

XX.—*On some New Species of Ficus from New Guinea.*—By GEORGE KING, M. B., LL. D., F. L. S., *Superintendent, Royal Botanic Garden, Calcutta.*

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Having been for some time engaged in the study of the Indo-Malayan species of *Ficus*, I have, in another place, suggested a new arrangement of the subordinate groups of which the genus is composed. Before proceeding to describe the new species from New Guinea which have recently come into my hands, it will be necessary to give a short outline of this new arrangement and of its morphological basis.

The flowers of the genus *Ficus* are collected in a hollow fleshy axis which forms a kind of flask, on the inner surface of which a number of flowers are arranged. The flowers at the bottom of the flask come to maturity first, those near its mouth being younger in point of development. These flower-bearing axes are called 'Figs' or 'Receptacles.' They vary in colour, form, size, and in the situation which they occupy on the plant. The hollow receptacle has walls of more or less fleshy texture, and its mouth is occupied by rows of bracts which, in the majority of cases, so interlock as practically to close it. The lower of these bracts often bend downwards into the cavity of the receptacle, curving round the upper flowers; the middle bracts are more or less horizontal in direction; while those towards the upper or outer part of the mouth project therefrom, so as to be visible externally and to form a more or less prominent apical umbilicus. In a few species, the mouth is surrounded externally by a more or less clearly defined annulus formed of coalesced bracts. So much for the receptacle. I may be permitted to quote the following description of the flowers contained in it from my forthcoming monograph on the Indo-Malayan and Chinese species of the genus, and from a paper sent to the Linnæan Society of London.

"The flowers, which are mostly unisexual, are situated on the inner walls of the receptacle. They may be either sessile or pedicillate. In some species they are separated from each other by scales or bracteoles, and in others by hairs, both of which appendages appear to be analogous to the *paleæ* that are found on the receptacles of many *Compositæ*. In other species the flowers lie close together, unseparated by any intervening appendages. Five kinds of flowers are found in the genus, *viz.*, male, pseudo-hermaphrodite, neuter, fertile female, and gall flowers. The structure of each of these is very simple. The male flowers consist of a perianth of from three to five pieces, which, although sometimes



united, are usually free. The perianth sometimes hardly covers the stamen or stamens; in other cases it is large, inflated, and completely envelopes the stamen. In some species the pieces of the perianth are thin and colourless, and not unfrequently hyaline; in others they are of a red or dark-brown colour and opaque. In quite half the Indo-Malayan species there is only a single stamen; in very many there are only two; while in only a few are there so many as three. In shape the anthers are for the most part ovate or elliptic, although some are very broad and almost rotund; they are always 2-celled and have sutural dehiscence. Some are sessile or nearly so, and in very few is the filament long. The attachment of the anther to the filament is innate in most species; in a few, however, it is adnate. In species with two stamens the filaments are often united for the whole or part of their length, leaving the anthers, however, free.

“Pseudo-hermaphrodite flowers occur in only a few species. Such flowers have a perianth like the male flowers, but along with the single stamen there is present in them a pistil with completely formed style and ovary. I have, however, never found one of these ovaries to contain a seed, but I have not unfrequently found one containing a larva.

“Neuter flowers are found only in the few species forming the section *Synoecia*. They are long-pedicillate, have a 3-leaved perianth, and are without any trace of either anther or pistil.

“Fertile female flowers have a perianth not very different from that of the males, but consisting in many cases of more pieces, and being more often gamophyllous. In the case where the pieces of the perianth are free, the individual pieces are sometimes rather easily detached, and are very apt to be confounded with the bracteoles of the receptacles in species where the latter exist. The perianth is usually much smaller than the mature achene, and covers the latter very incompletely or not all. In some cases where the perianth is gamophyllous it forms a small cup, which surrounds only the base of the ovary or its pedicel. It was in some such cases, where the perianth is hyaline, that Miquel was led to believe that none existed; and hence his statement about the perianth being absent in *Covellia*. The pistil may be sessile, but it is very often pedicillate; the ovary is more or less ovoid or obovoid, with a tendency to be emarginate on the side at which the style is attached. It contains a single pendulous ovule. The style is filiform, and is in most cases distinctly lateral or sub-terminal: it rarely springs from the apex of the ovary. In length the style usually greatly exceeds the ovary: it is usually smooth, but in a few species it is hairy. The stigma, which is papillose, varies in shape, being cylindric, clavate, peltate, or infundibuliform; and in a few cases it is flat. In many species it is obliquely



truncate, and in not a few bicrural. It is, however, often very difficult to determine the exact form of the stigma, from the fact that at an early stage the stigmas of the fertile female flowers of the same receptacles are joined together in a dense felted mass, from which it is nearly impossible to detach any individual in a state of entirety. After fertilisation, the ovary becomes developed into an achene which tends to be unilaterally emarginate (many achenes are very distinctly reniform), and the style becomes more lateral, or even basal. The ripe achene has a crustaceous pericarp of a pale yellow colour and with a more or less minutely tuberculate or undulate surface. External to the crustaceous coat, there is occasionally a glairy or viscid layer. The pericarp is never very thick, and sometimes it is conspicuously thin. On cutting the achene open the embryo is seen with a small amount of albumen. I have not, however, paid much attention to the relation of the albumen to the embryo. Not a few of the perfect female flowers fail to be fertilised. But the fact of the barrenness of such is not recognisable until the achene has been cut open, and they are found to contain no embryo. Externally these infertile achenes exactly resemble those containing embryos.

“ Besides the above four kinds of flowers, there occur, in all the species of *Ficus* which I have examined, a set of flowers which, adopting the name given to them by Count Solms-Laubach, I call *gall flowers*. My own name for these was originally *insect-attacked females*; but Count Solms-Laubach's name being much shorter and more suitable, I have adopted it. The existence of these gall flowers, as a separate and distinct kind of flower in this genus, was first made publicly known by the distinguished botanist just mentioned, in *Botanische Zeitung*, Nos. 33 to 36 for 1885. My own observations and inquiries on *Ficus* have been in progress since 1878, but on account of my unwillingness to publish anything until I had completed my research, I have been anticipated in the publication of the facts about gall flowers. The gall flowers in many respects resemble the fertile female flowers: they have in most cases a similar perianth, an ovary, and a style. When fully developed, they are recognised at a glance by their containing the larva of an insect, which can often be seen through the pericarp of the false achene into which the ovary develops. But whether the larva be visible or not, or whether it be present or not, the false achene of the gall flower may, in its later stages, be distinguished from the true achene of the fertilised ovary of the perfect or fertile female flower by being more often pedicellate, and by its shape being usually globular and rarely elliptic or reniform; by its surface being smooth, not minutely tubercular or undulate, and never viscid or glairy; and frequently also by the tense,



distended appearance of tough membranous wall (false pericarp). The style is, as a rule, much shorter and straighter than the style of the fertile female flower, and more terminal; and it has very frequently a dilated tubular apex which occupies the situation of the true stigma, but has often little or none of the viscid parenchyma characteristic of that organ. These peculiarities in the nature of the stigma and the shortness of the style are apparent in the gall flowers of many species from a very early stage. They are not consequences of the deposit of the egg of an insect in the ovary, but, as Count Solms-Laubach points out (*Bot. Zeitung*, l.c.), such original peculiarities in the style and stigma of the gall flower may rather determine the selection of it by the insect as the nidus for its egg; for in many of the species of *Blastophaga* and of some other Hymenopterous genera which visit figs, the ovi-positors are not long enough to reach down the longer and more curved styles of the perfect female flowers. There are, however, many species of *Ficus* (more especially in the group *Urostigma*) in which the gall and fertile female flowers are not characterised by any marked differences in the form of style and stigma, and it is only by cutting the ovaries open that the two can be distinguished.

“Now there is probably nothing in itself very remarkable in the mere occurrence in the genus of numerous flowers having the general form of females, which yet, by reason of certain peculiarities in their structure, are incapable of fertilisation by pollen and are practically barren, while at the same time their very structural defects fit them for becoming the nidus for the eggs of special insects. But when the manner in which these malformed female flowers are disposed in the receptacles is inquired into, it becomes clear that, through the interposition of insects, these malformed females play a most important part in the life-history of many species of the genus. In all the species, except those included in the section *Urostigma*, the gall flowers occupy the same receptacles as the males, while the fertile female flowers occupy different receptacles. In other words, the majority of the species have two distinct sets of receptacles—one set containing male and gall flowers, but no fertile female flowers, and another set containing only fertile female flowers without any trace of either male or gall flowers. The proportion of males to gall flowers in receptacles of the former kind varies. In all (excepting the *Urostigmas* just mentioned) it is the rule to find the males confined to a zone of greater or less width at the apex of the receptacle just under the scales which close its mouth. Sometimes this zone is very narrow indeed, and consists of only a single row of male flowers, and that row not always a complete one; the remaining part of the interior of the receptacle being occupied by gall flowers.



In by far the majority of cases these two kinds of receptacles, so physiologically distinct, are undistinguishable by external characters, and they are both borne by the same individual plant. They look exactly alike until one cuts them open and examines their contents. The most notorious of the few exceptions to this rule is the common eatable fig (*Ficus Carica*), in which species the male and gall flowers occupy elongated receptacles borne on one set of individual trees, while the fertile female flowers occupy more or less globular receptacles which are borne by a different set of trees. So different in appearance are the two kinds of receptacles in *F. Carica*, that the trees bearing them (although they have similar leaves) have almost from time immemorial been considered distinct species, known by distinct names—the former being called the Caprifig, the latter the Fig.

“In the majority of the gall flowers an insect deposits an egg, and many of them contain a larva which is easily seen through the coats of the false achene. The larva escapes into the cavity of the receptacle by cutting its way through those coats, and the fully developed winged insects are often to be found in considerable numbers in the cavity of the fig, the opening by which each escaped from the ovary in which it was developed being clearly visible. The perfect insects escape from the cavity of the receptacle into the open air by perforating a passage through the scales that close the mouth of the latter. The egg of the insect must in most cases be deposited in the ovary of the gall flower at a very early period; for, about the time at which the pupa is escaping from the ovary, the pollen of the anthers of the male flowers is only beginning to be shed. It is quite clear therefore that the synchronism of the two events—the escape of the insect and the maturity of the pollen—is an arrangement of much physiological significance. In the species of *Ficus* in which the arrangement just described obtains (and these are by far the majority), the perfect female flowers are contained in receptacles which are consecrated to themselves alone. In these receptacles the flowers are all perfect females. There is not a trace of a male or of a gall flower. These receptacles in many species are perfectly closed from a very early stage, and yet, in the majority of cases, every one of the ovaries of the females they enclose contains, when mature, a perfect embryo. The exact way in which these females are pollenised is a matter on which I cannot pretend to throw any light. I can only state the problem. The males are shut up from an early age with a number of females, the structure of whose organs is unfavourable to pollenisation. No pollen is produced by the males that are shut up with these females until all possibility of their becoming fertile with pollen has been precluded by the deposit within each of their



ovarial cavities of the egg of an insect. On the other hand, a number of perfectly formed females, *all well adapted for the reception of pollen*, are shut up together in a receptacle which contains neither male nor gall flowers, and to which it must from a very early stage be very difficult for pollen-bearing insects to get access. Yet each of the females situated in such apparently disadvantageous circumstances bears a well-formed embryo. No doubt the *Blastophaga* or other Hymenopterous insect developed in the gall flowers, in some way, conveys the pollen of the males to the perfect females imprisoned in the neighbouring receptacles. But although one can understand that it is to the advantage of the insect to enter the receptacle containing the gall flowers, since these afford it such a suitable nidus for its egg, and that the mature insect in escaping from these receptacles may, inadvertently carry along with it some of the pollen which the anthers are then shedding, yet it is difficult to understand how the pollen so removed is conveyed into the interior of the receptacle containing the perfect female flowers, and how these females are so universally fertilised by it.

“This arrangement, by which the receptacles are practically diæcious, obtains, as I have said, in a large proportion of the species of *Ficus*. There is, however, a group of species (*Urostigma*) in which it does not obtain, and in which male, fertile female, and gall flowers are contained in the same receptacle. In this group the difference in structure in the early stages between gall and fertile female flowers is very slight, and in some cases I could find no difference whatever. And even the ripe achenes of the fertile females are in many cases undistinguishable externally from the ovaries containing far advanced pupæ, and it is only by cutting them open that they can be recognised. As regards the relation in this group of *Urostigma* of the male flowers to the fertile female and gall flowers, there are two types of arrangement. In one set of species (of which *F. Bengalensis* and *tomentosa* are good examples) the male flowers are comparatively few in number, and are confined to a zone at the apex of the receptacle, just under the ostiolar scales; while in another set the male flowers are intermixed with the fertile female and gall flowers over the whole surface of the interior of the receptacle.

“A third small group (*Synæcia*) has neuter flowers mixed with the fertile females in one set of receptacles; while the other set of receptacles contain only male and gall flowers. And a fourth group (which I have named *Palæomorpha*) has male flowers which, in addition to an anther, contain an insect-attacked or gall pistil. These pseudo-hermaphrodite flowers are confined to the sub-ostiolar zone, the remainder of the receptacle being occupied by gall flowers: while perfect female



flowers occur in a distinct set of receptacles and are unaccompanied by any trace of male or gall flowers.

“It appears to me that, in the peculiarities in the structure and arrangement of the flowers which I have above described, the evolutionary history of the genus *Ficus* may to some extent be traced. I have therefore ventured to arrange the Indo-Malayan species into two great groups, and to divide the second of these great groups into three sub-groups, according to their presumed seniority. Believing that hermaphroditism is an archaic and primitive condition from which the genus is in process of delivery, I look on its persistence, even in an imperfect form, as an indication of age. I have therefore separated off the ten species in which I find it regularly to occur into a distinct group. Of this group pseudo-hermaphroditism is the diagnostic mark; and to the section which these ten species form I have given the name *Palæomorphe*. It is true that, in the whole of these ten species, the pseudo-hermaphrodite flowers are confined to the same receptacles as the gall flowers; while the perfect females are confined to a distinct set of receptacles in which there is no trace of either males or galls, and that the receptacles are thus practically dioecious. Still it appears to me that the persistence of the rudimentary female organ in the male flowers must be taken as indicating a more primitive condition than the enclosure in the same receptacle of strictly unisexual male and female flowers (the arrangement obtaining in *Urostigma*). These ten species being disposed of in a group by themselves, I have formed the remaining species of Indo-Malayan *Ficus* into a group characterised by unisexual flowers. And that group I have divided into three sub-groups, according as the receptacles are monœcious, pseudo-monœcious, or practically dioecious, the practically dioecious sub-group being again subdivided into sections which are founded on the number of the stamens and the situation of the receptacles. For five of the seven sections into which I have thus thrown the Indo-Malayan species, I have adopted, as sectional designations, words previously in use as sectional or subgeneric names. For the first section, as already stated, I have invented a new name, which indicates what I believe to be its position in the evolution of the genus, and for the seventh I have also invented a name, indicating its juniority in point of evolution. The arrangement is as follows:—

**GROUP I.—PSEUDO-HERMAPHRODITE**; male flowers with 1 stamen and a rudimentary pistil.

Pseudo-hermaphrodite flowers and gall

flowers in one set of receptacles:

fertile female flowers in another set *Palæomorphe*.

**GROUP II.—UNISEXUAL OR ASEXUAL**; male flowers without rudimentary pistils.



SUB-GROUP I.—Male, gall, and fertile female flowers on the same receptacle ... *Urostigma*.

SUB-GROUP II.—Flowers unisexual or neuter: male and gall flowers in one set of receptacles, fertile female and neuter flowers in another set ..... *Synæcia*.

SUB-GROUP III.—Flowers unisexual: male and gall flowers in one set of receptacles, fertile female flowers only in another set—

A.—Flower monandrous—

α, Receptacles chiefly axillary ..... *Sycidium*.

β, Receptacles mostly in fascicles from stem and branches ..... *Covellia*.

B.—Flowers di-, rarely triandrous—

α, Receptacles mostly axillary ..... *Eusyce*.

β, Receptacles mostly in fascicles from stem and branches ..... *Neomorphe*.

Amongst the new species which it is the chief object of this paper to describe there are none belonging to the sections *Palæomorphe* or *Neomorphe*. The species are as follows:—

UROSTIGMA.—Male, fertile female, and gall flowers in the same receptacle; stamen usually 1; stigma elongate, usually acute; receptacles in the axils of the leaves or of the scars of fallen leaves, tribracteate at the base; leaves alternate, entire, coriaceous, or sub-coriaceous, rarely membranous; usually trees or powerful climbers; epiphytal at least in early life.

*Ficus hesperidiiformis*, King; a tree, glabrous in all parts except the stipules which are minutely tomentose externally; young branches hollow, thick, marked with annular scars; leaves coriaceous, alternate, broadly elliptic-oblong, gradually tapering towards the apex which ends in a short rather blunt point, the base rounded, edges entire; lateral primary nerves very numerous (40 or 50 pairs) running nearly at right angles from the thick prominent midrib and anastomosing about .1 in. from the edge, secondary nerves and reticulations minute but distinct, the petiole from  $\frac{1}{3}$  to  $\frac{1}{2}$  as long as the blade; stipules very large, coloured, convolute, minutely tomentose on the outer, smooth on the inner surface;



length of blade and of stipules 6 to 9 in., petioles 2·5 in. to 4·5 in.; receptacles large, axillary, solitary, pedunculate, globose, smooth, apparently without basal bracts, about 1·5 in. in diam., the walls very thick; male flowers numerous, pedicellate, anther single, sub-sessile, ovoid, its walls thick and cartilaginous, the dehiscence lateral, perianth gamophyllous with 3 oblong blunt segments; gall flowers with hard, crustaceous, 3-sided ovary, thick short pedicel, and no perianth other than the long, linear, subulate scales which spring from the walls of the receptacle between the flowers; fertile female flowers not seen.

New Guinea; H. O. Forbes, No. 737.

The material in my possession is not very abundant, and I have not had the advantage of seeing Mr. Forbes's field notes. I presume this is a tree. The leaves and stipules at once recall to mind those of *F. elastica*. But the leaves of this are larger and the stipules are tomentose externally. The receptacles are quite different from those of *elastica*, being greatly larger and of a globular, not an ovoid, shape. When dry, the receptacles a good deal resemble a small orange.

*Ficus Edelfeltii*, King; a tree, the bark of the young shoots pale and slightly puberulous, all the other parts glabrous except the midribs of the leaves and the receptacles; leaves alternate, thinly coriaceous, shortly petiolate, from oblong to obovate-elliptic, gradually narrowed to the rounded 5-nerved base, the apex rather suddenly contracted to a short blunt acumen, the edges entire and slightly undulate; primary lateral nerves about 9 pairs, prominent on the lower surface and forming bold intramarginal arches, the midrib prominent, sparsely adpressed-pubescent; the rest of the lower surface glabrous and shining, the minor nerves and reticulations strongly marked; upper surface dull, darker than the lower; length of blade 6 to 8 inches, width 3 to 3·25 in.; petioles ·5 in. long: stipules slightly shorter than the petiole, lanceolate, convolute; receptacles axillary, in pairs, pedunculate, globular, with a projecting cylindric pubescent umbilicus, the sides pubescent when young, nearly glabrous when adult, from ·6 in. to ·75 in. in diam., basal bracts 3, small, reflexed; peduncle about ·1 in. long, tomentose; male flowers only near the mouth of the receptacle, sessile, the stamen elliptic, on a short thick filament, perianth of 5 narrowly semi-lunar pieces; gall flowers with a globular smooth, thin, naked ovary and a short lateral style, the perianth like that of the male: fertile female flower with an ovoid, rather flattened, minutely tuberculate achene, and a filiform lateral style much longer than the ovary, the stigma triangular, perianth of 4 broadly semi-lunar pieces.

New Guinea, H. O. Forbes, No. 59, and probably also 409, of which I have not complete specimens.



In foliage this species much resembles the Indian *F. nervosa*, Heyne; but the receptacles of this are much larger. Its nearest ally is, however, *F. pubinervis*, var. *Teysmanni*, which it almost exactly resembles in the form, texture, and nervation of its leaves. The flowers, however, of the two differ, and I have no doubt they are distinct species.

*Ficus Lawesii*, King; a tree, all its parts quite glabrous, the bark of the young shoots pale and shining; leaves petiolate, thickly membranous, ovate-oblong or narrowly elliptic, entire, the base rounded 3-nerved, the apex gradually narrowed to a very short blunt point; lateral primary nerves diverging from the bold midrib at a wide angle, about 10 pairs, not very prominent on either surface, the reticulations small and rather distinct on the lower surface; both surfaces quite smooth but rather dull when dry; length of blade 5 to 6 inches, width 2.5 in.; petiole 1 in. to 1.25 in.; stipules narrowly lanceolate, convolute, rather more than half as long as the petiole; receptacles crowded near the ends of the branches, in pairs, sessile, cylindrico-globose, .5 in. in diam., contracted at the base into a short thick pseudo-stalk, umbilicus composed of 3 large, thick smooth triangular scales, the sides smooth; basal bracts coalescing into an irregular ring: gall flowers sessile, the ovary prismatic, conical, smooth, style and stigma absent: male and fertile female flowers unknown.

New Guinea: H. O. Forbes, No. 85. From its general *facies*, I have no doubt that this is a *Urostigma* near *nervosa*. The receptacles, however, in the only two specimens I have seen, are diseased; and only the gall flowers can be distinguished.

I have named this after the Rev. W. G. Lawes, one of the devoted band of missionaries settled on the south-eastern coast of N. Guinea who have done so much in the way of collecting.

*Ficus casearioides*, King; a glabrous tree, the leaves on long petioles, thinly coriaceous, alternate, entire, broadly ovate-elliptic, tapering much to either end, the base acute, 3-nerved, the apex suddenly and shortly triangular-acuminate; lateral primary nerves 8 to 10 pairs, nearly at right angles to the midrib and like it strongly marked on the under surface, which is minutely tuberculate-tesselate; length of blade 5 to 6.5 in., breadth 2.75 in. to 3.25 in., petiole 1.5 in.; stipules lanceolate sub-convolute, .6 in. long; receptacles axillary, in pairs, on long slender peduncles, .5 in. in diam., depressed globular with a slight stalk-like construction at the base, smooth, basal bracts 3, minute; peduncles .75 in. long: male flowers sessile, the single anther broadly ovate, sub-sessile; the perianth of 3 obovate pieces: gall flowers sub-sessile or pedicillate, the ovary smooth with thick crustaceous walls, the style short, lateral; the stigma infundibuliform; perianth of 4 or 5 oblong pieces which closely



invest the ovary; female flowers like the galls but with a shorter more globose ovary and a longer style: all three kinds in the same receptacle.

New Guinea, H. O. Forbes, No. 568.

The leaves of this a good deal resemble those of *F. casearia*, Mull., but the structure of the flowers is different. The affinities of this in the section *Urostigma* are with *nervosa*.

SYNOECIA.—Flowers unisexual or neuter: male flowers with 1 stamen: male and gall flowers in one set of receptacles, fertile female and neuter flowers in another set; climbers with large coloured receptacles, the leaves tessellate beneath.

*Ficus Scratchleyana*, King; scandent, glabrous except the receptacles which are minutely sub-tomentose; leaves petiolate, coriaceous, entire, narrowly elliptic-oblong, gradually tapering to either end, the base minutely cordate, 3-nerved; the apex with a short blunt point; under surface tessellate; primary lateral nerves 5 or 6 pairs, prominent beneath, as is the midrib; length of blade 5 to 7 in.; width 1.75 in. to 2.25 in.; petioles 1 in. to 1.5 in. long; stipules subulate, convolute, about .5 in. long.; receptacles axillary, solitary, pedunculate, ovoid-globose, minutely sub-tomentose, with a prominent umbilicus, about 1 inch in diam., basal bracts 3, small; fertile female flowers pedicillate, the perianth of 4 linear pieces, ovary ovoid-elliptic, the style lateral; stigma large, bicrural when young, truncate when adult from the absorption of the arms; neuter flowers mixed with the females all over the receptacle, pedicillate, the perianth of 4 lanceolate pieces: receptacles containing male and gall flowers not seen.

New Guinea, H. O. Forbes, No. 900.

This is well distinct from any other species of this group. Its nearest ally is *F. apiocarpa*, Miq.

SYCIDIUM.—Flowers unisexual: male and gall flowers in one set of receptacles; fertile female flowers in a distinct set of receptacles; male flowers with 1 stamen (sometimes 2). Leaves alternate; receptacles small, axillary, more or less scabrid (a few have receptacles in fascicles from the stem); shrubs, small trees or climbers; rarely epiphytal.

*Ficus Armiti*, King: a climber; the young shoots covered with short, buff-coloured tomentum; leaves alternate, shortly petiolate, membranous, ovate-lanceolate, with a long acuminate apex, the base rounded or sub-cordate 5 to 7-nerved, the edges entire; primary lateral nerves 5 to 7 pairs, diverging from the midrib at rather a wide angle, lower surface minutely tuberculate, hispid especially on the midrib and nerves, the longer hairs with black enlarged bases; upper surface scabrid, the midrib minutely hispid; length of blade 2.5 in. to 3.;



breadth 1·25 in.; petioles ·2 in. long, tomentose; stipules, 2 to each leaf, subulate, rather longer than the petioles, tomentose at first, but ultimately glabrous; receptacles axillary, solitary, pedunculate, sub-globular, with rather a prominent umbilicus, shortly, hispid-tomentose when young, glabrescent when mature, ·2 in. to ·25 in. in diam.; basal bracts none, but a few irregular broad fleshy bracts along the sides; peduncles slender, about ·2 in. long, tomentose; male flowers numerous near the mouth of the receptacle, the perianth of 3 lanceolate pieces; anther single, broadly ovate, on a long stout filament; gall flowers with a pedicillate gamophyllous perianth which is deeply cleft into 4 linear curving lobes which embrace the ovoid, smooth, shining ovary: style lateral, from near the apex of, and half as long as, the ovary; stigma infundibuliform; female flowers unknown.

New Guinea; H. O. Forbes, No. 609. This species approaches *F. ampelas*, Burm., but its leaves are more inclined to be cordate at the base and acuminate at the apex, and they are less scabrous and more hairy on the under surface; while the receptacles are larger, more hairy when young, and on longer peduncles, than in that species.

I have named this after Mr. Armit, of the *Argus* Expedition for the exploration of New Guinea.

COVELLIA.—Flowers unisexual; male flowers in the same receptacles as the gall flowers, monandrous, the perianth of 3 or 4 distinct pieces: female flowers in separate receptacles from the males and galls, pedunculate or sessile, the perianth gamophyllous, much shorter than the ovary, or wanting, (rarely consisting of 4 or 5 pieces); the receptacles on long sub-aphyllous branches issuing from near the base of the stem, often sub-hypogæal; or on shortened branchlets (tubercles) from the stem and larger branches; or axillary: shrubs or trees, never epiphytes or climbers.

*Ficus Miquelii*, King: *F. caulocarpa*, Miq. in Ann. Mus. Lugd. Bat. iii, 235, 297 (not *Urostigma caulocarpa*, Miq. in Lond. Journ. Bot. VI, 568); *F. fistulosa*, Kurz (not of Reinw.), Forest Flora B. Burmah, II, p. 459, (partly): a tree, the young branches adpressed-strigose; leaves alternate or sub-opposite, membranous, obovate-oblong or oblanceolate, the apex suddenly contracted into a narrow tail about 1 inch long, edges entire, base much narrowed 3-nerved; lateral primary nerves 6 to 8 pairs forming an obtuse angle with the midrib; both surfaces pubescent when young, becoming when adult almost glabrous; length of blade 4·5 to 8 inches; petioles from ·3 to ·5 in.; stipules lanceolate, pubescent externally, ·35 in. long; receptacles borne on rather large, panicled, scurfy, shortly bracteolate branches, which issue from the stem, pedunculate, depressed-globular, pubescent, greenish when ripe and with



pale stripes, about .75 in. across; umbilical scales numerous, rather broad; basal bracts 3, ovate-acute; peduncles .75 in. long; male flowers only near the ostiole, sessile, the perianth inflated, of three broadly ovate much imbricate pieces; anther broadly ovate, its apex emarginate, sub-sessile; gall flowers sub-sessile or long-pedicillate, without perianth, the ovary ovoid-globose, smooth; style short, lateral; stigma tubular; fertile female flowers without perianth, pedicillate, the achene obovoid, minutely tuberculate; style as long as ovary, lateral; stigma, cylindric. Celebes, De Vriese; Singapore, King; Sumatra, Beccari; (Becc. Herb, P. S. Nos. 544, 631, 761); Perak, King's Collector, Nos. 1883, 955; Burmah, Kurz, No. 1520, 3145; New Guinea, Forbes, No. 903.

This species is allied to *F. botryocarpa*, Miq. by the short, much branched receptacular panicles. This is the plant which Miquel described as *Covellia caulocarpa*; but as he had already described a *Urostigma caulocarpa*, it became necessary to find a new name for this, and I have taken the opportunity of re-naming it after that distinguished botanist.

*Ficus Chalmersii*, King; a tree, the young shoots slightly swollen at the nodes, the bark dark brown with short pale adpressed hispid hairs: leaves alternate, thickly membranous, ovate-lanceolate to ovate-oblong, tapering gradually to the slightly unequal, bluntish or sub-acute, 3-nerved base, and to the sharply, but shortly acuminate, apex; the edges entire or obscurely and remotely sub-serrate; primary lateral nerves about 7 pairs, minutely adpressed-hispid on both surfaces; the remainder of the lower surface of the leaf glabrous, of the upper surface minutely adpressed-hispid; length of blade 5 or 6 inches; petiole about .5 in. long, adpressed-hispid; stipules, in pairs, lanceolate, glabrous except a few stiff hairs near the base externally, .5 in. long; receptacles on short woody racemes from the stem and larger branches, pedunculate, in pairs, when young broadly pyriform with concave apex and much depressed umbilicus, smooth, .75 in. or upwards in diam.; basal bracts 3, broadly triangular, united into a cup; peduncle thick, about .25 in. long; female flowers (when young) narrowly ovoid-elliptic, the style short, thick, terminal, with a dilated discoid tubular stigma; the perianth gamophyllous, half as long as the ovary and closely applied to it; ripe female, male and gall flowers unknown.

New Guinea; H. O. Forbes, No. 100. A species near *brachiata*, King, but not so glabrous, and with its receptacles borne on much shorter branches than in that species.

Named after the Rev. J. Chalmers, the intrepid Missionary explorer of New Guinea.

*Ficus Bernaysii*, King: a tree? the young shoots fulvous-tomen-



tose: leaves alternate, shortly petiolate, membranous, inequilateral, obovate-elliptic, tapering gradually from above the middle to the bluntnish, very unequal, obscurely 5-nerved, base, and rather suddenly to the shortly acuminate apex; the edges minutely serrate; the whole of the under surface shortly fulvous-tomentose; primary lateral nerves 7 pairs; upper surface shortly adpressed-hispid, tomentose on the midrib and nerves; length of blade about 7 inches, petioles under .5 in.; stipules tomentose externally, glabrous internally, convolute, .5 in. long; receptacles on long peduncles, in short crowded panicles, from the stem and larger branches, puberulous, sub-globose, about .25 in. in diam., contracted at the very base into a short pseudo-stalk, at the junction of which with the peduncle proper are 3 small triangular basal bracts: peduncle proper nearly .5 in. long: young female flowers with a flattish ovoid, smooth, ovary; the style nearly as long as the ovary, lateral, curved, hairy; the stigma cylindric; perianth gamophyllous, very short, covering only the stalk of the ovary; ripe female, male and gall flowers unknown.

New Guinea; H. O. Forbes, No. 625. A species which, in the form and arrangement of its receptacles, resembles *F. condensata*, King, and in its leaves approaches *stipata*, King, *fasciculata*, King, and *Forbesii*, King.

Named in honour of Mr. L. Bernays, of Brisbane, whose efforts for the exploration of New Guinea, and for the development of his own Colony of Queensland are so well-known.

**EUSYCE.**—Flowers unisexual, male and gall flowers in one set of receptacles, fertile female flowers in a distinct set of receptacles; male flowers with 2 stamens; receptacles small, axillary; scandent or erect shrubs or small trees, rarely epiphytal; the leaves alternate, softly hairy or glabrous, not scabrid or hispid.

*Ficus Pantoniana*, King; a glabrous climber; leaves alternate, shortly petiolate, coriaceous, almost exactly oval or ovate-oblong, entire, the apex slightly acute, the base rounded or sub-cordate 3-nerved; primary lateral nerves 4 pairs, rather prominent on the lower surface, which has wide obscurely tessellate reticulations; length of blade 3 or 4 inches, width 1.5 in. to 2 in.; petiole rather under .5 in.; stipules ovate-acute, glabrous, .3 in. long, receptacles in pairs from the axils of the leaves, but mostly from the scars of fallen leaves, smooth, globular, .4 in. in diam. produced at the base into a pseudo-stalk nearly .5 in. long, at the junction of which with the peduncle proper are 3 minute bracts; female flowers pedicillate, the perianth deeply 4-cleft, the lobes shorter than the ovate-oblong, smooth, pale-edged, ovary: style thick, lateral; stigma widely infundibuliform: male and gall flowers not seen.

New Guinea, H. O. Forbes, No. 185. I have not seen the recep-



acles of this which contain the male and gall flowers; but I put it into this section with some confidence from its resemblance, in externals as well as in the structure of the female flowers, to *F. disticha*, Bl.

I have named it in honour of Mr. J. A. Panton, a distinguished Australian explorer.

*Ficus Baeuerleni*, King: scandent, the young shoots puberulous; leaves coriaceous, shortly petiolate, ovate-oblong or elliptic-lanceolate, the base rounded or subcordate 5-nerved (2 of the nerves minute), the apex gradually narrowed to a short point, the edges entire; primary lateral nerves 4 or 5 pairs, very bold (as is the midrib) on the under surface which is uniformly covered with very short soft brown tomentum; upper surface minutely tuberculate; length of blade about 7 inches, petiole .4 in.; stipules convolute, pilose externally, rather longer than the petioles; receptacles axillary, pedunculate, solitary or in pairs, depressed-globose, nearly 1 inch in diam., contracted at the base into a short pseudo-stalk, at the junction of which with the peduncle proper are 3 broadly triangular basal bracts; peduncle proper .25 in. long, tomentose; female flowers with a perianth of 4 distinct fleshy pieces which are shorter than the narrowly ovoid, smooth, ovary; style slender terminal; stigma halbert-shaped; male and gall flowers not seen.

New Guinea; H. O. Forbes, No. 378.

This has a general resemblance to *F. recurva*, Bl., in the form and venation of its leaves and in the perianth of the female flowers. It is, however, well distinct by the larger size of all its parts, but especially of its receptacles which are ten times as large as those of *recurva*, besides being pedunculate and of a different shape. This also resembles *lasiocarpa*, Miq.

I have named this after M. Baeuerlen, of the expedition sent by the Geographic Society of Australasia for the exploration of New Guinea.

*Ficus duriuscula*, King, Monog. Indo-Malayan and Chinese *Ficus*; a tree, all parts glabrous but rather harsh and sub-scabrid; leaves petiolate, membranous, elliptic narrowed to each end, or elliptic-lanceolate, the apex rather shortly acuminate, the edges undulate sub-crenate, base boldly 3-nerved biglandular; primary lateral nerves 4 to 6 pairs, thin but strong, as are the midrib and secondary nerves; reticulations minute, very distinct on the lower surface; both surfaces glabrous, the lower harsh to the touch; length of blade 5 to 10 inches; petioles swollen at either extremity, varying in length from .5 in. to 1 inch; stipules lanceolate, glabrous, .25 in. long; receptacles axillary or in fascicles of from 3 to 6, from small broad flat ebracteate tubercles from the stem and larger branches, pedunculate, globose, their sides slightly ridged towards the sub-umbonate apex, glabrous, muriculate-scabrid, .5 in. across,



base slightly constricted, ebracteate; peduncle thin, .4 in. to .8 in. long, with a few small scattered bracteoles, scabrid; male flowers with 2 stamens and a 5 or 6-cleft hairy perianth; gall flowers with a perianth similar in shape but not hairy, the ovary ovoid, the style short, lateral; fertile female flowers with the achene ovoid, smooth, mucilaginous externally when ripe; the style lateral, longer than the ovary, curved; the stigma clavate; the perianth as in the gall flower.

New Guinea, (Soron) Sig. Beccari (Herb. Becc. P. B., No. 188); H. O. Forbes, No. 765.

A species allied to the Australian *F. magnifolia*, Mull. and to *Madurensis*, Miq. but with shorter petioles and more muricate receptacles. It also comes near *brevicuspis*, Miq., but its leaves are not obovate and their bases are not cordate as in that species; they are moreover longer, more pointed, and have shorter petioles. This also resembles *F. balica*, Miq. and *F. copiosa*, Steud. This, however, has two stamens, while the majority of those just mentioned have but one. The receptacles in Forbes's specimens are axillary and are more boldly muricate than in Beccari's No. 188: the leaves are also rather longer. When better material shall be forthcoming, it may be possible to separate these two forms specifically. At present I include them under one species.

*Ficus Odoardi*, King: Monogr. Indo-Mal. and Chinese *Ficus*; a tree, the young shoots covered with brown tomentum, the leaves oblong-elliptic, slightly inequilateral, gradually narrowed upwards to the shortly acuminate apex, the edges entire; the base broad, rounded, very slightly emarginate, 3-nerved; primary lateral nerves 5 pairs, prominent on the lower surface which is pretty uniformly hispid-pilose; upper surface slightly harsh and with some scattered stiff hairs especially on the nerves, the midrib minutely tomentose; length of blade from 6 to 9 inches; petiole about .3 in., tomentose; stipules ovate-acuminate, tomentose on the outer, glabrous on the inner, surface, .6 in. long; receptacles pedunculate, in pairs or solitary, axillary, 1 inch and upwards in diam., sub-globose, with conical umbonate apex and broad concave base, the sides rough, minutely tuberculate and deciduously hispid-pubescent or tomentose; the umbilicus minute, closed by stiff yellow hairs, and surrounded at some distance by a wavy annulus; basal bracts none; diameter, 1.25 in.; peduncles stout, clothed, like the receptacles, with deciduous tomentum, .3 in. long; male flowers pedicillate, large, occupying the upper half of the receptacles with the gall flowers; stamens 2, anthers linear, apiculate; perianth of 4 pieces, of which 2 are as long as and 2 are shorter than the stamens: gall flowers smaller, and on shorter pedicels, than the males, the perianth of 4 distinct pieces, the achene globular; style terminal, stigma slightly dilated: fertile female flowers not known.



New Guinea; Beccari, (P. P. No. 937); H. O. Forbes, No. 830. Named after Signor Odoardo Beccari, of Florence, the distinguished Malayan Explorer and Botanist.

*Ficus rhizophoraephylla*, King: scandent, all parts glabrous, the leaves thinly coriaceous, on long petioles, narrowly elliptic, tapering equally to either end, the edges entire cartilaginous and slightly recurved when dry, the midrib keeled and very prominent on the under surface; primary lateral nerves 12 pairs or upwards, sub-horizontal, scarcely visible on either surface; under surface minutely tessellate, dull; upper surface very smooth, shining; length of blade 3·5 in, breadth 1·5 in.; petiole 1·3 to 1·8 in. long: stipules linear-lanceolate, glabrous, as long as, or longer than, the petioles; receptacles crowded near the apices of the branches, in pairs, shortly pedicillate, globular, very minutely tuberculate, ·25 in. in diam.; female flowers on strong cartilaginous prismatic peduncles thicker than the prismatico-conical smooth ovaries; style from the base of the ovary which it slightly exceeds in length, straight, erect; perianth of 3 linear pieces which rise from the margin of the peduncle: male and gall flowers unknown.

New Guinea: H. O. Forbes, No. 578.

Without having seen its male and gall flowers, I put this species without hesitation into the section *Eusyce*, on account of its resemblance to *F. oleaefolia*, King, a species from Sumatra which has leaves very like this in texture and venation, but is smaller in all its parts and especially in its stipules. A farther indication of affinity is found in the fact that the gall flowers of *oleaefolia* and the fertile females of this species have similar prismatic ovaries. This in foliage also resembles the Australian *F. eugenoides*, Mull., which however, has very different female flowers, and which moreover is monocious and falls into the section *Urostigma*. The leaves of this are of a pale greenish yellow when dry; in shape and venation they much resemble those of *Rhizophora conjugata*, Linn.

*Ficus pauper*, King, Monogr. Indo-Mal. and Chinese *Ficus*; leaves membranous, petiolate, slightly inequilateral, lanceolate or ovate-lanceolate, the apex acute, the edges entire, narrowed from below the midrib to the obscurely 3-nerved base; lateral primary nerves about 6 to 8 pairs diverging from the midrib at rather a wide angle and, like the midrib, prominent beneath; midrib with a few scattered adpressed hairs; upper surface glabrous; length of blade 1·5 in. to 2 inches; petiole ·3 in. long, adpressed-strigose beneath; stipules persistent, scarious, deciduously sericeous, ovate-acuminate, ·35 in. long; receptacles pedunculate, in pairs, axillary when young, globose, slightly constricted at the base, sparsely strigose, the umbilicus large and prominent; basal bracts 3,



broadly ovate, blunt, puberulous; peduncle .1 in. long, densely puberulous; ripe receptacles unknown; male flowers with 2 nearly sessile anthers and a perianth of three distinct pieces; gall flowers with sub-globular smooth ovary, short thick lateral style and truncate stigma; female flowers unknown.

New Guinea; Fly River, No. 49, D'Albertis. This is apparently a shrub or small tree. It approaches *F. erecta*, Thunbg.; but is distinguished from that species by its smaller leaves which have more numerous and more horizontal primary lateral nerves than those of *erecta*; and by its adpressed strigose much smaller receptacles.

*Ficus soronensis*, King, Monogr. Indo-Mal. and Chinese *Ficus*; young parts puberulous; leaves narrowly elliptic, tapering to either end, the apex shortly acuminate; the base acute, 3-nerved; the edges entire; primary lateral nerves 3 or 4 pairs, not very prominent; under surface sub-scabrid from numerous minute black tubercles, the reticulations open and rather distinct; length of blade 2 to 4 inches; petioles .3 in. long; stipules lanceolate, scarious, puberulous, .4 in. long, persistent; receptacles in pairs from the axils of the leaves or of scars of fallen leaves, pedunculate, globular, sub-scabrid, minutely tuberculate, the umbilicus prominent; basal bracts none, but a few verruciform bracts on the sides of the receptacle; peduncles with one or two bracteoles, .15 in. long; female florets sessile or pedicillate, perianth of 3 or 4 pieces; achene sub-trigonous, slightly hairy near the apex, style lateral, stigma cylindric truncate; male and gall flowers not seen.

New Guinea, Soron, Beccari's Herb, P. P. No. 458. This comes near some of the forms of *F. erecta*, Thunbg., but differs in having the under surface of the leaves more tuberculate and much smaller receptacles. It is not, however, far removed from *erecta*.

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King, George. 1886. "XX.—On Some New Species of Ficus from New Guinea." *The journal of the Asiatic Society of Bengal* 55(IV), 394–411.

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