characters are rather unstable in this species, and an examination of the co-type specimens has convinced the writer that *P. nigrocinctum*, Chr. represents the typical *P. superficiale*, Bl.

The synonymy and the Chinese specimens examined by the writer are given below :—

P. superficiale, Bl. Fl. Jav. p. 136, tab. lvi, fig. 1 (1828).

Syn. :—*P. superficiale*, Hook. Sp. Fil. v, p. 71, part. ; Clarke, Ferns of N. Ind., p. 557, excl. var.

P. brachylepis, Bak. in Gard. Chron. n. ser. xiv, p. 494 (1880).

P. normale var. *sumatranum*, Bak. in Journ. Bot. 1880, p. 215.

P. nigrocinctum, Christ in Bull. Herb. Boiss. vi, p. 874 (1898).

CHINA. Szechwan : Mt. Omei (Faber, n. 1065) ; Yunnan : Mengtsz, rocks above the Red River, at 5000 ft. (Hancock, n. 166), limestone precipices at 8000 ft. (Henry, n. 106), S.W. mts. 7000 ft. (Henry, n. 9264), wooded cliff, 8000 ft. (Henry, n. 11,454), S.E. mts., 6000 ft., on tree (Henry, n. 11,454A) ; Szemao, W. mts., 5000 ft., on rock (Henry, n. 9264C).

With regard to the specimen recorded as *P. normale* var. *sumatranum* from Formosa, see under *P. Buergerianum*.

23. **P. Steerei,** Harrington.

So far as the writer is aware, this fern seems to be of comparatively rare occurrence. It was first described in 1877 from Formosa as *P. Steerei* ; subsequently, in 1891, from Tonkin as *P. tonkinense* ; and finally, in the next year, again from Formosa under the name of *P. Playfairii*.

The very thick, fleshy, broadly oblanceolate, sessile frond with numerous minute round sori, is very characteristic of this species, and immediately distinguishes it from its allied species.

The full synonymy and the examined specimens are as under :—

P. Steerei, Harr. in Journ. Linn. Soc. xvi, p. 32 (1877).

Syn. :—*P. tonkinense*, Bak. in Journ. Bot. 1890, p. 266.

P. Playfairii, Bak. in Ann. Bot. v, p. 474 (1891).

LUZON. Castillo (Loher, n. 867).

FORMOSA. Apes Hill, Takow (Henry, s.n., Steere, 1876, Playfair, n. 383).

TONKIN. " Tankenin, près de Guang-yen, sur les roches calcaires " (Balansa, n. 148).

Most of the specimens here cited are the types of each name given.

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24. **P. pteropus,** Blume.

Another polymorphic species in respect to the dimension and shape of the frond as well as the arrangement of sori. The frond may be either simple oblong-oblanceolate, or ternate, or pinnatifid with a long terminal and four lateral lobes, or in rare cases even palmatipartite with 5 oblong lobes. The sori are usually irregularly scattered, but are sometimes strictly uniseriate. They vary from round to oblong, and occasionally become confluent and grammitoid.

The plant often grows under water: then the frond is thin and firm. When it grows in drier situations, the frond becomes to some degree thicker.

The synonymy of this species is as follows :—

P. pteropus, Bl. Fl. Jav. Fil. cont. p. 168, tab. 76 (1829); Hook. Sp. Fil. v, p. 75; Hook. and Bak. Syn. Fil. p. 362.

Syn. :—*P. tridactylon,* Wall. List, n. 315; Benth. Fl. Hongk. p. 458 (1861).

P. Hancockii, Bak. in Journ. Bot. 1885, p. 106.

P. micropteris, Bak. in Kew Bull. 1906, p. 14.

P. aquaticum, Christ in Nova Guinea, viii, p. 153 (1909).

P. Hancockii was described from rather imperfect specimens. There are three pieces, two of which have simple, broadly oblanceolate, thin fronds with scattered sori, while the third is much larger and pinnatipartite with 5 lobes. This last-mentioned specimen is, unlike the typical *P. pteropus,* thick in consistency, but this may be due to the habitat. This third specimen is also much damaged by some external injury. The writer cannot help thinking that it is an abnormally thick-leaved specimen of *P. pteropus.*

P. micropteris, Bak. represents the simple-leaved form of this species which has been known as *P. pteropus* var. *minor,* Bedd. (Handb. p. 361).

The writer has been unable to find any distinction between *P. aquaticum,* Chr. and the typical *P. pteropus.*

The present species is widely distributed over India (Bhotan, Nepal, Assam, etc.), Ceylon, Malaccas, Philippines, Java, Sumatra, Hongkong, S.W. China, and Formosa. The following specimens from China and Formosa have been examined :—

CHINA. Yunnan: Szemao, E. mts., 6000 ft., in shade in forest (Henry, 12,630 *); Kwangsi: Lungchow, in wet ravine (Morse, n. 54).

HONGKONG. (Harland, 1857; Champion, n. 302; Wilford, n. 45).

* The type specimen of *P. micropteris,* Bak.

FORMOSA. Tamsui district (Hancock, n. 23, 100,* Oldham, n. 58), Posia (Steere), Sao bay (Murphey).

25. P. triglossum, Baker.†

A species probably most closely allied to the preceding and also to *P. hemionitideum*, Wall. From the trifid form of the former it differs by the larger sori, the presence of ovato-lanceolate and strongly dentato-ciliate scales on the under surface of the frond, by the strongly dentate and clathrate peltate scales in the sorus, and by the veins not forming distinct series of areoles. From the other species it differs by the presence of scales in the sori, thinner and flexuose costules, less distinct veinlets, and the trifid frond—which last point may not be very important.

In the original description it is stated that the sori are uniseriate, but in fact they show a tendency to become biseriate. The author is also wrong in placing the present species near *P. trifidum*, Don; these two species have no close relationship whatsoever.

I have only seen the type specimen from Milê, Yunnan, collected by Henry (n. 9953).‡

26. P. trisectum, Baker.

This is a very distinct species, being well characterised by the presence of short glandular hairs § on both surfaces of the frond, although this important character is not mentioned in the original description. The frond varies from trifid to pedate, and the terminal segment sometimes shows the tendency to produce additional lobes, the frond thus becoming subpinnatifid. Its margin is thickened and provided with very shallow notches.

The first name given to this species is *P. trisectum*, Bak.,‖ and the second one is *P. podobasis*, Christ.¶ Christ has also given a name *P. accessorium*, which, so far as the writer has been able to ascertain, has not been published.

This species is exclusively Chinese; I have seen the following specimens:—Yunnan: Milê district, in woods (Henry, n. 9891); Szemao, W. mts., 5000 ft. (Henry, n. 9891A, 13,121A, 13,121B); "Col de Pi iousé" (Delavay, Sept. 1888).

The specimen recorded by Christ as *P. podobasis* in the Bull. Acad. Intern. Geogr. Bot. xvi, p. 106 (1906) is not identical with

* The type specimen of *P. Hancockii*, Bak.

† Kew Bull. 1898, p. 232.

‡ This specimen has also been described as *Selligea triphylla*, Chr. in Bull. Herb. Boiss. vi, p. 878 (1898).

§ Longer and more conspicuous than those in *P. pteropus*, Bl.

‖ Kew Bull. 1898, p. 232.

¶ Bull. Acad. Intern. Geogr. Bot. xi, p. 215 (1902).

the real *P. podobasis*, Christ, but represents a small form of *P. oxylobum*, Wall.*

27. **P. Veitchii,** Baker.

This fern was first described in 1880 from Japan as *P. Veitchii*; then in 1885 from Yunnan, China, as *P. glaucopsis*; and again next year from Japan by Maximowicz under the name of *P. senanense*. Some ten years afterwards M. l'Abbé G. Giraldi found the same species in the northern part of Shensi, China, and the plant was accordingly named by Christ *P. shensiense*. Later, when describing a variety of *P. shensiense*, Christ records its occurrence in Japan also.

This species generally grows among mosses on moist rocks in a comparatively high altitude. A frond of young age, or from a very much shaded locality, may be very thin and almost membranaceous, whilst one from an exposed habitat, which is not usual, may be chartaceo-subcoriaceous and very firm. *P. glaucopsis* is the name given to a specimen from a drier situation, having a rather rigid frond with very pronounced teeth on the margin, so that the type specimen appears at a casual glance to differ from *P. senanense*. However, several intermediate forms connect these two types. The names *P. Veitchii*, *P. senanense*, and *P. shensiense* have been given to a more typical form of this species, and a comparison of the type specimens has shown their perfect identity.

Our plant is not uncommon in Central Japan, and also occurs in Central and Southern China, as well as in Quelpaert. The synonymy and the specimens examined from China are as follows:—

P. Veitchii, Bak. in Gard. Chron. n. ser. xiv, p. 494 (1880).

Syn.:—*P. glaucopsis*, Franch. in Bull. Soc. France, xxxii, p. 29 (1885).

P. senanense, Maxim. in Mél. Biol. xii, p. 571 (1886).

P. shensiense, Chr. in Nuov. Giorn. Bot. Ital. n. ser. iv, p. 99, tab. 3, fig. 2 (1898).

CHINA. Hupeh: (Henry, n. 6170, 6170A, 6170B); Shensi: "Montagne del Chae-pei-san" (Giraldi, Aug. 1895); Yunnan: "Montagne de Chĕ tchŏ tzè au dessus de Tapintze près de Tali" (Delavay, Aug. 1883). Western China: without locality (Wilson, n. 5341).

β. **nigrovenium,** (Chr.) *mihi.*

Syn.:—*P. shensiense* var. *nigrovenium*, Christ in Bull. Acad. Intern. Geogr. Bot. xvi, p. 106 (1906).

WEST CHINA. Without locality (Wilson, n. 5341A).

* See also under *P. oxylobum.*

28. **P. crenato-pinnatum,** Clarke.

This species is closely allied to the foregoing, and to the first glance they appear almost identical. However, the distinction between *P. crenato-pinnatum* and *P. Veitchii* is very definite. The species under consideration is often much larger than the other, having usually acuminate pinnae which frequently show a tendency to become bipinnatifid, and are hardly deflexed, as has been correctly delineated by the author.* In *P. Veitchii* the frond is, however, much smaller, with fewer pinnae which are, except one or two near the apex, always very obtuse, and those of the basal pair are often deflexed. The ramenta on the rhizome in these two species are also different. Excellent figures of *P. Veitchii* have been published by Makino under the name of *P. senanense.*†

Christensen hesitatingly expresses his view of the identity of *P. pseudoserratum,* Chr. with *P. crenato-pinnatum,* Clarke.‡ There is, however, no room for doubt that these two are absolutely identical. Besides these just mentioned, our plant has received another name—*P. griseo-nigrum.*§ An examination of the type specimens has convinced the writer that it is conspecific.

The occurrence of *P. crenato-pinnatum* in China was first recorded by Clarke when he described his fern from India. Up to the present this species has been found only in Manipur, India, and Yunnan, China. The following specimens from China have been examined :—

Yunnan : Mengtsz, woods, 5000 ft. (Henry, n. 9895A), grassy mountain-slopes, 6300 ft. (Hancock, n. 67) ; Szemao Hills, 4500 ft.–6000 ft. (Henry, n. 10,282) ; " Montagne de Yangiuchan, au dessus de Lankong " (Delavay, Aug. 1883).

29. **P. malacodon,** Hooker.

Now we have come to another group in which there has been much confusion. True *P. malacodon* is a very well-marked species, so that it does not require much comment. The frond is of a small to medium size, and has one to four falcate pinnae on each side, the margin of which is densely serrate with prominent cuspidate teeth.

This fern is not at all uncommon in the Himalayas. Its occurrence in China was first recorded by Baker,‖ and his information was based on a specimen collected by Henry in the

* Journ. Linn. Soc. xxv, p. 99, tab. xlii (1888).
† Phan. et Pter. Japon. Ic. Ill. tab. lxix, lxx (1901).
‡ Ind. Fil. p. 556. § Kew Bull. 1895, p. 55.
‖ Journ. Bot. xvii, p. 177 (1889).

Province of Hupeh.* Later, Christ enumerates the same name in the List of the Ferns collected by E. H. Wilson in Western China.†

A careful examination of these two specimens above-mentioned has shown that they do not represent the real *P. malacodon*, but *P. Stewartii*, Clarke. Unfortunately I have been unable to examine other specimens referred to *P. malacodon* by Christ, so that I cannot speak with certainty regarding the correctness of the identifications.

However, I have seen a specimen of the true *P. malacodon*, Hook. from Western China,‡ which has been known as *P. austrosinicum*, Christ,§ or *P. albido-glaucum*, C. Chr.‖ Another specimen of *P. malacodon* I have examined was collected in Yatung, Tibet.¶

30. **P. Stewartii**, Clarke.**

As has been alluded to under the preceding species, some specimens of *P. Stewartii* have erroneously been recorded from China as *P. malacodon*. Although these two species are closely related, *P. Stewartii* can be distinguished from the other above all by the nature of the serration, which is not cuspidate-pointed as in its ally, and by the direction of the lowest pinnae, which are deflexed, while those of *P. malacodon* are invariably falcate and curved towards the apex of the frond or erect patent at most.

The occurrence of *P. Stewartii* in China has also been reported by Christ,†† who, on this occasion, reduced it to *P. malacodon* as a variety. I have not seen any of the specimens referred to by that pteridologist, so that I am not quite sure as to their correct identification.

The following specimens have been examined from China :—

Hupeh (Henry, n. 6170E). Szechwan : Mt Omei (Wilson, n. 5333). Tibet : Yatung (Hobson, 1897).

31. **P. cyrtolobum**, Clarke.

In connexion with *P. malacodon* and other species of this group, I may perhaps say a few words about *P. cyrtolobum*.

* Henry, n. 6170E.

† Bull. Acad. Intern. Geogr. Bot. xvi, p. 106, n. 24 (1906). The name is given as *P. malacordon*, Kooh., which is, however, undoubtedly meant by that author for *P. malacodon*, Hook. ‡ Wilson, n. 5343.

§ Bull. Acad. Intern. Geogr. Bot. xvi, p. 107 (1906), not Christ in C. Chr. Ind. Fil. p. 512 (1906).

‖ Ind. Fil. Suppl. p. 58 (1913). ¶ Hobson, 1897.

** Ferns of N. Ind. in Trans. Linn. Soc. sec. ser. i, p. 563 (1880) ; *Pleopeltis Stewartii*, Bedd. Ferns Br. Ind. sub tab. cciv (1866).

†† Bull. Soc. Bot. France, Mém. i, p. 8 (1905).

The nearest affinity of this species is perhaps *P. malacodon*; Baker * united the former with the latter, and has drawn up a description which would fit both the species.

Our plant is characterised by the comparatively short stipe, a large graceful frond with long falcate pinnae, the margin of which is denticulate with low and not cuspidate teeth. The ramenta on the rhizome are much the same as in *P. malacodon*, being long-subulate, pale brown, fimbriate on the margin, and shiny black in the centre, but are generally longer. The spore of this species is almost smooth, as in *P. malacodon*.

P. cyrtolobum is not rare in Northern India, but seems to be not common in China. I have seen only one specimen from that country, which is very small, trifid with short basal lobes, resembling *P. hastatum* on the whole.†

P. cyrtolobum has been correctly described and figured by Clarke.‡

32. **P. oxylobum,** Wall.

There is little doubt about the identity of *P. oxylobum*, Wall. with *P. trifidum*, Don. As there is another *P. trifidum* published earlier than Don's species, this name, though older than *P. oxylobum*, cannot be used.

This species has been confused particularly with *P. hastatum* of Thunberg in many pteridological works, in spite of the fact that these two species are absolutely distinct.

P. oxylobum varies from ternate to pinnatifid, or may even be simple. In any case this species can be distinguished from *P. hastatum* by the absolutely entire margin of the frond, and by the larger size of the ramenta on the rhizome. When this species produces a lobed frond, it is always pinnatifid, whereas *P. hastatum* never produces pinnatifid fronds, but invariably pedate. However, both the species may become trifid in certain cases, which probably has caused the confusion. The spore of this species is echinate as in *P. hastatum*.

The following specimens have been examined from China and Formosa:—

CHINA. Kwangtun: Canton (Ford, Dec. 1878); Yunnan: Szemao, W. mts., 6000 ft. (Henry n. 10,080B); Mengtsz, rocky precipice in deep, dark glen (Hancock, n. 11); Szemao Mts., 6500 ft., on dry rocks (Henry, n. 13,074); Upper Yangtze (Francis); W. China (Wilson, n. 5331 §).

FORMOSA. South Cape (Henry, n. 1241).

* Hook. and Bak. Syn. Fil. p. 363.

† Yunnan (Delavay, n. 3997).

‡ Ferns of N. Ind. in Trans. Linn. Soc. sec. ser. i, p. 563, tab. lxxxiii (1880).

§ The specimen has been recorded as *P. podobasis*, Chr.; see Bull Acad. Intern. Geogr. Bot. xvi, p. 106 (1906). The same number has again been described as *P. trifidum* var. *catadromum*, Christ, in Lecomte, Not. Syst. i, p. 33 (1909)!

33. **P. ebenipes,** Hooker.*

The pinnatifid frond of this species often resembles the foregoing. The present plant can be distinguished from *P. oxylobum* and others, above all, by the patent, regularly arranged pinnae, the margin of which is serrate with low teeth, and by the very black, shiny ramenta on the rhizome.

I have seen the following specimens from China :—

Yunnan : Maokon tschang (Delavay, Oct. 1883). Tibet : Yatung (Hobson, 1897).

34. **P. Faberi,** Christ.†

Unfortunately, the writer has not been able to see the original specimen of this species. It is doubtless one of this group, and may possibly be either *P. oxylobum* or *P. cyrtolobum*. However, the description being inadequate, it cannot be decided satisfactorily.

35. **P. hastatum,** Thunberg.

An extraordinarily polymorphic species, to nearly each form of which one or two names have been given by various herbarium botanists. Fronds may be either elliptical, a few cm. in length, very obtuse, or longer, lanceolate, and acute or acuminate, or more or less ovate, or much elongated, linear lanceolate, and entire or repand, or ternatifid, subtrifid, or even pedate, but never pinnatifid. The first-mentioned, extremely dwarf form has been called *P. hastatum* forma *pygmaeum*, Maxim.‡ or *P. Matthewii*, Tutcher.§ Little larger forms have been named *P. hastatum* varr. *nikoense*,‖ *simplex*,¶ and *albopunctatum*, Chr.** *P. arenarium*, Bak.†† is a form with a long simple frond, found in China, and *P. Melleri*, Bak.‡‡ is a name given to a similar form gathered in Madagascar. Diels has been inclined to distinguish a ternatifid form with a stipe longer than the frond as *P. dolichopodum*,§§ but this is nothing but the normal form of *P. hastatum*, Thunb. The form with the pedate fronds has been described by Christ as *P. chenopus* and *P. dactylinum*.‖‖ A monstrous form with an inciso-laciniate frond has been called *P. hastatum* var. *incisum*, Mak.¶¶ The majority of these different forms are, however, not fixed, and two or three different forms are often found on the same rhizome, so that in

* Sp. Fil. v, p. 88 (1863).
† Bull. Soc. France, Mém. i, p. 17 (1905).
‡ Fl. As. Or. Fragm. p. 73 (1879).
§ Journ. Linn. Soc. xxxvii, p. 68 (1905).
‖ Tôkyô Bot. Mag. xxiv, p. 242 (1910).
¶ Bull. Acad. Intern. Geogr. Bot. xvi, p. 105 (1906).
** Ibid. xvii, p. 137 (1907).
†† Kew Bull. 1895, p. 56.
‡‡ Syn. Fil. p. 359 (1868).
§§ Engl. Bot. Jahrb. xxix, p. 205 (1900).
‖‖ Bull. Soc. Bot. Fr. Mém. i, p. 20 (1905).
¶¶ Tôkyô Bot. Mag. xxiv, p. 30 (1910).

many cases, unless a special name be given to every frond detached from the rhizome, such a multinominal system would only be found ridiculous. Besides the shape and size, the frond may be either pale green beneath or glaucous, as in many other species of this group, so that this also cannot be reckoned as any diagnostic character whatever.

As the distinguishing character of this species the margin of the frond is the most reliable; it is constantly depressedly crenate with rather distant notches, as is beautifully delineated by Makino.* The sori are situated midway between the midrib and margin, or slightly nearer the midrib. The spore is densely echinate.

The present species is very widely distributed over Japan, Formosa, China, and Corea, and then reappears in Madagascar. I have seen the following specimens from China and Formosa:—

CHINA. Fukien: Foochow (Maries); Chekiang: Ningpo (Hanbury, 1854, Hancock, n. 37, Faber, Aug. 1885); Shangtung: Chefoo (Faber, Feb. 1890, Hancock, n. 10), Wei-hai-wei (Matthew, Feb. 1909); Hupeh: Nant'o (Henry, n. 3025, 4436); Szechwan: Mt. Omei (Faber, n. 1066, Wilson, n. 5325), Moupin (David, 1870).

FORMOSA. Tamsui (Hancock, n. 45, Wilford, n. 519, Swinhoe, 1862); Posia (Steere).

36. **P. Engleri,** Leurssen.

This fern very much resembles the simple-leaved form of the preceding species, so that Christ reduced it to *P. hastatum* as a variety.† The only distinguishing character is, as has been pointed out by Luerssen ‡ and figured by Makino,§ that the spore is absolutely smooth. The writer has not been able to examine any specimen with ripe spores, so that this point has been left undecided.‖

This plant has been recorded from the south-west of Japan and Quelpart, where it occurs but seldom.

37. **P. Griffithianum,** Hooker.¶

Although this species is very closely related to *P. hastatum*, it is surprisingly invariable. This plant can be distinguished from its nearest ally by the much thicker, oblong-elliptical frond and by the larger costal sori.

It occurs in Northern India and Western China; from the latter country I have examined the following specimens:—

* Phan. et Pter. Japon. Icon. Illus. tab. xxviii.
† Bull. Herb. Boiss. vi, p. 878 (1898).
‡ Engl. Bot. Jahrb. iv, p. 361 (1883).
§ Phan. et Pter. Japon. Icon. Ill. tab. xxix.
‖ Cf. Appendix to the present paper, p. 308. ¶ Icon. Pl. sub tab. 955 (1854).

Yunnan: Mengtsz, shady rocks and on trees, 8000–9500 ft. (Hancock, n. 96); without special locality (Delavay, 1883–85). Western China (Wilson, n. 5322).

38. **P. drymoglossoides,** Baker.

A very interesting species, closely allied to *P. rhyncophyllum* and *P. salicifolium*, but is well characterised by the *Drymoglossum*-like appearance, as the name indicates.

This fern has a comparatively wide range of distribution in China; and as specimens have been collected in different localities from time to time, they have been described under various names. The synonyms and the specimens examined are as follows:—

P. drymoglossoides, Bak. in Journ. Bot. 1887, p. 170.

Syn.:—*P. moupinense*, Franch. in Nouv. Arch. Mus. Par. sér. 2, x, p. 121 (1887–88).

P. cyclophyllum, Bak. in Ann. Bot. v, p. 473 (1891).

P. drymoglossoides α, Chr. in Bull. Acad. Intern. Geogr. Bot. xi, p. 206, fig. dextr. (1902).

Chekiang: Ningpo (Hancock, n. 32); Kiangsu: Ling-yen-san, Soochow (Matthew, June 1904); Hupeh: Ichang (Henry, n. 1576); Nant'o (Henry, n. 2965, 4392); Changyang (Wilson, n. 1450); without precise locality (Henry, n. 5963); Szechwan: Mt. Omei (Faber, n. 1046), without locality (Henry, n. 7532A).

39. **P. rhyncophyllum,** Hooker.*

So far as the writer is aware, this species has not been recorded from China under its proper name, but has been confounded with the preceding species. However, Christ has noticed the difference, and distinguished it as *P. drymoglossoides* β, and has given a figure of the specimen.†

Although this fern is not uncommon in Northern India, it occurs but seldom in China; I have seen only the following specimens:—

Western China (Wilson, n. 5316). Central China (Wilson, n. 1379).

* Icon. Pl. sub tab. 954 (1854).

† Bull. Acad. Intern. Geogr. Bot. xi, p. 206 (1902), fig. sinist.

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(See also addendum, p. 312.)