *and Fl. Ind., II*, 174.; *Griff., Ind. Palm.*, 114, *t.* 220, *E, and F and in Macl. Calc. Journ., V*, 317.)

Hab. Frequently seen cultivated in villages all over Burma. Fl. H. S.; Fr. the following year.

Pae is the Burmese name of this and all the other species of *Corypha.*

23. C. Gebanga *Bl. Rumph., II*, 59, *t.* 97-98 *and* 105. (*C. elata, Roxb., Fl. Ind., II*, 176; *Mart., Palm.*, 233; *Griff. in Macl. Calc. Journ., V*, 314 *and Ind. Palm.*, 112, *t.* 220, *D.*).

Hab. Only occasionally seen in Burmese villages, as for example around Toungkoo. Fl. H. S.; Fr. the following year.

24. C. macropoda, *Kurz in Andam. Rep., ed.* 2, 50.—Pl. XV.

A gigantic stemless palm, 30 to 40 ft. high, all parts glabrous; leaves very ample, palmately flabellate, from 12 to 20 ft. across, the petiole towards the base as thick as the arm, straight and slender, from 18 to 25 ft. long, along the polished margin armed with strong incurved compressed glossy black spines; pinnæ united to near the middle into a blade, 6 to 10 ft. long, linear, 2-lobed and bluntish at apex, the ribs 4-cornered; inflorescence and flowers unknown ; drupes the size of a cherry, globular, with one or two small abortive ovaries at their base, smooth, olive-brown, 1-seeded.

HAB. In the bamboo jungles of Termoklee island, western side of South Andaman, on chloritic rocks.

Called *dondah* by the Andamanese. I have not seen the palm in flower, but judge it to be stemless from having failed to detect any indication of a stem in the numerous full-grown specimens I met with accompanied by seedling-plants, which latter had their roots so deeply seated in the rocky ground that I did not reach them after digging to a depth of more than 2 feet.

KORTHALSIA, *Bl.*

25. K. SCAPHIGERA, *Mart. Palm.*, 211.—(*Calamosagus scaphiger, Griff., Ind. Palm.*, 30, *t.* 184 *A. young plant ; Calamosagus wallichiæfolius, Griff. in Macl. Calc. Journ., V,* 24 *and Ind. Palm.*, 29, *t.* 184 *sub nom. C. harinæfolius.)*

Pls. XX, A, and XXI.

A large scandent rattan palm, the canes up to half an inch in diameter, the young leaves beneath fugaceously white-tomentose ; leaves pinnate, 2 to 4 ft. long, the rachis sparingly armed with short simple sharp retrorse spines and terminating in a long recurved-thorny tendril, the petiole ½ to 2 ft. long, irregularly beset with thin sharp rather straight spines 2 to 4 lin. long, the sheaths minutely brown-scurvy (in young plants sparingly prickly) dissolving along their margins into fibres embracing the stem ; pinnæ at base contracted into a compressed petiolule, alternately somewhat approximated, plaited, broadly rhomboid-ovate, the upper ones cuneate-rhomboid, acuminate, from about the middle irregularly and sharply erose-toothed (the teeth formed by the more or less subulate-excurrent veinlets), many-nerved, 4 to 7 in. long, the terminal segment much broader ; spadices long and pendulous, terminal, the tubular spathes (in fruit) smooth, brown ; catkins very compact and terete, on a short sheathed peduncle, densely tawny tomentose, 3 to 4 in. long, about 4 lin. thick ; bracts very broad, rounded or almost acute, smooth, a little longer than the densely villous bracteoles ; female calyx rigid, more than ½ lin. long, fibrous-ciliate ; corolla nearly 2 lin. long, very rigid-coriaceous, deeply 3-cleft, the tube very short ; drupes obovoid, mucronate, ½ inch long, retrorsely imbricate-scaled, 1-seeded ; scales rigid, trapezoid-ovate, longitudinally impressed, greenish, towards the apex brownish, bordered by a pale brown broadly lacerate narrow bluntish membrane.

HAB. Common all over the Andamans, especially in the evergreen tropical forests. Fr. H. S.

Called *bordah* by the aborigines. On the Andamans occurs another species of the habit of the preceding but with the sheaths densely covered by sharp spines. Unfortunately, I neglected to collect specimens from the sterile plants, which alone I met with.

26. K. LACINIOSA, *Mart., Palm.*, 211. (*Calamosagus laciniosus, Griff. in Macl. Calc. Journ., V,* 23 *c. tab. and Ind. Palm.*, 27, *t.* 183 *and t.* 216, *f.* 2. (*K. flagellaris, Miq., Suppl. Fl. Sumat.*, 591).

HAB. Tenasserim, from the Salween down to Mergui. Fr. March.

I have no clear idea of this species, which would differ from the former by the shape of the drupes. The armature of the sheaths and nature of the dentation of the leaves are, as I find, somewhat variable. *C. ochriger*, Griff. (*Ind. Palm.*, *t.* 216, *f.* 1), of which authentic specimens exist in H. B. C., is *K. rigida*, Bl. exactly. Miquel reduces his *K. flagellaris* to *K. angusta*, Bl. I have not seen the latter species, but if his conclusion be correct, then *K. laciniosa* and *K. angusta* must fall together.

ZALACCA, *Rumph.*

27. Z. WALLICHIANA, *Mart., Palm.*, 201, *t.* 118-119 *and* 136; *Miq., Fl. Ind. Bat., III,* 80, *quoad descr.* (*Z. edulis, Wall., Pl. As. rar., III,* 14, *t.* 222-224 *sub nom. Z. Rumphii; Griff. in Macl. Calc. Journ., V,* 7. *p. p. and Ind. Palm.*, 10, *t.* 175 *? Calamus Zalacca, Roxb., Hort. Beng.*, 72 *and Fl. Ind., III,* 773).

HAB. Frequent in the evergreen tropical forests all over Pegu and Martaban down to Tenasserim. Fl. C. S.; Fr. June, July.

Yeinga or *yengan Khyen* Burmese.

Wallich and Griffith reduce this species to *Z. edulis*, Rwdt. but it seems to differ by much smaller fruits, sessile catkins, and the leaves being green on both sides.

PLECTOCOMIA, *Bl.*

28. P. MACROSTACHYA, *n. sp.*, Pls. XVI and XVII.

A lofty climber, all parts glabrous; leaves pinnate, the petiole and rachis spiny, the spines straight, up to ⅓ inch long; pinnæ (median ones) somewhat approximate by pairs, linear-lanceolate, ½ to 2 ft. long, long-acuminate, white-powdery beneath, 3-ribbed (2 of the ribs marginal), coriaceous, but rather flaccid; spadices not seen; lateral spikes 4 to 5 ft. long, about 2 in. thick, somewhat compressed, pendulous; spathules distichous, rhomboid-obovoid, acute, 1½ to nearly 2 in. long, coriaceous, brown, blackish towards the upper borders, glabrous; male spikelets as long as the spathules, rusty-scurvy-strigillose, the rachis rather strong, shortly and distichously branched; female flowers not seen; male flowers: calyx wide, cup-shaped, about a line deep, shortly 3-toothed, the teeth acute, bordered especially in their sinuses by a dense brown woolly tomentum; petals rigid, falcate, lanceolate, sharply acuminate, about ⅓ inch long or somewhat longer, sulcate outside; stamens 6; drupes unknown.

HAB. Tenasserim, Bithoko range, at 3000 ft. elevation (Dr. Brandis).

Allied to *P. elongata*, Bl., but easily distinguished by the doubly larger flowers and the larger and more densely imbricate spathules.

DÆMONOROPS, *Bl.*

29. D. HYPOLEUCUS, *n. sp.*, Pls. XVIII and XIX.

Apparently a slender scandent rattan palm, the sheathed stems as thick as the finger, the canes as thick as a common quill; leaves interruptedly pinnate, 2 to 3 ft. long, without tendril, the petioles short, often saccate at base, armed with shorter and longer conical thorns on the back and along the margins sparingly intermixed with somewhat recurved straight short spines, the reddish rachis similarly but more sparingly armed, upwards simply recurved spiny; the sheaths armed like the petiole but very densely so with unequally long straight sharp spines up to an inch long or longer towards the mouth, in front sending out a long prickly recurved-thorny whip-like tendril; pinnæ ½ to ¾ ft. long, alternately and interruptedly approximate by twos on each side, oblong-lanceolate, acuminate, bristly ciliate towards the apex, white beneath, many-nerved; female spadix small, only ½ ft. long, on a slender peduncle (about an inch long) thorny on both margins; spathes unarmed or occasionally with a minute prickle on the midrib, smooth, lanceolate-oblong, slit almost to the base; spathules shortly tubular with an acuminate limb, small and distant; female flowers minute, about a line long, distichous; calyx shortly 3-lobed, ½ lin. long; corolla twice as long with a short tube, the lobes linear-lanceolate, acute; male flowers and fruits unknown. (*Calamus hypoleucus*, Kz. olim).

HAB. Tenasserim, Thounggyeen (Dr. Brandis). Fl. March.

30. D. GRANDIS, *Griff. in Mart., Palm., A—C and t.* 216, 327, *t.* 175, *f. ix, t. Z, xii, f.* 11; *Miq., Fl. Ind. Bat., III,* 88. (*Calamus grandis, Griff. in Macl. Calc. Journ., V,* 84 *and Ind. Palms,* 91, *t.* 210, *A—C and t.* 216, *f.* 3.)

HAB. In the evergreen tropical forests of Rutiand-island, Andamans. Fr. May.

There grow two or three other species of *Dæmonorops* in Chittagong, Arracan, and the other provinces of Burma, but these I know from insufficient MS. figures only or from having merely seen them growing.

N. B. *D. Hystrix*, Griff. is certainly identical with *D. oblongus*, Bl.; the spines in the latter become quite as long as in the former.

CALAMUS, *L.*

31. C. ARBORESCENS, *Griff. in Macl. Calc. Journ., V,* 33 *and Ind. Palms,* 46, *t.* 188, *A—C*; *Miq., Fl. Ind. Bat., III,* 113.—Pl. XXII.

The insertion of the stamens would appear to vary somewhat. In my specimens they are inserted at the base of the corolla and free; filaments not infracted, shorter than the anthers. Drupes obovoid-oblong, $\frac{1}{2}$-$\frac{3}{4}$ inch long, apiculate, supported by the coriaceous somewhat enlarged perianth, 1-seeded; scales uniformly brown, with a very narrow whitish minutely erose border, cordate-trapezoid, rounded at apex, almost biconvex from a longitudinal central furrow.

Hab. Frequent in marshy beds of choungs, in the moister and evergreen tropical forests of Pegu, on sandstone. Fr. C. S.

Called *thanoung* by the Burmans.

This is the only Burmese species which may truly be called arboreous, having no tendrils whatever. All others are furnished with such tendrils, either terminating their leaves (*flagellæ*), in which case the inflorescences are axillary (actually they spring from near the base of the opposite leaf) and destitute of spadical tendrils (*loræ*); or the leaves are destitute of them, and the tendrils arise near the apex of the sheath of the opposite leaf, in which case the inflorescences are leaf-opposed and tendril-bearing (or rather the *loræ* grow out into inflorescences). In classification, these several relations have no great value, as an arrangement based upon such characters removes nearly allied species far from each other, as for example *C. Andamanicus* from *C. tigrinus*.

32. C. erectus, *Roxb., Fl. Ind., III,* 774; *Griff. in Macl. Calc. Journ., V,* 35. (*C. longisetus, Griff. in Macl. Calc. Journ., V,* 36 *and Ind. Palms,* 44, *t.* 189, *A—B; Miq., Fl. Ind. Bat., III,* 114; *C. macrocarpus, Griff., Ind. Palms,* 40, *t.* 186, *A, f.* 1-2; *Mart., Palm.,* 333, *t.* 176, *f. X*).

Pls. XXIII and XXIV.

A low erect tufted palm, looking like *Zalacca*, 12 to 18 feet high, all parts glabrous; leaves 18 to 12 feet long, pinnate, without tendril, the petiole as also the sheaths armed with seriate greenish or fuscous flat sharp spines up to an inch long, the rachis similarly armed, but the spines gradually becoming fewer in number towards the apex; pinnæ by 5 or fewer alternately approximate, elongate-linear-lanceolate, glossy, green on both sides, many-nerved and transversely veined, acuminate, spinulose-ciliate, $1\frac{1}{2}$ to 2 feet long by $1\frac{1}{2}$ to 2 inches broad, the midrib beneath armed with distant capillary bristles; spadices elongate, branched, terminating in a whip-like recurved-thorny tendril; spathes somewhat compressed, linear-tubular, acuminate, armed with half-whorls of flat upwardly and downwardly directed spines up to $\frac{1}{2}$ inch long, the partial spathes unarmed, shaped and rupturing like those of *Zalacca;* spathules imbricate, cymbiform, almost truncate, glabrescent, fibrous-dissolving at their longer extremity; flowers distichous; calyx a little longer than the bract, shortly 3-toothed; corolla nearly 3 times longer, the tube narrow, nearly as long as the calyx, the lobes linear-oblong; stamens in males free, the filaments broad, not infracted, shorter than the anther; drupes more than an inch long, ovoid-oblong, apiculate, glossy, brown, 1-seeded; scales imbricate, cordate-trapezoid, fuscous, towards the base paler coloured, almost biconvex with a rather broad longitudinal central furrow, bluntish, the margins not bordered and almost entire; seed oblong, somewhat compressed, the albumen foraminate-erose, surrounded by a resinous crust.

HAB. Evergreen tropical forests of Chittagong and Pegu. Fr. C. S.

According to Roxburgh, the species is called in Chittagong *Sungotta*, but specimens collected there by Dr. Thomson bear the name *rong*—the name by which it goes in Sikkim also. The Burmese call it *theing*.

33. C. FASCICULATUS, *Roxb., Fl. Ind., III,* 779; *Griff. in Macl. Calc. Journ., V,* 52 *and Ind. Palms,* 62, *t.* 195, *A—B* (*excl. infl. in B*) *and t.* 190, *A, f.* 2; *Miq., Fl. Ind. Bat., III,* 127; *Mart., Palm.,* 210 *and* 238, *t.* 116, *f. IV and VI.*—Pl. XXVII, B.

HAB. Frequent in the mixed deciduous forests, especially in the lower ones, all over Burma, from Ava and Chittagong down to Tenasserim and the Andamans. Fl. Sept. Octob.; Fr. Apr. May.

Called *Kane ga* in Burma.

It often happens that the fruits in this species become monstrous, as shewn in the plate.

34. C. LATIFOLIUS, *Roxb., Fl. Ind., III,* 775; *Griff. in Macl. Calc. Journ., V,* 60 *and Ind. Palms,* 68, *t.* 198. (*C. palustris, Griff. in Macl. Calc. Journ., V,* 61 *and Ind. Palms,* 72, *t.* 199? *Miq., Fl. Ind. Bat., III,* 131?).—Pl. XXXI, A.

An extensive scandent rattan palm, all parts glabrous, the sheathed stems 2 to 3 in. diameter, the canes up to an inch thick; leaves 8 to 12 feet long, pinnate, terminating in a long whip-like retrorse-thorned tendril, the short petiole armed with a double or single row of short more or less sharp spines hollowed-out at inner base, saccate at base (the sac unarmed or sparingly and shortly prickly), the sheaths quite green, beset with a few excavate thorn-like protuberances or seriate large excavate flat sharp spines or occasionally quite or nearly quite unarmed (on the same plant), sometimes the spines short flat and black; the rachis armed with fascicled or simple upwardly recurved strong thorns; pinnæ alternate, broad-lanceolate, the median ones alternately approximate by twos, 1 to 2 ft. long by 3 to 5 in. broad, towards the shortly acuminate apex bristly ciliate, many-nerved and transversely veined, uniformly green; spadix bifariously decompound, axillary, elongate, drooping; spathes tubular, with an obliquely truncate acuminate limb, glabrous, sparingly recurved-thorny, the partial spathes conform, but not so small and less armed; spathules cymbiform, the outer margin acuminate-produced, glabrous; male flowers greenish-yellow; ovary-rudiment small, 3-lobed; drupes ellipsoid-oblong, rather glossy, apiculate, about $\frac{1}{3}$ inch long, supported by the persistent rigid perianth; scales trapezoid, bluntish, slightly biconvex, with a faint longitudinal furrow, pale brown, with a narrow blackish brown margin; seeds almost semi-convex, grooved and irregularly wrinkled.

HAB. In the evergreen tropical forests all over Burma from Chittagong, Pegu, and Martaban down to Tenasserim and the Andaman islands. Fr. Apr. May.

This is the *yamata* of the Burmans. According to Roxburgh, its name in Chittagong is *Kora bet.*

35. C. ANDAMANICUS, *n. sp.*, Pls. XXVII, A and XXVIII.

A lofty scandent rattan palm, the sheathed stems as thick as the arm, the canes up to an inch in diameter, all parts almost glabrous; leaves pinnate, terminating in a whip-like recurved-thorny tendril, 6 to 8 ft. long, the petioles saccate at base, armed with short blackish thin thorns arising from tubercle-like swellings and intermixed with a few long black spines; the reddish brown sheaths covered with numerous obliquely placed seriate whorls of capillary black spines, which soon break off and leave only their bases, towards the fugaceously greyish-tomentose base furnished with reflexed broader flat black spines up to nearly an inch long and forming stronger combs; the rachis more or less depressed 5-gonous, armed beneath with reflexed paired or ternary thorns, towards the petiole also distantly short thorned along the margins; pinnæ solitary, alternate, equidistant, 2 to $2\frac{1}{2}$ ft. long and up to an inch broad, linear, subulate-acuminate, along the margins and on the three principal nerves beneath distantly capillary-spiny, transversely veined, uniformly green; spadix axillary, ample, decompound, nodding; spathes somewhat compressed-tubular, armed with strong short reflexed solitary to ternary black thorns, otherwise apparently glabrous; the partial ones unarmed, tubular and slit on one side, rather abruptly acuminate, glabrous; spathules tubular-cymbiform, closely imbricated, truncate, glabrous; flowers... ; drupes distichous, numerous, supported by the somewhat enlarged perianth, elliptically-ovoid, acuminate, uniformly brown, about $\frac{1}{2}$ inch long; scales rhomboid, crustaceous, glossy, chestnut-brown-bordered, otherwise greenish, rather flat and without furrow, at apex prolonged into a lanceolate pale brown opaque acute ciliolate membranous appendage longer than the scale itself; seed semi-convex, grooved; albumen equable.

HAB. Common in the forests all over the Andamans.

Chowdah of the Andamanese.

36. C. TIGRINUS, *n. sp*, Pls. XXV and XXVI.

A large scandent rattan, all parts glabrous, the canes up to an inch in thickness; leaves pinnate, 4—8 ft. long, without tendril; the sheaths fearfully armed with whorls and half-whorls of broad flat sharp glossy fuscous or black spines (an inch long) variously intermixed with shorter or thinner ones, sending out from their front a long similarly armed whip-like tendril the thorns of which are connate and those further up recurved; the petiole and lower parts of rachis similarly but less densely armed not only on the back but also along its margins; pinnæ linear, the lower ones by 2 or 3 approximate, alternate or nearly so, 1½ to 2 ft. long, many-nerved and transversely veined, acuminate, spinulose-ciliate, green on both sides, the midrib above and usually also the lateral nerves beneath distantly capillary-spiny; the 2 terminal pinnæ more or less connate, deeply 2-cleft; spadix ample, decompound, nodding, tendril-bearing; spathes compressed linear-tubular, densely black-spiny; the partial spathes unarmed, tubular and much lacerating at apex; spathules tubular-cymbiform, densely imbricate, truncate, minutely brown scurvy, the one side more produced and often lacerating; flowers...; drupes ovoid-oblong, acuminate, about an inch long, black and brown variegated, 1-seeded, supported by the scarcely enlarged perianth; scales much imbricated, trapezoid, not furrowed on the crustaceous glossy pale brown rather flat back, rather broadly black-bordered and produced into a large pale-brown minutely lacerate membranous rather acute appendage; seed oblong, broadly and longitudinally ribbed.

Hab. Common in the evergreen tropical forests from the eastern slopes of the Pegu Yomah and Martaban down to Tenasserim and the Andamans. Fr. H. S.

Called *lémé* in Burma. The Andamanese name is *umdah.*

37. C. tenuis, *Roxb., Fl. Ind., III,* 780; *Griff. in Macl. Calc. Journ., V,* 45 *and Ind. Palms,* 57, *t.* 193, *A—C; Mart., Palm.,* 335, *t.* 176, *f. II, t. Z, XVIII, f. XXIV and XXV*; *Miq., Fl. Ind. Bat., III,* 118.

Pl. XXXI, B.

The drupes of this species are almost ellipsoid-globular, seated on the pedicel-shaped indurated perianth, apiculate, nearly ½ inch long, straw-coloured; scales rhomboid, uniformly straw-coloured with a narrow whitish border, acute, almost flat, with a distinct longitudinal furrow.

Hab. Chittagong (Roxb., etc.); also Pegu (according to Martius). Fl. R. S; Fr. Apr.

According to Roxburgh, it is called *bandhari bet* in Chittagong; specimens from there in H. B. C. are marked with the native name *golob bet.*

38. C. gracilis, *Roxb., Fl. Ind., III,* 781; *Griff. in Macl. Calc. Journ., V,* 54 *and Ind. Palms,* 64, *t.* 196 —Pl. XXXI, C.

Drupes ¾ inch long, elliptical to elliptically globular, apiculate, supported by the indurated stalk-like perianth, straw-coloured; scales trapezoid, bluntish, straw-coloured with a very narrow brownish margin, slightly biconvex with a very deep longitudinal furrow; seed irregularly wrinkled.

Hab. Forests of Chittagong (Roxb.). Fr. March.

According to Roxburgh, called *Mapoori bet* in Chittagong.

39. C. Helferianus, *n. sp.*

Evidently a slender scandent rattan somewhat of the habit of *C. viminalis*, all parts glabrous; leaves pinnate, without tendril, the rachis thin, 3-gonous, along the convex back sparingly armed with small recurved solitary thorns; pinnæ narrow-linear, alternately approximated by 2 to 4, long, acuminate, 6 to 8 in. long, towards the apex bristly ciliate, along the 2 lateral nerves above bristly and slightly so also along the midrib beneath; spadix elongate, very slender, glabrous; spathes elongate-linear-tubular, compressed, green, sparingly recurved thorny along the edges, the upper ones unarmed, the limb linear-acuminate, erect; the partial spathes shorter and truncate; spathules minute, cymbiform, remote; male flowers distichous, about 1½ lin. long; calyx cupular, shortly 3-toothed; corolla more than twice as long as the calyx, 3-cleft almost to the base, the lobes oblong, acute; stamens inserted at the base of the corolla; female flowers, etc. unknown.

Hab. Tenasserim (or Andamans?) (Helfer 6389).

It is apparently very nearly allied to *C. viminalis*, Bl., but the incompleteness of the material before me excludes the possibility of identifying it. It requires also comparison with *C. exilis*, Griff. (*Ind. Palms.*, 51), a species which I have not seen.

40. C. paradoxus, *n. sp.*, Pls. XXIX and XXX.

An extensive scandent rattan palm, all parts glabrous, the sheathed stems 1 to 2 in. in diameter; leaves pinnate, 5—7 ft. long, terminating in a whip-like hooked-thorny tendril, the petiole short, along with the lower part of the rachis indistinctly puberous and armed underneath and near both margins with more or less straight sharp thorns; the sheaths armed with yellowish sharp flat spines arranged in combs; pinnæ 1 to 1½ ft. long, up to an inch broad, of a thin texture, alternating by pairs and remote, marginate, shortly acuminate and inconspicuously remotely appressed-ciliolate; male spadix bifariously decompound, ample, drooping; spathes all smooth, tubular, with a truncate shortly acuminate limb; spathules similarly shaped, but much smaller, embracing the base of the very short (1 to 3 lin. long) distichously imbricate-bracted male spikelets; bracts spreading, ovate, acute, about a line long, brown, glabrous; male flowers: calyx about a line long, deeply 3-cleft, striate; petals rigid, at base only connate, nearly 2½ line long, oblong, acute; stamens 6, filaments rigid, the lower part linear-oblong, longer and broader than the anthers, terminating in an infracted thread, from which the anther is versatilely suspended; ovary-rudiment hardly any; female flowers and fruits unknown.

Hab. Martaban, in the evergreen tropical forests of Palawa zeik (Toukyeghat), east of Tounghoo. Fl. Apr.

I heard this species called *Yamatha Khyeing* by the Burmans.

41. C. Guruba, *Mart., Palm., ed. I,* 211 *et ed II,* 206 *and* 330, *t.*

175, *f. I, t. Z, XVIII, f. XX and XXI.* (*C. Mastersianus, Griff. in Macl. Calc. Journ., V,* 76 *and Ind. Palms.,* 84, *t.* 206 *and* 195, *B, excl. fol. sub nom. C. fasciculati*).

HAB. Frequent in leaf-shedding, especially the mixed, forests all over Burma from Chittagong and Ava down to Tenasserim. Fl. C. S.; Fr. Apr. May.

Called *Kyeing ni* in Burma.

Doubtful Species.

1. C. PLATYSPATHUS, *Mart., Palm., ed. I,* 210 (*Dæmonorops platyspathus, Mart., Palms.,* 206)

Stem thin, the sheaths sparingly armed with subulate thorns and spreading bristles, in front below the membranous deciduous limb with bristle-like thorns; the rachis and petiole with straight and recurved thorns; pinnæ all equidistant, linear-lanceolate, acute, several-nerved, plaited, along with the rachis beneath sparingly and minutely rusty-villous, ½ to 1 ft. long, about an inch broad; male spadix 1½ ft. long, supradecompound, the peduncle 1½ inch long, compressed-terete, thorny and bristly, the rachis lax, sparingly and minutely rusty-floccose, terminating in a recurved-thorny tendril; spathes membranous, flat, persistent, linear, 2—3 in. long, sparingly aculeate or almost unarmed; male flowers about a line long; calyx campanulate; corolla twice as long, the petals lanceolate, acute (*Mart. l. c.*).

HAB. Tenasserim, Tavoy (Wall. Cat. 8610).

I have not seen this species, which (owing to the tendril-bearing spadix) is evidently a *Calamus*, and, had it not been for the unequally distant pinnules, might have been compared with *C. Guruba.*

2. C. CONCINNUS, *Mart., Palm.,* 332, *t.* 116, *f. X; Walp. Ann. III,* 483.—Pl. XX, C.

Erect or almost stemless? the rachis of the leaves (and of the spadix) rusty-tomentose, sparingly beset below with half-conical subulate straight reversed pale thorns; pinnæ 15 to 20 in. long, 1—1¼ inch broad, almost equidistant, linear-lanceolate, subulate-acuminate, many-nerved, glossy above, with numerous transverse veins, the margins and keel above setulose; female spadix decompound; spathes coriaceous, rupturing, with small rather straight recurved thorns; secondary spathes lax membranous; spathules ring-shaped, short; calyx-lobes ovate, twice as broad as the lanceolate almost equally long corolla-lobes; drupe globular, acute, as large as a pea; scales yellowish, the lower margin broader brownish (*Mart. l. c.*).

HAB. Tenasserim, Tavoy (Wall. Cat. 8607.)

This species also is unknown to me, and the figured drupes appear to be very unripe.

3. C. NITIDUS, *Mart., Palms.,* 334; *Walp. Ann., III,* 484.

Stem? leaves rather rigid, the rachis armed with copious solitary and combined recurved thorns intermixed with smaller ones; pinnæ ½ ft. long, 1 inch broad, approximate, equidistant, linear-lanceolate, glossy, marginate along the 3 nerves above and almost bristly along the border; female spadix about 2—3 ft. long, terminating in a tendril, decompound; spathes produced into a membranous limb 2 in. long, at base beset with small retrorse black thorns rather thick at apex; flowers by pairs (a male and a fertile one); calyx tubular, 3-toothed; corolla lobes ovate, acute; drupes (unripe) globular, acute; scales chestnut-brown on the middle, with a broad pale-coloured fringed margin (*Mart. l. c.*).

HAB. Tenasserim, Tavoy (Wall. Cat. 8609).

Again a species which I cannot identify from the description only. It seems to belong in the affinity of *C. tigrinus*, etc. with fringed-appendaged scales, but has elongate spathules.

4. C. MELANACANTHUS, *Mart., Palm.*, 333, *t.* 116, *f. XIII, t. Z, XXII, f. X; Walp., Ann., III,* 484.—Pl. XX, B.

Scandent, the thorns all antrorse, glossy black (those of the sheaths almost whorled straight?) those on the rachis almost solitary, scattered and short (1-3 lin. long), recurved; pinnæ equidistant, linear, about 12—13 in. the upper ones ½ ft. long by 5—6 lin. broad, long acuminate, along the borders, on the midrib beneath and above and along the two lateral nerves beneath black-bristled; female spadix decompound, terminating in slender retrorsely aculeate tendrils; spathes rather terete, shortly truncate, the lower ones with scattered retrorse thorns, the upper ones almost unarmed; drupes ellipsoid, acute, 10 lin. long by 5 lin. thick; pale yellowish, sometimes with a brown-coloured thin margin (*Mart. l. c.*).

HAB. Tenasserim, Chappedong (Wall. Cat. 8608).

A species unknown to me.

5. C. HUMILIS, *Roxb., Fl. Ind., III,* 773.

Shrubby; not scandent nor flagelliferous. Leaves lanceolar, smooth, many-nerved. Spines few, but long and strong (*Roxb. l. c.*).

HAB. Chittagong (Roxb.).

6. C. POLYGAMUS, *Roxb., Fl. Ind., III,* 780; *Griff. in Macl. Calc. Journ., V,* 48, *in adnot.*

A most extensive scandent rambler, canes the thickness of a common walking-stick; spines almost whorled; sheaths flagelliferous; lower pinnæ in remote fascicles of 3 or 4, the upper ones single and alternate or opposite, all linear with a few bristles on the margins and nerves underneath; male and hermaphrodite flowers on the same supra-decompound spadix (*Roxb., l. c.*).

HAB. Chittagong (Roxb.).

Hoodoom bet of the natives, according to Roxburgh.

EXPLANATION OF THE PLATES.

(All figures are of the natural size, except where the contrary is stated.)

Pl. XII. Areca hexasticha, *Kurz.* Fig. 1. plant, reduced in size; fig. 2. spadix in young fruit; fig. 3. transverse section of spadix, shewing the 6 series of flowers; fig. 4. a very young fruit with perianth; fig. 5. the same, longitudinal section, somewhat magnified.

Pl. XIII. Livistona speciosa, *Kurz.* Fig. 1. plant, reduced; fig. 2. a piece of the ultimate branching of the fruiting spadix; fig. 3. seed, from below; fig. 4. section of the same; fig. 5. upper part of petiole and base of leaf. (The trunk in fig. 1 is drawn too thick by nearly half a line).

Pl. XIV. Livistona speciosa, *Kurz.* Fig. 1. lower; fig. 2. upper part of petiole.

Pl. XV. Corypha macropoda, *Kurz.* Fig. 1. plant, reduced; fig. 2. seedling-plant, also reduced; fig. 3. fruit; fig. 4. terminal pinnæ, reduced; fig. 5. portion of petiole, reduced.

Pl. XVI. Plectocomia macrostachya, *Kurz.* Fig. 1. tail-like spike, lowest and uppermost part of it; fig. 2. a spathule with the inflorescence; fig. 3. flower; fig. 4. flower of *Plectocomia elongata*, for comparison's sake; fig. 5. flower, opened out, magnified; fig. 6. petal, from outside, magnified.

Pl. XVII. Plectocomia macrostachya, *Kurz.* Fig. 1. a portion of the leaf; fig. 2. the same, shewing spine on the under side.

Pl. XVIII. Dæmonorops hypoleucus, *Kurz.* Fig. 1. flowering branch, ♀; fig. 2. an ultimate branching of inflorescence, magnified; fig. 3. calyx, magnified; fig. 4. corolla, laid open, magnified.

Pl. XIX. Dæmomorops hypoleucus, *Kurz.* Fig. 1. portion of branch and lower part of leaf; fig. 2. terminal portion of leaf.

Pl. XX. *A.* Korthalsia scaphigera, *Mart.*, from the Andamans. Fig. 1. part of fruiting spadix; fig. 2. a flowering catkin, ♀; fig. 3. drupe; fig. 4. scales of drupe, magnified; fig. 5. seed; fig. 6. the same, longitudinal section. *B.* Calamus melanacanthus, *Mart.* Fig. 1. drupe, copied from Martius's work. *C.* Calamus concinnus, *Mart.*, copied from Martius's work. Fig. 1. fruiting branchlet; fig. 2. drupe, magnified.

Pl. XXI. Korthalsia scaphigera, *Mart.*, from the Andamans. Fig. 1. sheath and lower part of petiole; fig. 2. young plant.

Pl. XXII. Calamus arborescens, *Griff.*, from Pegu. Fig. 1. part of fruiting spadix; fig. 2. drupe; fig. 3. scales; fig. 4. seed, immature; fig. 5. terminal portion of the male spadix; fig. 6. male flower, somewhat magnified; fig. 7. calyx, slit open, magnified; fig. 8. corolla, with stamens, laid open, magnified; fig. 9. stamens from different views, magnified.

Pl. XXIII. Calamus erectus *Roxb.*, from Chittagong. Fig. 1. lower part of female spadix; fig. 2. portion of fruiting spadix; fig. 3. seed, with the resinous cover; fig. 4. seed, longitudinal section; fig. 5. scales.

Pl. XXIV. Calamus erectus, *Roxb.*, from Chittagong. Fig. 1. portion of male spadix; fig. 2. male flower; fig. 3. corolla with stamens, laid open, somewhat magnified; fig. 4. stamens from different views, magnified.

Pl. XXV. Calamus tigrinus, *Kurz*, from the Andamans. Fig. 1. fruiting branch of the spadix with portion of tendril; fig. 2. lower part of the basal spadix; fig. 3. drupe;

fig. 4. scales of the same, magnified; fig. 5. seed from above; fig. 6. the same, side-view; fig. 7. the same in longitudinal section, shewing the embryo at *e.*; fig. 8. young fruits, from Pegu; fig. 9. scale of the same, magnified.

Pl. XXVI. CALAMUS TIGRINUS, *Kurz*, from the Andamans. Fig. 1. leaf with tendril, reduced; fig. 2. portion of petiole and sheath with tendril; fig. 3. pinnule.

Pl. XXVII. *A.* CALAMUS ANDAMANICUS, *Kurz*, from the Andamans. Fig. 1. portion of the fruiting spadix; fig. 2. drupe; fig. 3. scales of the same, magnified; fig. 4. the same, still more magnified; fig. 5. seed; fig. 6. the same, longitudinal section. *B.* CALAMUS FASCICULATUS, *Roxb.*, from Burma. Fig. 7. a portion of the spadix with unripe and monstrous fruits; fig. 8. a monstrous fruit, magnified.

Pl. XXVIII. CALAMUS ANDAMANICUS, *Kurz*, from the Andamans. Fig. 1. a portion of the stem with leaf and lower part of inflorescence, much reduced; fig. 2. the same, with the lower part of the petiole; fig. 3. a pinnule.

Pl. XXIX. CALAMUS PARADOXUS, *Kurz*, from the Martaban. Fig. 1. portion of flowering male spadix; fig. 2. terminal spikelet of the same, magnified; fig. 3. a male flower, magnified; fig. 4. the same laid open, magnified; figs. 5 and 6. anthers seen from the side and front, magnified; fig. 7. leaf, reduced.

Pl. XXX. CALAMUS PARADOXUS, *Kurz*, from Martaban, ♀. Fig. 1. lower portion of leaf and sheath; fig. 2. upper portion of ditto, with part of tendril.

Pl. XXXI. *A.* CALAMUS LATIFOLIUS, *Roxb.*, from the Andamans. Fig. 1. portion of the fruiting spadix; fig. 2. drupe: fig. 3. scales of the same, magnified; figs. 4 and 5, seed seen from below and above; fig. 6. the same in longitudinal section; fig. 7. unripe fruits from Pegu; fig. 8. the same, somewhat magnified; fig. 9. scales of the same, magnified. *B.* CALAMUS TENUIS, *Roxb.*, from Chittagong. Fig. 1. piece of fruiting spadix; fig. 2. drupe; fig. 3. scales of the same, magnified; fig. 4. seed, from above; fig. 5. the same, in longitudinal section; fig. 6. unfinished pencil sketch of drupe, copied from Roxburgh's drawings. *C.* CALAMUS GRACILIS, *Roxb.*, from Assam. Fig. 1. lower part of spadix with leaf-sheath; fig. 2. drupe; fig. 3. seed from below; fig. 4. the same, in longitudinal section; fig. 5. scales, magnified; fig. 6. transverse section of the same.

On the General Theory of Duplex Telegraphy.

By Louis Schwendler.

(Continued from page 21.)

The first part of this investigation concluded by giving the best relations between the resistances of the different branches of the Bridge Arrangement, under the limiting supposition, however, that the line used for duplex working was perfect in insulation, or more generally that the real conduction resistance of the line could be neglected against the resistance of the resultant fault.*

It now remains, therefore, to investigate if the simple relations given are generally true; or, if not, what they become in case the line has an appreciable leakage. In fact this is clearly the case of practical importance, since all overland lines, especially long ones, even if constructed on the best known principles, will always have a very considerable leakage, *i. e.*, the resistance of the resultant fault (i) will generally be by no means very large in proportion to the real conduction resistance (L) of the line.

In order to obtain the best general solution of the problem, we must conduct the investigation with great caution, that is, we must be careful not to introduce beforehand any relation between the different variables, however convenient, that is not necessarily a consequence of the paramount condition to be fulfilled for Duplex Telegraphy, *i. e.*, *Regularity of Signals*.

Thus it will be seen that the present general investigation must be conducted somewhat differently from the special one given in the First Part.

It must, however, be understood from the beginning that whatever the best relations may be, which should exist between the different resistances of the Bridge Method, when used on an imperfect line, these relations must revert to the special ones given before if we put $i = \infty$, and this fact affords a certain check upon the correctness of the new relations to be found.

General solution of the first problem for the Bridge Method.

The diagram (Fig. 1) given in the First Part represents the general case, and to it therefore I shall refer in the present paper.

The general mathematical question which is to be solved for Duplex Telegraphy has been stated as follows:—

Regularity of Signals. D *and* S *are two functions which must be rigidly equal to zero when no variation in the system occurs; and which for*

* For a definition of the terms, "resultant fault," "real conduction," "measured conduction," "real insulation," "measured insulation," &c., which will be of frequent occurrence in this paper, see my *Testing Instructions*, Part II, Section I.

any given variation in the system must be as small as possible, and approximate rapidly towards zero as the variation in the system becomes smaller and smaller.

Further these two functions D and S were expressed, say for Station (I), as follows:

$$D' = \frac{E'}{E''}\frac{N''}{N'}\frac{1}{\mu'}\frac{\Delta'}{m''\,\psi'} \quad \ldots \quad \ldots \quad \ldots \quad \text{(III')}$$

and

$$S' = E'\frac{m''}{N''}\mu'\,\psi' - \frac{E'\,b'}{n'} + \sigma'\,\phi' \quad \ldots \quad \ldots \quad \text{(IV')}$$

These two expressions are quite general, *i. e.*, they do not as yet contain any restrictive conditions (beyond those involved by the mode of arrangement of the system of conductors) between the different variables; and the signification of the abbreviated terms can be found from the First Part.*

Now the first relation that we shall introduce is

$$w + \beta = f$$

for both stations, which may be called most appropriately "*the key equation.*"

The introduction of this relation at the outset is quite justified, for say that $S' = D' = o$ is rigidly fulfilled in Station (I), when Station (I) is sending and the key in Station (II) is at rest, and suppose the electromotive force in Station (II) equals o (the E. M. F. of all elements annulled and only their resistance β'' left), then, moving the key in Station (II) from its rest contact to its working contact, the regularity condition $S' = D' = o$ would be (*i. e.* balance in Station I) at once disturbed if $w'' + \beta'' \gtrless f''$ during the motion of the key, even if no variation in the line took place. Thus it is paramount to have $w + \beta = f$ for each station during the movement of the key.†

* For convenience of reference I shall give here all the terms of which use will be made hereafter.

$$n = b\,(a + d + g + f) + (a + g)\,(f + d.)$$
$$m = b\,(g + d) + d\,(a + g.)$$
$$k = b\,(a + f) + a\,(f + d.)$$
$$\psi = \frac{k}{n}$$
$$\rho = \frac{a}{n}$$
$$\alpha = b\,(g + d)\,(a + f) + a\,g\,(d + f) + f\,d\,(a + g.)$$

These expressions have been obtained by the application of Kirchoff's rules to the Bridge Arrangement as represented in Fig. 1, and they are quite general, as no other relations beyond those represented by the diagram have been introduced as yet.

† To fulfil the key equation most exactly during the movement of the key, I have constructed a key (constant resistance key) based on the following principle: During

But if for instance in Station (I)

$$w' + \beta' = f'$$

it follows that

$$\phi' = \psi'^{*}$$

Hence, substituting its value for σ' and reducing, we get more simply,

$$S' = \frac{E' \, m'}{N'} \psi' - \frac{E' \, b'}{n'} \quad \ldots \quad \ldots \quad \ldots \quad (\text{IV}')$$

but as

$$\frac{m'}{N'} = \frac{b'}{k' - \frac{\Delta' \, n'}{m'}}$$

and

$$\psi' = \frac{k'}{n'}$$

we have

$$S' = \frac{E' \, b'}{n'} \left\{ \frac{1}{1 - \frac{\Delta'}{m' \, \psi'}} - 1 \right\} \quad \ldots \quad \ldots \quad (\text{IV}')$$

Therefore S' approximates most rapidly† towards zero if $\frac{\Delta'}{m' \, \psi'}$ does, or we have

$$\theta' = \frac{\Delta'}{m' \, \psi'}$$

should be as small as the circumstances will allow of.

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the first movement of the key (up or down stroke) a force is stored up in a spring before the contacts are changed, which force finally causes the change in these contacts; for this reason the two principal contacts of the key co-exist only for an almost infinitesimal time, the length of which is moreover independent of the signalling speed. Thus for this key $w + f = \beta$ is fulfilled in all positions except one, when it is $\frac{w + \beta}{2}$, but for such a short time that the error cannot have any disturbing influence whatever.

* ψ' is the proportion of the total current arriving at point 1 Fig. 1, which passes off through the instrument g' when the key of Station (I) is at rest. Then ψ', being a function of a', b', d', g', is also a function of f'. ϕ' is the proportion of the total current arriving at point 1 Fig. 1, which passes through the instrument g' when the key of Station (I) is sending, thus, besides being a function of a', b', d' and g', it is a function of $w' + \beta'$ insead of f', and as ϕ' and ψ' are otherwise quite similar functions they become identical if we make

$$f' = w' + \beta'$$

† $\frac{E' \, b'}{n'}$ can never become zero, but should on the contrary be as large as possible, and, therefore, S' can only approximate towards zero by $\frac{\Delta'}{m' \, \psi'}$ becoming as small as possible.

Now that D' approximates also rapidly towards zero by making

$$\theta' = \frac{\Delta'}{m' \psi'}$$

as small as possible can be proved as follows :—

By definition we have

$$D' = \frac{p'}{P'}$$

Further, as $\phi' = \psi'$ (on account of the key equation), we have

$$p' = S' \text{ invariably}$$

$$\therefore \quad D' = \frac{S'}{P'}$$

Thus D' for any given P' approximates towards zero at the same rate as S' does, *i. e.*, the smaller θ' becomes.

Therefore the whole problem is actually most generally solved by making

$$\theta = \frac{\Delta}{m \psi}$$

as small as possible for both stations.

Now for Station (I), if balance in the g' branch for the outgoing current be established, we have

$$a' d' - b' c' = o$$

where c' is the "*measured circuit*" from Station (I), and supposing that all variations in the system are chiefly due to variations in the line resistance,* we have at once:

$$- b' \delta c' = \Delta'$$

$\delta c'$ the total variation of the line resistance may be either positive or negative, and supposing that $\delta c'$ contains its sign we have :

$$\theta' = \frac{\delta c'}{\frac{m' \psi'}{b'}}$$

to be made as small as possible.

Now in case of the line being perfect ($i = \infty$) $\delta c' = \delta L$ (a constant with respect to the different resistances of each arrangement, and which was the case in the first solution). At present however $\delta c'$ is a function

* The variations in c' may be due to variations in the line, or to variations in the duplex arrangements. In the latter case they may be due either to an alteration of temperature in the station and then the effect can be only small, or to an accident (wire or connection breaking) and then the influence will become so great that nothing short of actual repairs could help. Thus practically the problem has only to be solved for variations in the line.

of the resistances of the two arrangements, which function must be first determined before we can decide what general condition makes θ' as small as possible.

We have

$$c' = l' + \frac{i\,(l'' + \rho'')}{i + l'' + \rho''}$$

ρ'' being the complex resistance of Station (II).

Put $l' = x$
and $l' + l'' = L$

$$\therefore \quad c' = x + \frac{i\,(L - x + \rho'')}{i + L - x + \rho''}$$

Now c' may vary from three essentially different causes, namely :—

1. x varies, or the position of the resultant fault alters ;
2. i varies, or the resistance of the resultant fault alters ;
3. L varies or the real conduction of the line alters, as may happen by an increase or decrease of the temperature along the whole length of the line, or by the occurrence of a partial discontinuity (imperfect joints, loose shackles, &c.).

These three causes may act separately or conjointly, and their total effect we can approximately get by taking the *total* differential of c' with respect to x, i, and L.

$$\therefore \qquad dc' = \frac{dc'}{dx}\,dx + \frac{dc'}{di}\,di + \frac{dc'}{dL}\,dL$$

or

$$\delta c' = \frac{dc'}{dx}\,\delta x + \frac{dc'}{di}\,\delta i + \frac{dc'}{dL}\,\delta L \qquad \text{approximately,}$$

which expression is perfectly true, however, for small variations δx, δi, and δL.

Now*

$$\frac{m'\,\psi'}{b} = \frac{N'}{n'} + \delta c' = \rho' + c' + \delta c'$$

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* $$\frac{m'}{N'} = \frac{b'}{K' - \Delta'\,\dfrac{n'}{m'}}$$

$$\therefore \quad \frac{N'}{m'} = \frac{K'}{b'} - \frac{\Delta'}{b'}\cdot\frac{n'}{m'}$$

or $$\frac{K'}{b'} = \frac{N'}{m'} + \frac{\Delta'}{b'}\cdot\frac{n'}{m'}$$

but $$\Delta' = b'\,\delta c'$$

$$\therefore \quad \frac{K'}{b'} = \frac{N'}{m'} + \delta c'\,\frac{n'}{m'}$$

$$\therefore \quad \theta' = \frac{\frac{d\,c'}{d\,x}\,\delta x + \frac{d\,c'}{d\,i'}\,\delta\,i + \frac{d\,c'}{dL}\,\delta\,L}{\rho' + c' + \delta\,c'}$$

But as δx, δi and δL are very small, and, as neither $\frac{d\,c'}{d\,x}$, $\frac{d\,c'}{d\,i}$, nor $\frac{d\,c'}{dL}$ can become infinite, it follows that $\delta c'$ must be always very small in proportion to c' itself, and more so as compared with $\rho' + c'$.

Thus we have at last

$$\theta' = \frac{\frac{dc'}{dx}}{\rho' + c'}\,\delta x + \frac{\frac{dc'}{di}}{\rho' + c'}\,\delta i + \frac{\frac{dc'}{dL}}{\rho' + c'}\,\delta L$$

and therefore to make θ', for independent variations δx, δi, and δL, as small as possible, each term should be made as small as possible. Now, taking ρ' and ρ'' as independent variables, it will be seen that the total differential of each term is negative. Thus θ' becomes smaller the larger ρ' and ρ'' are selected, and the same of course is the case for θ'' (Station II).

Now the complex resistance of any one station can be expressed as follows:—

$$\rho^* = \frac{(a+f)(g+d)}{a+g+d+f} - \frac{(ad-gf)^2}{(a+d+g+f)\left\{b(a+d+g+f)+(a+g)(f+d)\right\}}$$

Thus for any given sum of resistances, *i. e.*, $a + f + d + g =$ const., ρ will be largest if

$$a\,d - g\,f = o \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad \text{(VI)}$$

which is the "*immediate balance condition.*"

Now

$$\frac{m'\,\psi'}{b'} = \frac{K'}{b'} \cdot \frac{m'}{n'}$$

Substituting for $\frac{K'}{b'}$ its value we get

$$\frac{m'\,\psi'}{b'} = \frac{N'}{n'} + \delta c'$$

but $N' = c'\,n' + \alpha'$

$\therefore \quad \frac{N'}{n'} = c' + \frac{\alpha'}{n'}$, but $\frac{\alpha'}{n'} = \rho'$

$\therefore \quad \frac{N'}{n'} = c' + \rho'$

or $\quad \frac{m'\,\psi'}{b'} = c' + \rho' + \delta\,c'$

* This expression is nothing else but the resistance of a Wheatstone's Bridge between the two battery electrodes. It is most easily obtained by the application of Kirchoff's rules.

The fulfilment of the immediate balance condition is therefore no longer an assumption made to afford convenient and quick means of adjustment when balance is disturbed, but, as has been proved, is necessary in order to reduce the effect of any disturbance whatever to a minimum.

Supposing now the fulfilment of the immediate balance, we have

$$\rho = \frac{(g + d)\,(a + f)}{a + d + f + g}$$

which again has a relative maximum for

$$g + d = a + f$$

whence it follows, in consequence of equation (VI), that

$$a = d = f = g \quad \text{.....................................} \quad \text{(VIII)}$$

represents the general solution of the problem.

This result might of course have been anticipated from the special solution, since equation (VIII) gives only a relation between the branches, quite independently of i. It remains now to determine the magnitude of one of the branches, and to this end we have to consider the magnetic moments of the receiving instruments.

Maxima Magnetic Moments. By definition we have

$$S = P - Q$$

for both stations, and as it has been proved before quite generally that $S = o$ if $\Delta = o$, *i. e.*, if rigid balance in the station for the out-going current be established, we know at once that at or near balance the currents which in one and the same station produce single and duplex signals must be identical, and need therefore express the magnetic moment in each station for *one* current only, by presupposing balance in both the stations.

The currents which at or near balance produce the signals are

$$* \; G' = \frac{E''}{4}.\frac{\mu'}{g'' + c''} \qquad \text{in Station (I),}$$

and

$$* \; G'' = \frac{E'}{4}.\frac{\mu''}{g' + c'} \qquad \text{,, ,, (II).}$$

* For balance in Station (II) the current passing through Station (I) is

$$G' = E''\,\frac{b''}{K''}\,\mu'\,\psi'$$

$$\frac{K''}{n''} = \psi''$$

$$\therefore \quad G' = E''\,\frac{b''}{n''\,\psi''}\,\mu'\,\psi'$$

but $\psi' = \psi''$ on account of $a = d = g = f$ in each Station

$$\therefore \quad G' = E''\,\frac{b''}{n''}\,\mu'$$

but $n'' = 4\,g''\,(g'' + b'')$

and dividing by b'' we get

These expressions follow from the general formulæ by fulfilling the regularity equation (VIII) for both stations, and in addition the balance conditions.

Multiplying now G' by $\sqrt{g'}$ and G'' by $\sqrt{g''}$, we get

$$P' = \frac{E''}{4} \cdot \frac{\sqrt{g'}}{g'' + c''} \mu'$$

$$P'' = \frac{E'}{4} \cdot \frac{\sqrt{g''}}{g' + c'} \mu''$$

the magnetic moments of the two instruments in Nos. (I) and (II) Stations respectively; and, considering that*

$$\frac{\mu'}{g' + c''} = \frac{\mu''}{g' + c'} = \frac{i}{Q}$$

where $Q = (g' + l')(g'' + l'') + i(g' + g'' + l' + l'')$, we may write the two above expressions as :—

$$P' = \frac{E''}{4} \cdot \frac{Q}{i} \sqrt{g'}$$

$$P'' = \frac{E'}{4} \frac{i}{Q} \cdot \sqrt{g''}$$

The first expression has clearly an absolute maximum with respect to g', and the second with respect to g'', but these two maxima cannot be simultaneously fulfilled, and do not therefore represent a solution in this particular case. But if we consider that during a *duplex* signal both the instruments g' and g'' are in circuit, while during a *single* signal, though not both the instruments yet certainly their equivalent in resistances are in circuit, it will be clear why simultaneous maxima of the two single expressions are *not* possible. It represents simply the more general case to which the question belongs of making the magnetic moments of two instruments, connected up in the same single circuit, maxima. In this case it is well known we can do nothing more than make the sum of the magnetic moments a maximum, and here therefore we must do the very same.

Adding then we get

$$P = P' + P'' = \frac{i}{4} \frac{E'' \sqrt{g'} + E' \sqrt{g''}}{Q}$$

$$G' = \frac{E''}{4} \cdot \frac{\mu'}{g'' + \frac{g''^2}{b''}}$$

but $g''^2 = b'' c''$ on account of balance in Station (II)

$$\therefore \quad G' = \frac{E''}{4} \cdot \frac{\mu'}{g'' + c''}$$

* This can be easily shewn by substituting for μ', μ'', c' and c'' their actual values.

which expression has a maximum with respect to both g' and g'' considered as independent variables, and such indeed according to the nature of the problem they really are.

Thus, differentiating P with respect to g' and g'', we get

$$\frac{d\,P'}{d\,g'} = Q - 2\sqrt{g'}\left\{\sqrt{g'} + \frac{E'}{E''}\sqrt{g''}\right\}\frac{d\,Q}{d\,g'} = o$$

and

$$\frac{d\,P}{d\,g''} = Q - 2\sqrt{g''}\left\{\sqrt{g''} + \frac{E''}{E'}\sqrt{g'}\right\}\frac{d\,Q}{d\,g''} = o$$

But as the same kind of instruments are employed in both the stations, we require evidently also the same force in both to produce the signals, no matter what the state of the line may be.

Thus we must put*

$$P' = P''$$

or

$$\frac{E''}{4}\frac{\sqrt{g'}}{Q} = \frac{E'}{4}\frac{\sqrt{g''}}{Q}$$

$$\therefore \qquad \frac{E''}{E'} = \frac{\sqrt{g''}}{\sqrt{g'}}$$

Substituting this value for the proportion of the E. M. F., we get

$$Q - 4g'\frac{dQ}{dg'} = o$$

and

$$Q - 4g''\frac{dQ}{dg''} = o$$

but

$$\frac{dQ}{dg'} = g'' + l'' + i$$

and

$$\frac{dQ}{dg''} = g' + l' + i$$

Substituting these values in the above equations and reducing; and, further, dividing the first equation by $l' + i$ and the second by $l'' + i$, we get at last

$$l'' + \frac{i\,l'}{i + l'} + g'' - 3\,g''\left(1 + \frac{g''}{l'' + i}\right) = o$$

and

$$l' + \frac{i\,l}{i + l''} + g' - 3\,g'\left(1 + \frac{g'}{l' + i}\right) = o$$

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* This supposition in the case of a perfect line is fulfilled by itself, since then the two instruments are not only of the same kind, but absolutely identical.

Put $l'' + \frac{i\,l'}{i + l'} = L''$ measured conduction from Station (II),

and $l' + \frac{i\,l''}{i + l''} = L'$ measured conduction from Station (I).

Thus, the two equations which determine the absolute magnitude of g' and g'' respectively, are

$$L' + g' - 3\,g'\left(1 + \frac{g'}{l' + i}\right) = o$$

and

$$L'' + g'' - 3\,g''\left(1 + \frac{g''}{l'' + i}\right) = o$$

from which g' and g'' can be expressed, namely,

$$g' = -\tfrac{1}{3}\,q' + \tfrac{1}{3}\sqrt{q'\,(3\,L' + q')} \qquad \text{............} \quad (X')$$

and

$$g'' = -\tfrac{1}{3}\,q'' + \tfrac{1}{3}\sqrt{q''\,(3\,L'' + q'')} \qquad \text{............} \quad (X'')$$

where

$$q' = i + l'$$

and

$$q'' = i + l''$$

Supposing now $i = \infty$, or the insulation perfect, we have $L' = L'' = L$, and

$$g' = g'' = g = \frac{L}{2}$$

the former *special* solution.

But so long as i is not infinite, L' and L'' may be different from each other; and, therefore, also g' different from g'', and, further,

$$g' = \frac{L'}{2}$$

and

$$g'' = \frac{L''}{2}$$

will be somewhat too large. These values will, however, represent a very close approximation in the case of any line in tolerably good electrical condition; and, as a line worked *duplicè* represents two lines, it can be always afforded to select the best sections, when the above values for g' and g'' will be sufficiently correct for all practical purposes, especially if it be remembered that when once g' and g'' have been fixed, they cannot be easily altered, and that, therefore, L' and L'' must be invariably certain averages, either for the whole year or for certain seasons. This, however, belongs more to the practical application than to the theory of Duplex Telegraphy.

The resistance of the b branch in each station can now be easily calculated from the balance equations and the values given for g' and g''.

The value of the b branch must be calculated to enable as to ascertain that *maximum* part of b which will have to be made variable in increments for the purpose of adjusting balance, and to this interesting question we shall revert further on.

The general solution of the problem might now be considered complete, if it were not for the currents which produce the signals, of which we do not know as yet with certainty that we have the maxima in the solution given above. It must, however, be understood that this solution represents the *only true one* from our physical point of view, and that, if it should not be identical with that giving the maxima currents, when considered generally by themselves from the beginning, the solution would not be thereby invalidated; but only the duplex method in question would prove to be not quite so perfect as could be desired. The sequel, however, will shew that the relation $a = d = g = f$ represents also the maxima currents that are possible under the circumstances. As this investigation is of great importance in forming a correct opinion of the value of the method, it will be fully gone into.

Maxima Currents. When considering the question of currents, for any telegraphic circuit, the two conditions which invariably should be fulfilled are:

Firstly.—Greatest possible constancy of current.

Secondly.—Maximum current.

How far these two conditions can be fulfilled simultaneously, depends clearly on the special circuit and the special arrangements adopted; but so much is certain, that from a practical point of view, the first condition (constancy of current) will always be of far greater importance than the second, inasmuch as the required strength of currents can be obtained by employing cells, efficient in kind, sufficient in number, and properly arranged to suit requirements.

Thus in our case, when we consider the currents which produce the signals in Duplex Telegraphy, before going to the condition of maximum current, we must ascertain first the condition of *greatest possible constancy* of current.

Now it has been proved before that *immediate balance* in each station is requisite in order to make the effect of any disturbance on the receiving instrument as small as the circumstances will allow of. But as these disturbances were considered with respect to *one* and the *same* instrument, *i. e.*, independently of the magnetic moment, these disturbances are then simply due to the disturbances in the signalling current; from which it follows at once that the fulfilment of the *immediate balance* condition is required also in order to have the ***greatest possible constancy*** in the signalling current. Thus when investigating the question of maxima currents we are justified in presupposing the rigid fulfilment of the immediate balance for both stations, *i. e.*,

$$ad - gf = o$$

Further, as it has been shewn before that the fulfilment of the regularity condition

$$a = d = g = f$$

for both stations does make the effect of the disturbances still *smaller*, we have only to investigate the current at balance, and to show that the condition of maximum current becomes identical with the regularity condition, whence it would follow that the duplex method under consideration is perfect in every conceivable respect.

The question to be solved stands, therefore, as follows :—

Two signalling currents, the expressions of which are known, have to be made simultaneous maxima, while the different variables are linked together by four condition equations.

Thus $$G' = E'' \frac{b''}{k''} \mu' \psi'$$

the current which produces single and duplex signals in Station (I).

$$G'' = E'' \frac{b'}{k'} \mu'' \psi''$$

the current which produces single and duplex signals in Station (II).

$$\left.\begin{array}{ll}
1. & a' d' - b' c' = o \\
\text{balance in } (g') \text{ Station (I).} & \\
2. & a'' d'' - b'' c'' = o \\
\text{balance in } g'' \text{ Station (II).} & \\
3. & \left.\begin{array}{l} a' d' - g' f' = o \\ a'' d'' - g'' f'' = o \end{array}\right\} \\
4. & \\
\text{immediate balance in both stations.} &
\end{array}\right\} \text{Condition equations.}$$

Now c' is a function of ρ'', but on account of equation (4) ρ'' is independent of b'', thus c' is also independent of b''; in the same way it follows that c'' is independent of b'; thus b' and b'' can be explicitly expressed at once, and from the four condition equations we have

$$b' = \frac{a' d'}{c'}$$

$$b'' = \frac{a'' d''}{c''}$$

$$f' = \frac{a' d'}{g'}$$

$$f'' = \frac{a'' d''}{g''}$$

and, substituting these values in the expressions for G' and G'', we get

$$G'^{*} = E'' i \cdot \frac{a' g''}{\left\{ c'' (a'' + g'') + a'' (g'' + d'') \right\} \left\{ q' (a' + g') + a' (g' + d') \right\}}$$

$$G''^{*} = E' i \cdot \frac{a'' g'}{\left\{ c' (a' + g') + a' (g' + d') \right\} \left\{ q'' (a'' + g'') + a'' (g'' + d'') \right\}}$$

where

$$q' = i + l'$$
$$q'' = i + l''$$

Put
$$\frac{g''}{g'} = k$$

and substitute in the first expression

$$g'' = k g'$$

in the second

$$g' = \frac{g''}{k}$$

when we get

$$G' = E'' i\, k \cdot \frac{a' g'}{\left\{ c'' (a'' + g' k) + a'' (d'' + g' k) \right\} \left\{ q' (a' + g') + a' (g' + d') \right\}}$$

$$G'' = E' i \,. \frac{a'' g''}{\left\{ c' (g'' + a' k) + a' (g'' + d' k) \right\} \left\{ q'' (a'' + g'') + a'' (d'' + g'' \right\}}$$

Now it will be seen that G' has clearly a maximum with respect to g', while G'' has a maximum with respect to g''; thus, if we take g' as the only variable in G' (k constant) and differentiate with respect to g', we get

$$\frac{d\,G''}{d\,g'} = o$$

and, if we take g'' as the only variable in G'' and differentiate, we get

$$\frac{d\,G''}{d\,g''} = o$$

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* If in these two expressions we put

$$i = \infty$$

and remember that then

$$a' = a'' = a$$
$$d' = d'' = d$$
$$g' = g'' = g$$

and
$$c' = c'' = L + \rho$$

while
$$\rho = \frac{a\,(g + d)}{a + g}$$

we get
$$G' = G'' = G = E \frac{a\,g}{\left\{ L\,(a + g) + 2\,a\,(g + d) \right\} . \,(a + g)}$$

the expression of the current which produces the signals (single and duplex) through a perfect line, as was given in the first part of this investigation (p. 19).

These two equations must be fulfilled simultaneously in order to have the simultaneous maxima of the two currents in question.

Executing the differentiation, and re-substituting for k its value $\frac{g''}{g'}$, we get after reduction

$$a'\,a''\,(c''+d'')\,(q'+d')-g'\,g''\,(a'+q')\,(a''+c'')$$
$$-g'\,(a''+g'')\left\{(q'\,(a'+g')+a'\,(g'+d')\right\}\frac{d\,c''}{d\,g'}=o$$

and

$$a'\,a''\,(c'+d')\,(q''+d'')-g'\,g''\,(a''+q'')\,(a'+c')$$
$$-g''\,(a'+g')\left\{q''\,(a''+g'')+a''\,(g''+d'')\right\}\frac{d\,c'}{d\,g''}=o$$

while

$$\frac{dc''}{dg'}=\frac{i^2}{(q'+\rho')^2}\cdot\frac{a'\,(a'-d')}{(a'+g')^2}$$
$$\frac{dc'}{dg''}=\frac{i^2}{(q''+\rho'')^2}\cdot\frac{a''\,(a''-d'')}{(a''+g'')^2}$$

Now the terms in the two equations which have $\frac{dc''}{dg'}$ and $\frac{dc'}{dg''}$ for factors become independently zero, the first for $a'=d'$, and the second for $a''=d''$; and, substituting these values for d' and d'' in the other two terms, both become zero for

$$a'\,a''-g'\,g'=o$$

whence it follows that

$$a'-d'=o$$
$$a''-d''=o$$
$$a'\,a''-g'\,g''=o$$

is one of the simultaneous solutions of the two equations.*

Thus, substituting for d' its value a', and for d'' its value a'', we get

$$G'=E''\,i\,\frac{a'\,g''}{(c''+a'')\,(a''+g'')\,(a'+g')\,(a'+q')}$$
$$G''=E'\,i\,\frac{a''\,g'}{(c'+a')\,(a'+g')\,(a''+g'')\,(a''+q'')}$$

The first equation has clearly a maximum with respect to a', and the second with respect to a'', namely

$$\frac{dG'}{da'}=0,\text{ which gives } a'=g',$$

and

$$\frac{dG''}{da''}=0,\text{ which gives } a''=g''.$$

* The other solutions which are possible from a mathematical point of view are however impossible with respect to the physical problem, for the quantities being all electrical resistances must be taken with the same sign, say positive.

Thus it follows generally that $a = d = g$ represents a maximum of the currents, and this, in consequence of the immediate balance, gives at last

$$a = d = g = f$$

the known regularity condition, which thus has also to hold good in order to make the two currents G' and G'' simultaneous maxima.

The *first problem* for the Bridge Method has therefore now been generally solved, and the results are expressed by the following formulæ:

$$\mathbf{a} = \mathbf{d} = \mathbf{f} = \mathbf{g} = \mathbf{w} + \beta$$

$$\mathbf{g} = \mathbf{H}\left(\sqrt{1 + \frac{\mathbf{L}}{\mathbf{H}}} - 1\right)$$

where $$H = \frac{q}{3} = \frac{l + i}{3}.$$

When the insulation is perfect ($i = \infty$) the results revert to those originally obtained in the special solution, *viz*:—

$$\mathbf{a} = \mathbf{d} = \mathbf{f} = \mathbf{g} = \mathbf{w} + \beta$$

$$\mathbf{g} = \frac{\mathbf{L}}{2}$$

$$\mathbf{b} = \frac{\mathbf{L}}{6}$$

It will be clear that the given solution fulfils the following conditions which are necessary and sufficient to place Duplex Telegraphy on a par with Single Telegraphy.

i. *Any variation in the resistance of the line has the least possible disturbing effect on the receiving instrument.*

ii. *Any disturbance can be eliminated by a single adjustment in the* b *branch without disturbing balance in the distant station.*

iii. *Maximum magnetic moment of the receiving instrument.*

iv. *Maximum current.*

There seems to me to be no other method that can fulfil all these conditions simultaneously, and the "*double balance*"* method must therefore be pronounced perfect in every conceivable respect. I am convinced that if the general problem of duplex working were investigated by means of the Variation Calculus, the *double balance* method would come out as the *final* and *only* solution.†

* I have called this method the "*double balance*" method, since there are two balances to be fulfilled in each station, namely, balance in the b branch for the arriving current and balance in the g branch for the outgoing current.

† The double balance method was introduced on one of the important Bombay-Calcutta main lines in June last. Since then this duplex method has been working so satisfactorily and with such regularity and speed, even during the worst time of the

ADDENDUM.

HISTORICAL.

When reading this paper before the Asiatic Society on the 4th February 1874, and, further, when editing the First Part for publication in the Journal of the Society, I was unacquainted with the fact that a most complete history of Duplex Telegraphy had been published by Dr. Karl Eduard Zetzsche* (Leipzig 1865). According to Professor Zetzsche,† the Bridge Method of Duplex Telegraphy was already invented in 1863 by Maron, a Prussian Telegraph Inspector; and Dr. Zetzsche very truly remarks that the Bridge Method would seem to be that least affected by variations in the resistance of the line. To this, from an historical point of view, most valuable book, I refer the reader. It is to be hoped that an English translation of it may soon be published.

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year (South-West monsoon)—when necessarily the insulation as well as the inductive capacity of lines are so enormously variable, that about its thorough practicability no doubt can be entertained, and Col. Robinson, Director General of Telegraphs in India, has consequently decided to introduce this duplex method also on the other long main lines of India.

At present the apparatus for the Bombay-Madras line (worked direct 800 miles) is almost finished, and the apparatus for Calcutta-Rangoon is under manufacture.

The Calcutta-Bombay main line is worked duplicè with Jabalpur only in translation; distance between Calcutta and Jabalpur 850 miles: distance between Jabalpur and Bombay 640 miles. The wire is almost throughout No. $5\frac{1}{2}$ B. W. G. (diam. = $5\frac{1}{4}$ m. m.)

This experiment, made on such a large scale and under the most unfavorable meteorological conditions, has proved most conclusively the practicability of the *double balance* method, which certainly will invariably succeed on any line where single telegraphy is possible.

* Die Copiertelegraphen, die Typendrucktelegraphen, und die Doppel Telegraphie, ein Beitrag zur Geschichte der electrischen Telegraphie, von Dr. Karl Eduard Zetzsche, Leipzig 1865.

† Page 125 in the work quoted.

(To be continued.)

List of Chiroptera inhabiting the Khasia Hills, with description of a new species.—*By* G. E. Dobson, B. A., M. B., F. L. S.

To Major H. H. Godwin-Austen we chiefly owe our knowledge of the fauna of these little known hill tracts, and the following list has been almost altogether made out from his collections presented to the Indian Museum. Most of the species were new, or Himalayan forms, while one is a well known European bat.

Fam. *RHINOLOPHIDÆ.*

1. Rhinolophus luctus, Temm.

This species has never, so far as I know, been found in the plains. Indeed all the species of this genus appear to be fond of elevated lands far from human habitations. The genus *Rhinolophus* is the only genus of this large family represented in the colder latitudes, and both species of leaf-nosed bats found in England belong to it. The fur of all the species is remarkably long and dense, evidently in relation to the temperature they live in. In this respect they contrast remarkably with the species of the allied genus, *Phyllorhina*, which are almost confined to the plains and low hill ranges of the tropical and sub-tropical parts of the Eastern Hemisphere.

2. Rh. Yunanensis.

Rh. Yunanensis, Dobson, J. A. S. B., 1872, p. 336.

? *Rh. larvatus*, Milne-Edwards (non Horsfield), Mammif. du Tibet, 1872, p. 248.

Milne-Edwards' species is most probably identical with this, which will probably be found generally distributed throughout the Himalayas and adjoining mountain ranges. A dried specimen in the Indian Museum from Tupai Mukh, collected during the Lushai expedition, belongs to this species.

3. Phyllorhina armigera, Hodgson.

This fine species, first discovered by Mr. Hodgson in Nipal, is almost the only hill-dweller among numerous and widely distributed species of the genus. It is alone surpassed in size by the African *Ph. Commersonii (Macronycteris gigas*, Gray), and is the largest Asiatic leaf-nosed bat yet discovered. It extends along the Himalaya into China, and has been found by Mr. Swinhoe at Amoy.

The Khasia Hills are a new locality for this species.

4. Ph. leptophylla, n. sp.

Ears rather large, broad and triangular with subacute tips, the outer margin slightly concave beneath the tip. The upper transverse nose-leaf small, upper edge simple, narrower than the horse-shoe portion, thin, the three vertical folds in front faintly discernible at base only: the horse-shoe with a small incision in the centre of its front free edge: frontal pore small, placed at some distance behind the transverse nose-leaf.

Wing-membranes from the tibia a short distance above the ankle; interfemoral membrane triangular, the extremity of the tail projecting. Fur and integuments dark throughout.

This species belongs to the same section* of the genus as *Ph. armigera* from which it is distinguished by its considerably smaller size; by the upper transverse nose-leaf being simple, not lobed above as in that species, and by the incised front edge of the horse-shoe which in *Ph. armigera* is invariably plain.

The specimen from which the above description is taken is an adult male preserved in alcohol, obtained in the Khasia Hills by Major H. H Godwin-Austen and sent by him to the Indian Museum.

5. Ph. larvata, Horsfield.

The Indian Museum possesses specimens of this species from the Khasia Hills collected by the late Lieut. Bourne. They differ remarkably in the colour of the fur from the Javanese and Burmese forms. Those from the Khasia Hills are usually very dark without the least reddish tinge; in one specimen, however, an old male with greatly enlarged glandular elevations between the eyes, the fur has a very distinct orange tinge throughout.

6. Ph. fulva, Gray.

This appears to be the most widely distributed species of the genus. It varies remarkably in the colour of the fur and size of the ears, and has consequently received nearly as many names as those of the different countries it inhabits.

Fam. *VESPERTILIONIDÆ.*

7. Vesperus pachyotis.

Vesperus pachyotis, Dobson, P. A. S. B., 1871, p. 211.

This remarkable species, readily distinguished by its peculiar fleshy ears, has not been recorded from any other locality. The original description was taken from two adult specimens, a male and female, preserved in alcohol in the Indian Museum.

8. Vesperugo (Pipistrellus) imbricatus, Horsfield.

This is the commonest bat in India where it takes the place of the European Pipistrelle. Specimens vary much in size according to age and locality; the form of the teeth, especially of the incisors, is also very varia-

* *Gloionycteris*, Gray.

ble, and consequently the species has received a great number of different names.

9. Vesperugo (Pipistrellus) Austenianus.

Pipistrellus Austenianus, Dobson, P. A. S. B., 1871, p. 213.

Major Godwin-Austen has lately sent another specimen of this species which is readily known by its broad straight tragus, and intensely black integuments and fur. *P. affinis*, Dobson, from Yunan, is very close to this species, but there are nine vertebræ in the tail compared with seven in *P. Austenianus*, the tragus is narrower, and the colour of the fur light brown.

10. Nycticejus ornatus, Blyth.

This peculiarly marked bat is the nearest representative of the American genus *Atalapha* (= *Lasiurus*). It is common in the warm valleys about Darjeeling and Dr. J. Anderson found it in the Kakyan Hills, Yunan.

11. Barbastellus communis, Gray.

I can discover no difference between the specimen sent by Major Godwin-Austen and specimens of the common European Barbastelle. It appears to be common in the Himalayas. Specimens have been sent from Másuri by Captain Hutton, and from Simla by Moulvie Ataor Ruhman; those from Simla are preserved in the Indian Museum.

It may be confidently expected that the following species which are generally common in the surrounding countries will be found in the Khasia Hills, namely—*Pteropus medius*, Temm.; *Cynopterus marginatus*, Geoff.; *Cynonycteris amplexicaudata*, Geoff.; *Megaderma lyra*, Geoff.; *Rhinolophus affinis*, Horsf.; *Rh. Garoensis*, Dobson; *Phyllorhina diadema*, Geoff.; *Ph. speoris*, Schr.; *Taphozous saccolaimus*, Temm.; *T. melanopogon*, Temm.; *Vespertilio formosus*, Hodgson; *Kerivoula picta*, Pallas; *K. Hardwickii*, Gray; *Vesperugo annectens*, Dobson; *Vesperus (Tylonycteris) pachypus*, Temm.; *Nycticejus Temminckii*, Horsf.; *N. Tickelli*, Blyth; *Murina harpia*, Pallas; and *M. cyclotis*, Dobson.

Descriptions of new species of Chiroptera from India and Yunan.—*By* G. E. Dobson, B. A., M. B., F. L. S.

Phyllorhina brachyota, n. sp.

Ear comparatively small, as broad as long, inner margin very convex forwards, outer margin slightly concave beneath the tip; nose-leaf as in *Ph. larvata*, Horsf., front surface of upper transverse portion with three very distinct vertical ridges; frontal pore small, indistinct, not larger than that of the females of *Ph. larvata.*

Feet small: wing-membrane from the metatarsus near the base of the toes. Interfemoral membrane rather large, triangular behind; extreme tip of tail free.

Fur, above, light brown at base, the terminal third of the hairs very dark, the extreme tips paler: beneath similar but somewhat paler. The fur on the shoulders and along the spine darker. Ears and wing- and interfemoral-membranes very dark known. Specimens in colourless alcohol appear very dark brown throughout.

The second upper premolar is separated from the canine by a wider interval than usual in this genus; in the midst of this space, but rather to the outside, the small, scarcely distinguishable first premolar is placed.

Length, head and body 1″·95 inches; tail 1″·4; head 0″·75; ear (anteriorly) 0″·5; forearm 1″·75; thumb 0″.25; second finger 2″·7; fourth finger 2″·1; tibia 0″·72; calcaneum 0″·4; foot and claws 0″·3.

The above description is taken from an adult male, preserved in alcohol, obtained by Staff Surgeon F. P. Staples in Central India, and presented by him to the Museum of the Army Medical Department at Netley.

Vespertilio montivagus, n. sp.

Crown of head very slightly elevated; muzzle obtuse: ears narrow, tapering, with rounded tips; outer side flatly emarginate immediately beneath the tip for about quarter its length, then slightly convex, and lower down, opposite the base of the tragus with a small emargination, terminating beyond this in a small rounded lobe; inner margin convex for two-thirds its length, then forming a straight line to the tip; tragus long, narrow, and acutely pointed; inner margin straight, outer slightly convex upwards with a small rounded lobe at the base.

Feet very small, toes two-thirds the length of the whole foot. Tail wholly contained within the interfemoral membrane. Wings from the base of the toes.

Fur, above, dark-brown, the extreme tips paler and shining; beneath much darker, almost black for three-fourths the length of the hairs, the remaining portion ashy. In front the face is everywhere densely covered, the long hairs concealing the eyes and leaving the tip of the nose alone naked: on each side of the muzzle two or three small glandular wart-like elevations may be seen through the hairs. The ears are quite naked anteriorly, posteriorly their bases only are covered. On the wing-membrane the fur of the back extends as far as a line drawn from the junction of the proximal and middle thirds of the humerus to the commencement of the distal third of the femur: on the interfemoral membrane it ceases abruptly at the end of the second caudal vertebra. Beneath the fur extends upon the wing-membrane as far as a line drawn from the elbow to the knee-joint; the interfemoral membrane is covered at the root of the tail, and three fourths of the remaining part is very thinly clothed with the short hairs arising from the transverse dotted lines.

Incisors, on each side, parallel and acutely pointed; inner incisors longest, with a small acutely pointed talon near their extremities on the outer side. In the lower jaw the second premolar is small but distinctly visible, standing in the tooth-row; in the upper jaw the space between the canine and third premolar is small, and the second premolar is very minute, placed interiorly, in the angle between the first and third premolar, and with difficulty distinguishable even with the aid of a lens.

Length, head and body 1″·8 inches; tail 1″·6; head 0″·65; ear 0″·58; tragus 0″·25; forearm 1″·5; thumb 0″·25; second finger 2″·7; fourth finger 1″·9; tibia 0″·6; foot and claws 0″·3.

Habitat.—Hotha, Yunan.

The above description is taken from adult male and female specimens preserved in alcohol, obtained by Dr. J. Anderson during the Yunan Expedition, and deposited in the Indian Museum, Calcutta.

Some Ornithological Notes and Corrections.

By W. Edwin Brooks, C. E.

(Received August 25th, read Nov. 4th, 1874).

Tinnunculus Pekinensis, Swinhoe.

I obtained a mature male, a young male in changing plumage, and an adult female of this species, in April last, near Dinapore. They were, with many others, hovering over the cleared *paddy* land close to the line of railway.

T. cenchris, Naum., it will be remembered, is distinct from the Indian and Chinese species.

Accipiter virgatus, Temm.

J. A. S. B., 1872, p. 73.

Mr. Hume saw the specimen procured in Cashmere by Capt. Cock, and pronounced it to be an old male of *Ac. nisus*, Lin.; in which I believe him to have been correct.

Aquila bifasciata, Gray and A. orientalis, Cab.

With the addition of Mr. Anderson's specimens, I have now eight of the latter species. Four are marked as males, as indeed their small size indicates; the average length of the wing in these is 20·09 inches. Of four males of *A. bifasciata* – the first four I met with—the average of the wing is 20·62 inches, or a trifle more than half an inch difference, which is quite a trifling one for so large a bird as an eagle. The sexing of one of the four females is certainly incorrect: this bird has a wing only 20.75 long: one of the males has the wing 20.50: showing a difference of only 0.25 in. between male and female, which, in an eagle of this size, is far too small; there should have been a difference of 1.50 in. at least. Between the four males and four females of *A. bifasciata* there is an average difference of 2.63 inches; I, therefore, need only contrast the males of each as regards size, using for this purpose only this series of eight of each which I have before me.

One of the objections to my identification of *Aq. orientalis* with *A. bifasciata* was the alleged larger average size of the latter—a question which must be left open till a reliable series of the European bird can be obtained, *i. e.*, reliable as regards sex. The European birds were mostly obtained from the dealer Moeschler of Dresden, and there is much doubt about the specimens marked as females, for they approach the males too closely in size.

The other point of supposed difference was the darker tone of plumage of the European bird. With regard to this, I find that the Indian species is quite as dark. In fact, in the series now before me, the balance of darkness of colour is decidedly on the side of the Indian birds. The European ones, which are spring and summer birds, are more faded. The question of colour may, therefore, be dismissed at once, for in this respect the two species correspond as closely as could be desired, but that of comparative size must stand over till a good series of the European bird is obtained, and for such a series to possess any value the sexes of the birds should have been determined by a naturalist, and not by a mere dealer.

For the present, then, I adhere to my conclusion that the two species are identical; each one having the peculiar buff patch at the back of the head, the strongly banded wings when immature, and a tail barred in precisely the same way—all very strong points in favour of absolute identity.

Aquila hastata, Lesson.

This species is said by Mr. Dresser to differ from the species found in North Europe, in the plumage of the young bird. The adults are said to correspond.

I have two specimens in their first plumage, taken from the nest at Saharunpore, and the following is a description of them.

Irides dark brown; bill black, but lead-gray towards base; cere and gape bright yellow; feet a dull yellow; claws black. Above, dark hair-brown; this dark brown is shaded into quite a brownish-grey on the lower half of the back and upper tail-coverts, the feathers of this lighter portion being dark-shafted; upper tail-coverts barred with white on their outer webs; from top of head and down to nape of neck the feathers are tipped with small fulvous spots; scapulars, ridge and bend of wing, and most of the lesser wing-coverts tipped with fulvous spots of larger size; median wing-coverts similarly pale-tipped, with the lower row having the spots considerably larger (about ½ in. in length): this row of large spots presents the appearance, at a little distance, of a first and slight wing-bar; greater coverts all broadly tipped with dull fulvous white, presenting the appearance of a second and strong bar on the wing; secondaries and tertials broadly edged with greyish-white shaded off into the darker portion of the feather, and these light ends form the third bar on the wing; the dark portion of the wing-coverts and scapulars is of the same dark hair-brown as the back; primaries uniform black and unbarred; secondaries brown, profusely barred with hoary-grey on both webs; the greyish-white ends to the tertials are very broad; cheeks and side of head brown of a paler shade than the top of the head and streaked very faintly with darker; tail-feathers dark brown, tipped broadly with greyish-white, and barred with greyish on both webs; these bars are nearly square to the shaft (Mr. Anderson's young example has not, however, any indication of bars on the tail, except on the two outer feathers, and these nearly obsolete bars are confined to the inner webs); chin, throat, and breast are brown of a shade lighter than the head and upper back and gradually becoming paler lower down, till it passes into dingy fulvous on the lower abdomen and under tail-coverts; from the top of the breast to lower abdomen the feathers have central and terminal stripes of fulvous, the stripes increasing in size towards the legs; the feathers of the lower tail-coverts are slightly, but broadly, barred with pale brown, and the shaft portion forms also a longitudinal brown streak; the appearance of the tail from below is brown, darkest towards the basal portion, and barred profusely with whitish grey; tibial plumes lightish brown spotted with fulvous; tarsus fulvous, indistinctly streaked with pale brown. The primaries, though apparently barless, are, especially the inner ones, when seen from below, obsoletely barred on the inner web. One specimen is much less spotted than the other on the upper portion of the wing, most of the lesser coverts being plain brown, and the small spots being almost confined to the vicinity of the bend of the wing and to its ridge.

Mr. Dresser has promised me an immature bird of the European form for comparison, the result of which will be communicated hereafter.

AQUILA FULVESCENS, Gray and Hardw.

For the last three years no additional examples of this rare eagle have been procured. The African species, *Aquila nævioides*, Cuv. with which our bird has been confounded, is, I find, subject to some variation as regards the tail. In my remarks on this species (P. A. S. B., 1873, pp. 173-175), I noted the strongly barred tail of the example then before me. Mr. Anderson has since lent me another South African example, a fine adult bird, which is in the moult; in it both *old* and *new* tail-feathers are hoary-greyish-brown, and the indications of bars so faint as to be only perceptible in certain lights. It would thus appear that only some individuals have the tail well-barred like the common Indian *Aquila Vindhiana*, and, consequently, that a barred tail may not always be one of the characteristics of the species. I may note that I have a single example of *Aquila Vindhiana* with an absolutely plain tail; but of the hundreds that I have seen, all, with this single exception, had well-barred tails.

The body plumage of this second example of *Aq. nævioides* above referred to is of two colours: all the old feathers are light sandy-coloured, while the new ones are foxy-red: the lesser and median wing-coverts, and also the scapulars, are a mixture of purplish-brown of different shades and rufous; the rufous, in most of the feathers, occupying the centre as a broad stripe, but in some cases being confined to one side. The nostril is vertical and of the same oblong form as that of *Aq. Vindhiana*.

I cannot understand how our Indian *A. Vindhiana* came to be confounded with the well-marked African *A. nævioides;* no two birds could be more distinct, the foxy-red plumage of the latter being most striking. As far as general tone of colour goes, the African species more resembles *Aquila fulvescens*, Gray in its immature or buff stage; but this last is readily distinguished by its very circular nostril, not to mention other well-marked differences.

AQUILA VINDHIANA, Franklin.

Having seen Ruppell's plate of *Aquila albicans* and read what Mr. Blanford* and Dr. Finsch† say of the North East African species, which they term *A. rapax*, Temm., I strongly suspect its identity with our Indian *A. Vindhiana.* From what I have seen of true *Aquila nævioides* vel *rapax*, I cannot conceive of this bird ever being "pale cream coloured" or "blackish brown;" and a species distinct from *A. nævioides* (and which has been confounded with it) is doubtless found in the Northern portion of Africa. Rüppell's plate of *A. albicans* is the most perfect representation of a pale "Wokhab" that could be desired. A series of North African and Punjab birds should be compared. Mr. J. H. Gurney once told me (*in litt.*) that the identity of the North African Eagle generally termed *A. nævioides* with our Indian *A. Vindhiana* was very probable; and also that Lord Walden had Abyssinian examples of the latter species.

ARCHIBUTEO STROPHIATUS and A. CRYPTOGENYS Hodgs.

Are two entirely distinct species. I have copies of Hodgson's minute drawings of each, with all details of bills and feet. Although both are of similar size, the latter is a much feebler bird and more of a Buzzard; it has a very much smaller foot, a more slender tarsus, and a much smaller bill, and while *A. strophiatus* has the nostril free, *A. cryptogenys* has it partially hidden by plumes. The plumage of the two birds is also entirely different. Neither, I should remark, bears the faintest resemblance to *Aquila pennata*, which is only two-thirds of the size of Hodgson's two species, so that if a specimen of the last-named in the British Museum, said to have been sent by Hodgson, is labelled *A. strophiatus*, it could not have been so labelled by Hodgson, who cannot be held responsible for what is probably due to Museum blunders, and who anyhow knew the Booted Eagle too well to apply the name of *strophiatus* to it.

MILVUS PALUSTRIS, And.

P. A. S. 1873, pp. 142—147.

Mr. Anderson authorizes me to withdraw this species. I have procured a considerable series of the common Indian village Kite (*M. affinis*, Gould),

* Zoology and Geology of Abyssinia, p. 295.

† Trans. Zool. Soc. Lond., 1870, p. 201.

and there appears to be but little doubt that *M. palustris* is this bird in either second or third plumage.

As before observed, *M. Govinda,* Sykes is the larger Kite which comes to the plains of India in the cold weather. The large dimensions given by Sykes render it certain that he described the larger species, for no common village Kite reaches the length of 26 inches. It is also pretty clear that Sykes did not contemplate there being two affined Kites, both of them found in the country in which he worked.

Mr. Gurney has informed me that the two types are of different sizes; but regardless of the types, neither of which in this instance may have been the very one from which Sykes described, I think we should hold to the original description, which describes a large 26-inch Kite. And in this case *Milvus major*, Hume and *Milvus melanotis*, Temm. and Schleg. become synonyms of *Milvus Govinda*, Sykes.

I possess a common Indian village Kite, returned to me by Mr. Gurney as being feather for feather identical with the Australian species, *M. affinis*, Gould. This identical bird is the commonest form of the resident species distributed so widely over India; and I think, therefore, that our common Kite should in future be known by its correct name of *M. affinis.*

At Mussoorie, both species are to be seen during the spring and summer, but more in the interior of the hills only the large species, *M. Govinda*, is met with. A few breed at Barahaut on the Bhaugaruttee.

Pernis cristata, Cuv.

A young bird from the nest which I once kept in confinement, had the breast of a rather light earth-brown, each feather having a black central stripe. Even in this young bird the crest was well developed.

The dark-plumaged birds are the fully adult ones. I have one shot from the nest in this plumage, and all I saw at Saharunpore in July, where they had their nests in trees near the canal, were of this dark plumage. In speaking of the young bird, I should have mentioned that the upper plumage was a very dark clove-brown.

Hirundo Daurica, Lin. and H. erythropygia, Sykes.

I only met with the latter species in cishimalayan Cashmere, as far up as Chungus on the Tawi river. At Mussoorie, Simla, and Almorah, and also at Binsur, north of Almorah, the strongly striated species with paler rump-band (*H. Daurica*) prevails. It is also somewhat larger than *H. erythropygia.* I have procured both in the plains in the cold weather, but the hill bird is there very much scarcer. *H. erythropygia* breeds near Chunar, and at most places in the North-West Provinces where there are old buildings or quarries suitable. The eggs are laid at the commencement of the rains. At Mussoorie, I saw a nest of *H. Daurica* on the ceiling of a bath-room in Col. Macdougall's house. The birds went in and out through a broken pane of glass. Other nests were affixed to the underside of the roofs of servants' houses belonging to a house at the south end of Mussoorie. The doors being generally left open, the place just suited the swallows, which were only shut up with their nests at night. The young were hatched in the beginning of July, so that the eggs must have been laid towards the latter part of June. I have, however, seen eggs of this species at Almorah in the end of April.

HEMICHELIDON SIBIRICA, Gmel.

H. fuliginosa, Hodg.

I have referred to this species in J. A. S. B., 1872, p. 75. It is now known by its older term of *H. Sibirica*, Gmel. I compared my examples with one of Hodgson's in the Indian Museum, and found them identical. Hodgson's dimension (2¾ in.) for the wing refers to the minimum size; the range of variation in length of wing is greater than I supposed possible in such a small bird, viz. 2.75 to 3.05 in. What the small species referred to by me in J. A. S. B., 1872, p. 76 was, I have no means of ascertaining. I remember it well, and still have Mr. Hume's letter concerning it, written at the time, when he assured me that Hodgson's species was not the one commonly received as such.

ALSEONAX TERRICOLOR, Hodgs. and A. LATIROSTRIS, Raffles.

Mr. Hume considers these species identical, and in writing of the former always terms it *A. latirostris*, under which name he has figured it in 'Lahore to Yarkand.' Mr. Swinhoe* identifies *Muscicapa cinereoalba*, Temm. and Schleg. with *Alseonax latirostris*, Raffles. Having examined the Chinese species *M. cinereoalba*, I find it distinct from *A. terricolor*, by its shorter tail and rather differently shaped and somewhat broader and shorter bill, which is also blacker towards the tip than in the other bird. *Alseonax latirostris* is without doubt one of these two closely allied birds; and the question is, Which of the two agrees with Raffles's type and description? Mr. Hume appears to think that because *A. terricolor*, Hodgs. has been procured in the country from which Raffles described his *A. latirostris*, it is therefore Raffles's species; but the other bird, which is a common species in China, may also occur in Sumatra in winter.

I do not know whether Mr. Swinhoe was correct in uniting *A. cinereoalba* and *A. latirostris*, and whether he compared his examples of the former with the type or not; and the subject requires thorough investigation, for Mr. Swinhoe† speaks of the Chinese bird as being "identical with the Indian species."

* Proc. Zool. Soc. Lond., 1871, p. 325.

† P. Z. S., 1863, p. 288.

I know for a certainty, from close comparison, that Mr. Swinhoe's examples of *M. cinereoalba* in the Indian Museum are not identical with the Indian species *A. terricolor*, and I have indicated the points of difference. This identification of his makes me very much doubt that of *A. cinereoalba* with *A. latirostris*. Apparently he has not noted the difference between *A. terricolor* and *A. cinereoalba*.

I fail to see any grounds whatever for Mr. Hume's identification in the fact that both he and Lord Walden have *A. terricolor* from the locality whence Raffles obtained his species; and the question, What bird is *Alseonax latirostris?* must be regarded as at present an unsettled one.

Erythrosterna parva.

J. A. S. B., 1872, p. 76.

The bird I observed in Cashmere should be *Erythrosterna hyperythra*, Cabanis, distinguished from *E. parva* by having a band of velvet-black down each side of the neck and edging the red of the throat and breast. This full breeding-plumage is assumed after the birds have left the plains. In the cold weather when they re-appear, they have lost the black band; but the old males retain the red breast. In this plumage it has been mistaken for *E. parva*, which for the present should be expunged from the Indian list.

Erythrosterna albicilla, Pallas.

Erroneously termed *E. leucura* by Blyth and Jerdon, this species having a western limit at about Buxar or Ghazeepore and being replaced in the North-West by the aforenamed species. The black wings and tail of *E. albicilla* and its colder and greyer plumage readily distinguish it from the other when in immature or female plumage; it is not nearly so often procured with a red throat, and even then the red does not extend down the breast as in the other species, but is confined to the throat.

Acrocephalus stentoreus, H. and E.

Acrocephalus brunnescens, Jerdon, Ibis, 1874, p. 49.

Lord Walden* considers the Cashmere species to be distinct. I have seen many both in Cashmere and in the plains of India, and the birds are perfectly identical. The very peculiar and loud voice is alone sufficient to identify the bird by, whether in the plains or in Cashmere. It varies somewhat in size and in tone of colour; the latter depending upon the season of the year. Our plains' birds are only with us during the cold weather, leaving in the spring. Cashmere is the nearest breeding-place, but the great majority of the birds probably go farther north. I should also remark that in this species length of bill, wing, and tail is variable.

* Trans. Zool. Soc. Lond., 1872, p. 64.

ACROCEPHALUS DUMETORUM, Blyth.

I saw a few of this species near Mussoorie on June 1st frequenting dense rose-thickets at about 7000 feet elevation. Whether they would have remained there to breed or gone further north, is a question to be solved. Capt. Hutton is said to have taken the eggs near Mussoorie. The males were not singing, as they usually do vigorously when the nest is built.

DUMETICOLA AFFINIS, Hodgs.

Is subject to variation as regards being spotted or not, just as is *D. major*, Brooks. I obtained one or two unspotted examples of the latter; they were breeding males, too, and in full song. Mr. Hodgson was aware of the variation, and hence figures *D. affinis* as unspotted, but describes it as spotted. The female of neither species has been recorded; that sex in both is probably unspotted. I never obtained a female of *D. major*.

DUMETICOLA BRUNNEIPECTUS, Blyth.

Referred to by Mr. Blanford in J. A. S. B., 1872, p. 164. I examined this bird, and found it to be *D. affinis* in the unspotted stage. I would suppress Blyth's *D. brunneipectus* altogether as a species, considering it but *D. affinis*, Hodgs.

TRIBURA LUTEOVENTRIS, Hodgs.

I examined the specimen referred to by Mr. Blanford* and found it also to be *Dumeticola affinis*, Hodgs. in the unspotted plumage. *Tribura luteoventris* has a longer head, measured from the back of the skull to the tip of the bill, which latter is also of a different shape. The specimen in the Indian Museum is so old and faded that the original colour cannot be recognized; nor can the forms of wing and tail be ascertained.

NEORNIS FLAVOLIVACEA, Hodgs.

I have this species, and it is a greenish olive above. Hodgson's drawing, No. 900, does not represent it, as stated by Mr. Hume,† but is applicable to *Hororornis assimilis*, Hodgs., as stated by Gray.

PHYLLOSCOPUS PALLIDIPES, Blanford, J. A. S. B., 1872, p. 162.

Is not a *Phylloscopus*, but a true *Horeites*. I have examined the type: the second quill is equal to about the sixteenth; third equal to eighth; the first, second, third, and fourth are graduated, the distance from tip to tip of each feather diminishing till the fourth is reached. This is a very rounded wing, such as is not possessed by any *Phylloscopus;* in the wing of which genus there is always a long space

* Journ. As. Soc. Bengal, 1872, p. 164. † Stray Feathers, 1873, p. 444.

between first and second quills, and the second is equal to from fifth or sixth to eighth or ninth, according to the species. The tail, too, of *Horeites pallidipes* is much rounded and *non-phylloscopine.* A further difference between *Phylloscopus* and *Horeites* lies in the fact that the former has twelve tail-feathers and the latter ten. I cannot see any generic distinction between *Horornis* and *Horeites; Neornis* also appears to be the same with a better developed tail.

PHYLLOSCOPUS MAGNIROSTRIS, Blyth.

Mr. Hume* tells us that this bird is identical with *P. borealis,* Blasius (*P. sylvicultrix,* Swinhoe). I examined the Chinese examples of the latter, in the Indian Museum, and found the following differences:

1. *P. borealis* has a minute first primary, as in *P. sibilatrix,* Bechst, while *P. magnirostris* has a much larger one, as in *Hippolais Rama,* Sykes.

2. The wing of *P. borealis* is of a different shape from that of *magnirostris,* being more pointed, with the 2nd quill intermediate between the 5th and 6th; while *P. magnirostris* has a wing much more rounded in form, the 2nd quill being equal to about the 9th.

Such differences as these are fatal to identity.

CULICIPETA CANTATOR, Tickell.

I examined the specimen referred to by Mr. Blanford† and found it to be *Reguloides viridipennis,* Blyth, and to agree perfectly with the types in the Indian Museum. *C. cantator* is a very different bird, and is correctly described by Jerdon.

REGULOIDES VIRIDIPENNIS, Blyth.

May be described as a small and brightly coloured *Reg. trochiloides,* Sundevall. Small examples of *Reg. trochiloides* are very difficult to separate from *Reg. viridipennis.*

REGULOIDES MACULIPENNIS, Blyth.

Mr. Hume‡ identifies this species with *Reg. chloronotus,* Hodgs.; against which I do protest. I also have seen Hodgson's drawing referred to by Mr. Hume and could not come to such a conclusion. Hodgson's types of *chloronotus* have been identified by Blyth and others with *Reg. proregulus,* Pallas. The drawing referred to is one intended to represent the nest, which by the bye is that of an *Æthopyga,* and we have no evidence that Hodgson distinguished between his *Abrornis chloronotus* and *Reg. maculipennis,* or that he knew the latter species at all. Such an identification from this slightly coloured drawing cannot be admitted. Hodgson sometimes over-

* Stray Feathers, 1873, p. 494.
† Journ. As. Soc. Bengal, 1872, p. 163.
‡ Stray Feathers, 1873, p. 494.

coloured and sometimes under-coloured. Take his *Lophophanes dichrous:* the drawing is far too red, and it would be impossible to recognize the species intended from it. So also with his *Parus Œmodius :* it was this very faulty drawing, omitting the crest and the wing spots, that led me to describe *Lophophanes Humei* (J. A. S. B., 1873, p 57), which must henceforward stand as *Lophophanes Œmodius*, for Blyth made out that the type of *Parus Œmodius* was not a *Parus* but a *Lophophanes*. Many of Hodgson's drawings are very good, especially those in which he had evidently superintended the work and given minute details, but others, such as that of the supposed *Reg. maculipennis*, are insufficient for the determination of such birds as the *Phylloscopi*, which, as a rule, resemble each other so much in size and colour.

I also examined the specimen referred to by Mr. Blanford in J. A. S. B., 1872, p. 162, and found it to be *Reguloides maculipennis*, Blyth; as also was *Reguloides* sp.? mentioned on the following page of the same Journal.

BUDYTES FLAVA, Lin.

B. CINEREOCAPILLA, Savi.

B. MELANOCEPHALA, Bonaparte.

Under the term *Budytes viridis*, Scop. Lord Walden* makes great confusion. He says, "One example in winter plumage, olive green above, upper part of breast sulphur yellow, rest of under surface pure white; some of the ventral and under tail coverts dashed with sulphur yellow. Supercilium conspicuous, broad, and pure white. Agrees perfectly with examples from Continental India."

This bird is, of course, *Budytes flava*, the characteristic of which is the *broad* white supercilium. Again he says,† "*Motacilla flavescens*, Stephens, Gen. Zool. Aves. X, p. 559, is enumerated in the 'Hand list' by Mr. G. R. Gray, as a distinct species, with the habitats of the Moluccas, Celebes, Timor and Java, assigned. Stephens gave this title to Buffon's Bergeronette de l'ile de Timor Hist. Nat. V. p. 275. Buffon's bird belongs to that phase of plumage of *B. viridis*, (Gm.) in which the superciliary stripe is yellow, the upper plumage ash coloured, and the under yellow." When the male of *B. flava* has newly moulted in the spring, the supercilium is sometimes strongly tinged with bright yellow, as are the margins to the white wing-coverts and tertials; this yellow rapidly fades away leaving the feather pure white: the yellow tinge on the white wing margins is a regular occurrence, but that on the supercilium is accidental or, I should

* Trans. Zool. Soc., 1872, p. 65.

† In a memoir 'On the Birds of Celebes,' Trans. Zool. Soc. Lond., Vol. VIII, part 2, 1872, p. 65.

rather say, occasional and not specific. Of the many hundreds of examples examined by me, only three had this yellow bloom on the supercilium. Lord Walden, however, speaks of the bird as being *ash-coloured* above! The ash-coloured back in the field-wagtails pertains only to the young and, perhaps, to the female in winter plumage. When the supercilium is *yellow*, the back is *green* in *B. flava.* Stephens' bird was probably the female of *Budytes citreola*, Pallas or the male in autumnal plumage, for this species has a yellow supercilium and an ash-coloured back; which *B. flava*, *B. cinereocapilla*, and *B. melanocephala* certainly have not.

There are four distinct yellow field *Budytes* with olive green backs, and I note them, with short distinguishing characters of the mature male.

B. flava.	Grey head, broad white supercilium, grey and white cheeks.	Generallly distributed over the old world and northern half of the new.
B. cinereocapilla.	Dark grey head, supercilium absent or else very narrow and white; often only a half supercilium behind the eye; cheeks a dark slate colour or almost black. This dark cheek is the well marked peculiarity of the species.	Eastern Europe, India, and China.
B. melanocephala.	Pure black head, with very rarely indeed a supercilium, and then very narrow, like a thin white thread. I have twice seen examples with this thread-like supercilium. The black head is a good distinction.	Eastern Europe, India, and China.
B. Rayi.	Top of head yellowish olive, supercilium bright yellow, and cheeks yellow.	Western Europe, North-West Africa, and Central Asia.*

It will thus be seen that the colour of the cheek in summer is alone a sufficient criterion.

It seems inexplicable to me how so many good ornithologists have confounded these four very distinct species, and lumped them together as *B. flava* with varieties, or as *B. viridis* with varieties.

There are but two yellow-headed marsh wagtails found in all India, and, I believe, in all the world besides, viz. *Budytes calcaratus*, Hodgs.—with black back and yellow head, sometimes a greyish patch remaining on the lower back; and *Budytes citreola*, Pallas—with grey back and yellow head, also generally a crescentic black band above the shoulders at the hind part

* Two examples of this species, as also of *Anthus pratensis*, were lately obtained by Dr. Stoliczka in Yarkand.

of the lower neck, but this is sometimes absent, even when the bird is in full plumage. *B. citreoloides*, Hodgs. is identical with this latter species, and not with the former, as Mr. Hume supposes in 'Lahore to Yarkand.' Hodgson's drawing represents a yellow-headed wagtail with a grey back. The back feathers are always more or less changed when the head in spring becomes pure yellow; Hodgson's drawing thus shewing a uniform grey back with the yellow head, is clearly a representation of a male *B. citreola.* When the other species, *B. calcaratus*, Hodgs., attains the yellow head, the back is either blotched largely with jet-black or is entirely black. It is therefore an utter impossibility for Hodgson's *B. citreoloides* to have been the black backed bird.* *B. citreoloides*, Hodgs. is a synonym of *B. citreola*, Pallas, and as such should sink into disuse. Hodgson's drawing of *B. calcaratus* is lifesized, and represents the bird in winter plumage with yellow supercilium, olive cap, and grey back. In this plumage it closely resembles *B. citreola* in its winter plumage. It is *by the long tarsus alone* that I connect *B. calcaratus* with the black-backed bird. The tarsus of *B. citreola* never reaches the size given by Hodgson for *B. calcaratus;* both in the drawing and in the table of dimensions, the length of the tarsus given is that of the largest black-backed birds I have procured. In 'Lahore to Yarkand' Mr. Hume appears to consider Hodgson's description as inapplicable to the black-backed species; but I cannot see in what respect it does not suit. It should be remembered that Hodgson measured the tarsus from the sole of the foot, and not from the junction of the toes, the latter being the usual mode of measurement.

The females of all the six species I have noted, have their characteristics, but it would add too much to the length of this paper to introduce them now; enough to say that they abundantly confirm my view of the distinctness of each.

These wagtails can only be properly worked out by the field observer, and the confusion into which cabinet naturalists have thrown them is thus easily accounted for.

Motacilla Cashmiriensis, Brooks.

Is only *M. Hodgsoni*, Gray in full summer plumage. Having had abundant opportunities of again observing this bird up the valley of the Bhagaruttee, I am forced to the above conclusion.

I formerly thought that *M. Hodgsoni*, Gray and *M. personata*, Gould were identical, the former being the latter in breeding plumage: but having lately had the advantage of Mr. Mandelli's fine series of *M. Hodg-*

* Gould in his 'Birds of Asia' has misapplied the term to the black backed yellow headed Wagtail.

soni, shewing that the adult male retains its black back during the autumn and winter months, it is impossible to avoid the conclusion that the two species, though closely affined, are thoroughly distinct.

M. Hodgsoni may be described as a black-backed *M. personata.* Each species has the eye set in a diamond-shaped white patch, which even in young grey and white birds of the year is conspicuous; so that neither should ever be confounded with *M. luzoniensis* or *M. Dukhunensis.*

Old females of *Hodgsoni* have black backs like the males; but younger birds, as I take them to be, often have the back grey, but of a more dusky shade than that of *personata*, which has the back of a pure light grey. Some females of *Hodgsoni* have the grey clouded with black to a slight extent, especially on the upper portion of the back.

A parallel case of specific distinctness existing only in the colour of the back is that of *Budytes calcaratus*, Hodgson and *Budytes citreola*, Pallas; the former of which has a jet black back in the breeding season, while the latter has invariably a grey back, with generally a black half collar at the lower part of the hind neck during the breeding season. I refer to the males only, for the females are very similar to one another.

Motacilla Luzoniensis, Scop.

The western limit of this species appears to lie between Dinapore and Buxar, in the districts in which I have been placed. The old males, to a great extent, retain the black back during autumn and winter, and even the old females are somewhat patched and clouded with black at these seasons. The chin and throat is always white, and *the white band down the side of the neck*, as in *M. Dukhunensis*, is invariably present at all seasons. This white band communicates with the white surrounding the eye. In *M. personata*, the eye, at all seasons, is set in a diamond-shaped patch of white, which is bounded below, as well as above, by black; this white eye-patch has thus no communication with the white of the lower parts, and is the characteristic by which this species may at any time be easily known, when obtained in the plains.

Mr. Hume has pointed out to me that Dr. Jerdon's description of *M. Dukhunensis* is only applicable to *M. personata*, Gould, and this, as is proved by his appendix, was Dr. Jerdon's own conclusion; but in his description, the statement that "the neck all round is black" does not agree with another that in its winter dress it is barely distinguishable from *M. Luzoniensis. M. personata* is at all times conspicuously distinct from *M. Luzoniensis.* Dr. Jerdon's description of *M. Dukhunensis* is, however, not sufficiently definite to fix the species intended, neither is the original description by Sykes, except for the statement that "it very closely resembles *M. alba* of Europe, but differs in being of a light slate or cinereus, and in the wing coverts and secondaries being edged with broader white" (P. Z. S., 1832, p. 91).

ANTHUS AGILIS, Sykes.

Was said by Blyth to be apparently *Anthus trivialis*, Penn. (= *Anthus arboreus*, Bechst). In the original description, Sykes says, "found on open stony lands;" but I think it probable, as it is the only *Anthus* noted by him, that his *agilis* was either *Agrodroma campestris*, Lin. or *Corydalla rufula*, Vieill. These pipits do affect stony and waste lands, as does *Corydalla striolata*, Blyth, but neither of the tree-pipits do, least of all *P. maculatus*, Hodg.,* to which Sykes's term *agilis* has most unaccountably been applied: the most arboreal of all pipits certainly is never found on "open stony lands." I think it would be almost safe to conclude that Sykes's bird was one of the three I have named, viz. either *Ag. campestris* juv. with spotted breast or *C. rufula* or *C. striolata*. I am most inclined to the last. I am weary of hearing ornithologists speak of the green Chinese tree-pipit as *P. agilis*, Sykes, the application of the name to it being absurd.

ALAUDA DEVA, Sykes.

Spizalauda Deva Blyth.

I do not see any grounds whatever for separating the genus *Spizalauda* from *Alauda*, and I think the term should be abandoned. *Spizalauda simillima*, Hume is as true an *Alauda* in every respect, in colour of plumage, in voice, and in habits, as could be desired. It is rather small and this is all that can be said.

Sykes says of his *Alauda Deva*, that it is smaller than *A. Gulgula*, but *Alauda Malabarica*, which Mr. Hume would identify with *Alauda Deva*, is not smaller than *A. Gulgula*, but fully the same size, or if anything a larger and finer lark; Sykes's species is therefore the small one which Mr. Hume separated (J. A. S. B., 1870, p. 120) as *S. simillima;* and the last term becomes a synonym of *Alauda Deva*, Sykes. I have seen many of this last, including some brought by bird-catchers from localities well to the south and west, and there is but one species which is smaller than *gulgula*, and this is the true *Alauda Deva* of Sykes. The Khandalla large crested lark, *A. Malabarica* Scop., will stand as such till the contrary be shewn, and my *Alauda australis* of the Neilgherries (Stray Feathers, 1873, p. 486), which is a fine large non-crested rufous toned *Alauda*, will stand until an older name can be shewn as clearly pertaining to it.

* In J. A. S. B., 1873, p. 83, line 24, for "*never* strictly arboreal, read "*more* strictly arboreal."

ALAUDA DULCIVOX, Hodg.

Of the unfair identification of this species with *A. arvensis* of Europe, I shall say nothing more, but will leave those that have good eyes for form and colour to decide for themselves, when they have an opportunity of comparing specimens of each: I repeat that they are most thoroughly distinct, and that *A. arvensis* is *non-alpine* or *non-monticolous*. The colour and form of bill is different, the colour of the legs and feet is different, to say nothing of the different body plumage and almost total absence of rufous on the greater wing-coverts. There is the utmost difference that can be expected in birds of such similar plumage as larks.

CORVUS CULMINATUS, Sykes and C. INTERMEDIUS, Adams.

These two crows, though very similar in general appearance, are nevertheless quite distinct. As a rule the latter has a decidedly (*by fully an inch*) longer tail and is a bird of duller plumage. The voice of the hill bird, too, is notably different, being a much deeper toned and more hollow sounded croak. This great difference in the note strikes most observers on first going to the hills. For a time, I was inclined to believe with Mr. Hume in the identity of the two species, but having examined a good number of each and having paid great attention to the voices and manners, I am entirely convinced of their specific distinctness.

SCOLOPAX RUSTICOLA.

It was a mistake to include this bird among those that breed in the Cashmere Valley (J. A. S. B., 1872, p. 86). It breeds among the pines on the mountain sides, high up near the snows.

On the occurrence of a Superorbital chain of Bones in the Arboricolæ (Wood-partridges).—*By* James Wood-Mason *of Queen's College, Oxford.*

(Received April 20th; read March 4th, 1874.)

(With Plate II).

In his elaborate paper 'On the Osteology of the Gallinaceous Birds and Tinamous' read before the Linnean Society on November 25th, 1862, Professor W. Kitchen Parker announced the remarkable discovery, in *Tinamus robustus*, "of a whole row of super-orbital bones, the like of which must be sought for, not amongst birds, but in a group of creatures a long way down in the scale," *viz.*, in the Skinks and Blind-worms. Further on in the same paper, the presence of a similar chain of superorbitals in *Psophia crepitans*, "only in an enfeebled form," is mentioned. The same author, in a memoir 'On the Structure and Development of the Skull in the Ostrich Tribe' read before the Royal Society on March 9th, 1865, records the occurrence of a double row of these bones extending all along the superorbital margin from the lacrymal to the post-frontal process in *Tinamus variegatus*.

I have now to announce the occurrence of a similar chain of ossicles in four out of the eight recognized species of *Arboricola*, a genus of Indian Partridges, *viz.*, in *A. torqueola*, *atrogularis*, *rufogularis*, and *intermedia*; and I look forward with especial interest to the examination of skulls of the two of the remaining species which have been referred by some authors to the subgenus *Peloperdix*, and which inhabit the Tenasserim provinces and the Malay peninsula.

Mr. Parker has pointed out how in the Lapwing (*Vanellus*) the frontal in the young bird sends out square denticles of bony substance under and beyond the nasal gland, which coalesce with one another, with the lachrymal in front, and with post-frontal process behind, so as to form beyond the gland a secondary frontal margin, which acts as a smooth eave to the eyeball; and that the superorbital chain of bones in the Tinamou takes the place of this secondary frontal margin and the denticles in the Lapwing, the same end being attained by different means. But in the Arboricolas the arrangement is totally different: in them the margins of the combined frontals so far from being bevelled or scooped for the reception of the nasal gland are rather prominent and the internal edges of the ossicles composing the chain come into close relation of apposition with them.

I have examined a considerable number of species of Gallinaceous birds, small and great, including, by the kindness of my friend Major Godwin-Austen, a species of *Bambusicola*, but have hitherto failed to detect so much as a single grain of bone in the superorbital membrane of any one of them.

3.

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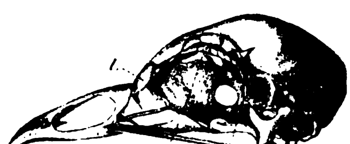

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2.

Jules Schaumburg Lith.

The *Arboricolas*, I may add in conclusion, differ from all in not having the temporal fossa bridged by bone, the zygomatic process of the squamosal being quite rudimental.

Explanation of Plate II.

Fig. 1. Upper view of skull of *Arboricola rufogularis*, nat. size.

Fig. 2. Side view of the same skull, nat. size.

Fig. 3. Upper view of skull of a young individual of the same species, nat. size.

Fig. 4. Side view of the same skull, nat. size.

Fig. 5. Upper view of skull of *Tinamus robustus*, magnified two diameters. (After Parker).

Sro. Superorbital chain of ossicles; *l.* lacrymal; *p. o.* postorbital process; *s. o. m.* unossified portion of superorbital membrane.

INDEX.

☞ Names of new genera and species have an asterisk (*) prefixed.

ADDITIONS AND ERRATA.

Page 46, 17 lines from top of page, *after* words "*D. elongata*, Miq.," *add* words "Fl. Ind. Bat. I /2. 12;" and 21 lines from above, *for* "t. 9293," *read* "t. 92—93."

Page 57, 8 lines from top of page, *after* words "slopes of," *add* word "the;" and *after* "Pegu" *add* "Yomah."

Page 61, 4 lines from top of page, *transfer* the passage "2. C. LINNÆANUS, (*Menispermum hirsutum* L. sp. pl. 1469 Roxb. Fl. Ind. III. 814; *Menispermum myosotoides*, L. l. c.; *Cocculus villosus*, DC. Syst. I. 525; Hf. and Th. Ind. Fl. I. 101).

HAB. Frequent in hedges, shrubberies, etc., around villages all over Pegu and Prome; also Ava. Fl. Jan. Febr.

3. C. INCANUS, Colebr. in Linn. Trans. XVII. 57; Scheff. Obs. Phyt. III. 76, t. 10. (*Pericampylus incanus*, Miers in Tayl. Ann. ser. 2. VII. 40 and Contr. Bot. III. 118; Hf. and Th. Ind. Fl. I. 102; *Menispermum villosum* Roxb. Fl. Ind. III. 812).

HAB. Frequent in savannahs, mixed and other deciduous forests all over Burmah from Chittagong, Ava, Pegu, and Martaban down to Tenasserim, up to 3000 ft. elevation. Fl. March," *to* the bottom of the following page.

Page 63, 3 lines from the bottom of the page, *for* "edition," *read* "issue;" and 5 lines from the bottom, *after* "t. 940," *add* "Jenk. Pl. Ind. 20. t. 19."

Page 67, 18 lines from top of the page, *for* "Roxb.," *read* "Rchb."

Page 74, 17 lines from top of page, *erase* the marks × × and *substitute* * *.

Page 76, 6 lines from bottom of page, *after* word "Seeds," *add* word "usually."

Page 85, 6 lines from top of page, *after* "257," *add* "(*C. biflorus*, Turcz. in Bull. Mox. 1863. 580)."

Page 103, 15 lines from top of page, *for* "*S. glutinosa*," *read* "*S. Mysurensis*."

Page 104, 4 lines from top of page, *restore* "*S. Mysurensis*, W. A.," and *reduce* "S. GLUTINOSA, Roxb. (non Cav.)" to a synonym; and 11 lines from top of page, *for* "ALBUTILON," *read* "ABUTILON."

Page 105, 3 lines from top of page, *for* "Capsules," *read* "Carpels."

Page 121, 8 lines from bottom of page, *after* "374," *add* "*W. longiramea*, Turcz. in Bull. Mosc. 1863, 571."

Page 125, 4 lines from top of page, *for* "*," *read* "×;" and 20 lines from the top, *for* "*G. scabrida*," *read* "*G. acuminata*."

Page 126, 16 lines from top of page, *substitute* "G. ACUMINATA, Tuss. in Ann. Mus. IV. 91. t. 48," and *reduce* "G. SCABRIDA, Wall" to a synonym; and 5 lines from the bottom, *for* "IV," *read* "1111."

Page 187, 17 lines from top of page, *after* "1/2," *add* "poll."

Page 206, 10 lines from top of page, *add* the words "Mr. Homfray of Port Blair has since informed me that this palm makes a trunk 8-12 ft. high, and that the leaves are there proportionally smaller. It is found also in the vicinity of Port Mouat."