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SPECIES OF GANODERMA AND RELATED GENERA MAINLY OF THE BOGOR AND LEIDEN HERBARIA

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(With nine Text-figures and Plates 1–15)

This contribution to the knowledge of the Aphyllophorales is dedicated to Dr. M. A. Donk as a tribute to his life-long endeavour to put the systematics and the taxonomy of this challenging order on a sound basis.

A collection of South Asian specimens of *Ganoderma* and various other collections have been studied taxonomically as to spore, pore and anatomical cutis characters by using a technique devised by the author (Steyaert, *1946*: 137; *1947*: 47); it allows microtome sections of botanical material to be mounted immediately in Canada balsam.

Three genera and 15 of the 39 species studied are described as new. All species are from Indonesia except when indicated otherwise; they are *Humphreya*, *Haddowia*, *Magoderna*, and *Ganoderma kosteri* (The Netherlands), *G. vanheurnii*, *G. manoutchehrii* (Iran), *G. dejongii*, *G. donkii*, *G. puglisii* (Italy), *G. bruggemanii*, *G. trulla*, *G. trulliforme*, *G. lamaoense* (Philippines), *G. leytense* (Philippines), *G. ahmadii* (West Pakistan), *Humphreya endertii*, *Haddowia aëtii*, *Magoderna vansteenisii* (Indonesia and Australia). Eight new combinations are proposed, viz. *G. petchii* (Lloyd), *G. weberianum* (Bres. & Henn.), *Humphreya lloydii* (Pat. & Har.), *H. coffeatum* (Berk.), *Amauroderma preussii* (P. Henn.) (syn. *Ganoderma sikorae* Bres., *G. rubeolum* Bres.) (predominantly African), *Haddowia longipes* (Lév.), *Magoderna infundibuliforme* (Wakef.), *M. subresinosum* (Murrill).

The names of two important species, to wit *G. pseudoferreum* (Wakef.) Over. & Steinm. and *G. rivulosum* Pat. & Har. become synonyms of previously published names, whose correct combinations are *G. philippii* (Bres. & Henn.) Bres., and *G. weberianum* (Bres. & Henn.) *nov. comb.*, respectively.

Ganoderma lucidum (Curt. ex Fr.) Karst. and *G. resinaceum* Boud. are redefined especially on spore characters previously unreported and which prove infallible in distinguishing the two species. *Ganoderma chaffangeonii* Pat., *G. sessile* Murrill, *G. polychromum* (Copel.) Murrill, *G. praelongum* Murrill, *G. argillaceum* Murrill, and *G. subperforatum* Atk. are placed in the synonymy of *G. resinaceum* on the basis of their spore features.

The genus *Amauroderma* as currently understood is critically examined. Three new genera (*Humphreya*, *Haddowia*, *Magoderna*) are set up for a mixture of *Amauroderma* and *Ganoderma* species.

Additional details and distributional information are given for the previously published species that received new combinations (mentioned above) as well as for the following species: *Ganoderma applanatum* (Pers. ex S. F. Gray) Karst., *G. tornatum* (Pers.) Bres., *G. brownii* (Murrill) Gilbertson, *G. adspersum* (Schulzer) Donk, *G. mirabile* (Lloyd) Humphrey, G. *philippii*

(Bres. & Henn.) Bres., *G. williamsianum* Murrill, *G. tropicum* (Jungh.) Bres., *G. flexipes* Pat., *G. chalceum* (Cooke) Stey., *G. amboinense* (Lam. ex Fr.) Pat., *G. subtornatum* Murrill, *G. lucidum* (Curt. ex Fr.) Karst., *G. resinaceum* Boud, *G. colossus* (Fr.) C. F. Baker, and *Amauroderma rugosum* (Bl. & Nees) Torrend.

INTRODUCTION

The author's interest in the genus *Ganoderma* was awakened some forty years ago when as a recently appointed plant pathologist he came into contact with diseased oil palms in the Belgian Congo. It should be remembered that the oil palm, *Elaeis guineensis* Jacq., was then little more than a wild plant that had fairly recently been brought into cultivation, on a small scale in Africa but more extensively in South-east Asia. By then only elementary knowledge of its diseases had been gained. Amongst their causes species of *Ganoderma* appeared to occur not infrequently and some literature relating to them already existed. As to the identification of the species involved however the problem was practically at a deadlock not only in the herbaria but evidently much more so in the field. Besides an imposing array of more than 200 published binomials no published monograph of the genus existed and none exists to-day. Patouillard's brief paper of 1889 only reviewed the species known at that time, and it soon became obsolete under the avalanche of binomials published mostly at the beginning of this century. The papers by Humphrey & Leus (*1931*, *1932*) treated only the *Ganoderma applanatum* group as it occurred on the Philippine Islands. These publications mark however an important turning point in the study of the Polyporaceae as they put strong emphasis on anatomical features and employed the more elaborate laboratory technique devised at the end of the last century and the three first decades of the current. These publications are perhaps among the most important in connection with Polyporaceae; they were certainly momentous at the time of their publication. It is to be regretted that the example was not followed more extensively. We might probably have been spared the abundance of systems that have been suggested for the splitting of the very extensive family of Polyporaceae *sensu lato* into genera and all the controversies they engendered.

The author's concern for the systematics of the genus *Ganoderma* started in 1951 and has since remained the principal subject of his researches, except for a thirteen months period in 1952–3 when having a leave of absence as an FAO phytopathological expert in Iran.

During these well nigh twenty years a considerable amount of labour has been devoted to establishing iconographical documents of every specimen examined without which one cannot proceed to the distribution into species. During the first ten years research was restricted first to the Congo and then to Africa in general. This extension to the whole of Africa appeared to be insufficient because of the considerable number of species that could be distinguished. From 1961 onward research was extended to material of the whole world and an extensive study was carried out of type specimens that had been published from other regions than Africa. This policy proved to be rewarding as a much better knowledge has been

gained about the palmicolous species of *Ganoderma* (Steyaert, *1967b*), whose distribution patterns are either Americano-African, African, Asiatic, or pantropical.

The need of a monograph is evident, not only for *Ganoderma* but also for so many other extensive genera of fungi whose study has been left in abeyance. Yet taxonomists shy at undertaking such enterprises; they mean many years of perseverance and devotion. If however such undertakings are not fulfilled soon a time will come that the superabundance of published binomials will prevent them. It will by then have become impossible for a single person to attempt such a task. Although there may be still some corners of the world that are insufficiently explored there is already an abundance of specimens lying idle in the herbaria where they are unfortunately exposed to possible destruction. The destruction of the Berlin herbarium and a few others are telling examples of this danger. In this paper two suggestions are made of what could have happened had the Berlin collections been totally destroyed: the binomials *Ganoderma philippii* and *G. weberianum* would have been irretrievably 'lost'. Since the Berlin herbarium was particularly rich in type specimens it may be assumed that such losses must really have happened in regard with other binomials of fungi.

Time has come that in the very near future the accumulated wealth of specimens in the herbaria must be taken advantage of by elaborating monographs of the many giant genera that have been neglected in this regard. Nowadays much time and efforts are spent to write local floras although for many species taxonomic knowledge is inadequate or even faulty. The author does not wish to discredit these floras; they certainly fill an undisputed need but still there can be no doubt that in many a part they remind of buildings with many faulty-baked bricks.

Since this paper is the first of some size resulting from an accumulation of documents pertaining to the species of *Ganoderma* it appears desirable to go into the description, once and for all, of these documents and how they were or are obtained.

ELABORATION OF THE ICONOGRAPHIC DOCUMENTATION

The successive stages for each specimen are as follows:

(i) Specimens on loan are photographed when received; two or three photographs are taken: one of the upper surface, one of a section of a basidioma cut into halves, perhaps one of the pore side if it has any noteworthy peculiarities, and one of the basidioma taken sideways if it is stipitate. The photographic prints are to be enlarged in order to obtain an exactly life-size picture of the specimen.

(ii) (a) A small block ($\pm$ 3–4 $\times$ 8–9 mm) is cut out along a plane of section of the basidioma (Steyaert, *1967b*) so that the narrow edge of the block is parallel to the general direction of the hyphae (Steyaert, *1967a*: *fig. 1*).

(b) A block of the tube layer ($\pm$ 8 $\times$ 15–16 mm) is cut out.

(c) The two blocks are boiled in water.

(iii) In order to obtain the spore mounts the block of the tube layer is taken out of the water, drained of excess water and squeezed with the pores downward and

the tubes vertical over a slide. Two or three drops of water are evenly spread out and the slide left to dry on a heater at relatively low temperature. When dry one or two drops of Canada balsam are dripped on the slide. It may be useful to add a drop of chloralphenol and let it spread out together with the balsam. This will facilitate the elimination of air bubbles from the spores. The slide is left a few moments to let evaporate most of the xylene from the Canada balsam and a cover glass (20 × 40 mm) is then applied. On the heater the Canada balsam will spread out evenly under the cover glass. A slight pressure on the cover glass will squeeze out the excess balsam. The slide is then left to cool.

This procedure may seem rather unorthodox for fungi but somehow the *Ganoderma* spores withstand this treatment quite well.

(iv) Sections of the cutis and tube layer. —

Sections of the cutis (12–20 μ thick) and sections of the tube-layer (20–30 μ thick) are obtained with a freezing microtome. They are freed from the knife either with a drop of water or a very fine water-colour brush and dropped in a watch-glass or small petri dish filled with water. When enough sections have been cut the best are removed with a small narrow spatula aided by the brush and then placed in a second dish with water to let float away the free hyphal fragments that might have clung to them. The sections are then transferred to a slide either by dipping the spatula in a drop of water that had been put on the slide or by letting fall directly from the spatula a drop of water and in this manner carry the section onto the slide.

The sections (usually 9 to 12 of them for the cutis or 2 for the tube-layer) are arranged on the slides with the aid of two fine brushes and the water drained off with the help of a small square of tissue paper. After most of the water has been drained off a cover glass (18 × 18 mm) is laid over the sections.

One slide of the cutis sections is washed with a 7 % KOH solution in water. A drop of this liquid is placed at the edge at one side of the cover glass and a square of tissue paper at the other side to drain off the water. The KOH solution will thus remove the melanoid substances (Steyaert, *1967a*: 190) of the cutis. The potassium solution is washed out either by distilled water or a diluted solution of acetic acid.

The slides, either treated with the KOH solution or untreated, are then lixiviated with drops of chloralphenol (Steyaert, *1946*, *1947*; Langeron, *1925*: 747). (Chloralphenol = 2 parts by weight of chloral hydrate + 1 part of dry phenol, when heated melts into a sirupy liquid.)

Chloralphenol displaces the water and when this is achieved completely a drop of Canada balsam is put at the edge of the cover glass and drawn under it like the other liquids by a square of tissue paper. As many drops of Canada balsam are added as are needed to obtain both the full displacement of the chloralphenol and to fill the area underneath the cover glass. The slide is left on the heater to let evaporate as much xylene as possible. The cover glass becomes firmly fixed upon cooling.

The microphotographs appended to this article show that in this manner very good pictures of sections of the cutis can be obtained.

It can be stated that without this simple technique that ensures as permanent a

slide as can be obtained—Canada balsam alone has stood the test of time for at least one century—the study of the genus *Ganoderma* could not have been pursued to the extent to which it has now been carried. As more than 3000 specimens have been studied in the manner described, and at least 5 slides have been mounted for each specimen, a collection of at least 15.000 slides has been built up.

To be complete it should be noted that sections of the tube-layers are mounted in the same manner except that they are not washed with a KOH solution.

ICONOGRAPHY.—To ensure a uniform magnification of all drawings and photographs the same microscope and accessories (eye-pieces, objectives, and camera-lucida) have been used throughout this investigation; the correct position of the microscope on the table being secured by drawing the outline of the microscope base on the table; and at the perpendicular of the camera lucida's mirror a short line was scratched on the table to mark the spot on which the spores were to be drawn.

Failure to take the above precautions might result in serious variations in the magnification. These precautions were taken so that the drawings could be measured as a matter of routine; they eliminated the micrometer eye-piece as a tool of measuring. Measurements were obtained by projecting a stage micrometer scale onto a paper on the table and dividing this scale geometrically into microns. As the magnification of the spores on the table corresponds to a magnification of 3150 times the micron division lines are sufficiently spaced to be correct to half a micron. This scale was reproduced on a flat ruler with which the measurements are to be taken. It also carries the appropriate scales for the pore drawings and the microphotographs.

The basidiospore drawings—10 per specimen—are made on a piece of transfer paper and then lined up near the top of a sheet of drawing paper cut to the size of a herbarium sheet. The latter is called the voucher sheet. The rest of the voucher sheet receives the drawing of a cross section of the tube-layer, viz. a microscope field drawn at the magnification of 155 times. Such a field covers approximately 1700 μ in diameter.

The microphotographs of the cutis sections, whether washed with KOH or not, are magnified 720 times. The prints, about 29 × 19 cm, are hinged on the side of the voucher sheet and the life size photographs of the basidioma, on the lower edge.

These sheets are filed as herbarium sheets but the specimens are stored in boxes of various standard sizes so as to accommodate specimens of various sizes and bulk. The sizes of the boxes are indicated by letters A, B, C, and so on and for each size they are numbered from one on. The box numbers are mentioned on the voucher sheets and a label on the outside of the box mentions the temporary or definite determination.

All systems of filing bulky specimens have their advantages and inconveniences. In the standard systems of taxonomic filing, herbaria have been obliged to provide space in trays or drawers in separate cupboards and even a separate filing for very bulky specimens. This system of storage coupled with voucher sheets (as adopted

in the Brussels herbarium) permits—when a determination is altered—translocation of the voucher sheets only; the location of the boxes never varies. For medium sized and small herbaria the Brussels system offers the advantage of saving much filing space. A disadvantage is that when one wishes to assemble specimens for the study of a particular group this may be a tedious job. However with the iconography ready for every specimen the sorting out will have been made much easier.

Following a visit to Leiden in 1966 a loan was kindly granted of *Ganoderma* collections of the Rijksherbarium as well as those of the Bogor herbarium and of Dr. M. A. Donk, temporarily housed in the Rijksherbarium. The loan consisted of a selection made by the author.

For this and all the working facilities that were enjoyed in the Leiden herbarium deep appreciation and gratitude is expressed. That more than 30 species are involved speaks for the importance of these collections. The opportunity of publishing this paper is taken also to discuss a few specimens foreign to the main set, which is chiefly of Asian distribution.

As explained in a former publication by Steyaert (*1967b*) each basidioma studied, principally those received on loan, has been given a number. This is done because when a collection comprises several basidiomata it may represent more than one species. If the basidiomata are not numbered reference to a specimen will often be laborious and lacking in precision. It is also an indication that in the Brussels herbarium a voucher sheet of the specimen with complete iconography has been prepared and stored away.

As in previous publications Ridgway's "Color standards and nomenclature" has been used together with Dade's Latin translations. Most other charts are glossy, which impairs colour comparison of non-glossy objects and are therefore less suitable for this kind of work. Colours cited from Ridgway are capitalized, other non-capitalized colours are the author's own appreciations and are in the main restricted to spore colours as seen through the microscope.

The word basidioma—as a corollary to van Brummelen's (*1967*) re-introduction of the word ascoma—is resorted to as it appears to be the most appropriate term for what is currently referred to as fructification, carpophore, or sporophore and so on; all these denominations are open to some criticism, the first two being the least appropriate as there is certainly no analogy to a phanerogamic fructification. At the most a basidioma can be compared with a phanerogamic flowering stage, the spores being plus or minus polarized. The term sporophore applies to any spore-bearing hypha as these occur in the Fungi imperfecti. 'Basidioma' has a much more restricted application as it is to be used in connection with Basidiomycetes only.

The expression melanoid substances has been resorted to to designate the kind of wax that impregnates the cutis. It is a translation of the French expression 'substances mélanoïdes' of Maillard (Steyaert, *1967a*, foot-note on p. 190) for a complex of sugars and proteins.

The collectors' notes have been left in their original language. The word holotype

is capitalized for the type of the correct binomial; it is not capitalized for synonymous binomials. In mentioning dates, months have been indicated by roman figures to obviate any misrepresentation of arabic figures when they are used by themselves.

The author wishes to express his most sincere gratitude to Mr. R. Tournay for his unfailing help in elaborating the Latin diagnoses.

GANODERMA APPLANATUM (Pers. ex S. F. Gray) Pat.

Fig. 1a

Boletus applanatus Pers., Obs. mycol. **2**: 2. 1799. — *Boletus applanatus* Pers. *ex* S. F. Gray, Nat. Arr. Br. Pl. **1**: 642. 1821. — *Polyporus applanatus* (Pers. ex S. F. Gray) Wallr., Fl. crypt. Germ. **2**: 591. 1833; Fr., Epicr. 465. 1838. — *Ganoderma applanatum* (Pers. ex S. F. Gray) Pat. *in* Bull. Soc. mycol Fr. **5**: 67. 1889.

Polyporus megaloma Lév. *in* Annls Sci. nat. (Bot.) III **5**: 128. 1846.

Polyporus leucophaeus Mont., Syll. Crypt. 157. 1856.

Most of the specimens, but especially Donk 12,296, with 8 layers of tubes, and Ahmad 3085, with 4 layers, have extensive zones of white mycelium. These two specimens and some others (DD 14,247, 14,253, 14,266, 14,701; Everest Exp. 1953 remarkable by having nine layers of tubes) have several layers of tubes separated by thin layers of context tissue. They are all typical of the species; there can be no doubt as to their identity. The same applies to the Bombay specimen (DD 3065), which has a pale grey upper surface and pale brown context. The latter specimen probably marks the southern limit of distribution of the species. The other specimens have darker brown context—but not reddish brown—, some with pale brown zones near the cutis.

Beyond this southern limit *G. applanatum* seems to be replaced by *G. tornatum* and about this limit there appears to be an overlapping of the two species; the distinction between the two is then rather delicate. The upper surface of the basidiomata of *G. tornatum* may not be as dark as in the truly tropical specimens, but a distinctive feature seems to be the thin horn-like deposits in the context, which to the author's knowledge are not observed in *G. applanatum*.

SPECIMENS EXAMINED.—GERMANY: Falkenstein bei Zwiesel, s. hosp., Greiner (L), 10-IX-1966, 66.L.4.

AUSTRIA: Ober Oesterreich, Altergau, Buchberg, s. hosp., M. A. Donk 12,296 (L), 29-IX-1962, 66.L.5.

INDIA: Uttar Pradesh: Dehra Dun, alt. 650 m, on *Cedrela toona* at roadside, R. A. Maas Geesteranus 14,457 (L), 5-IX-1964, 66.L.6.; Chakrata, on *Picea morinda*, B. K. Bakshi (DD H.2434), 22-VI-1936, 58.DD.16; Haldwani, on butt of living *Mallotus philippensis*, B. K. Bakshi (DD H.3643), 27-III-1941, 58.DD.5; Nainital, on stumps of *Picris ovalifolia*, B. K. Bakshi (DD H.2380), 6-XI-1932, 58.DD.11; on roots of *Dalbergia sissoo*, B. K. Bakshi (DD H.5948), 58.DD.1; Dehra Dun, on stumps of *Tectona grandis*, B. K. Bakshi (DD H.3797), 4-X-1944, 58.DD.6; Dehra Dun, on stumps of *Bauhinia retusa*, B. K. Bakshi (DD H.4052 (a)), 9-XI-1945,

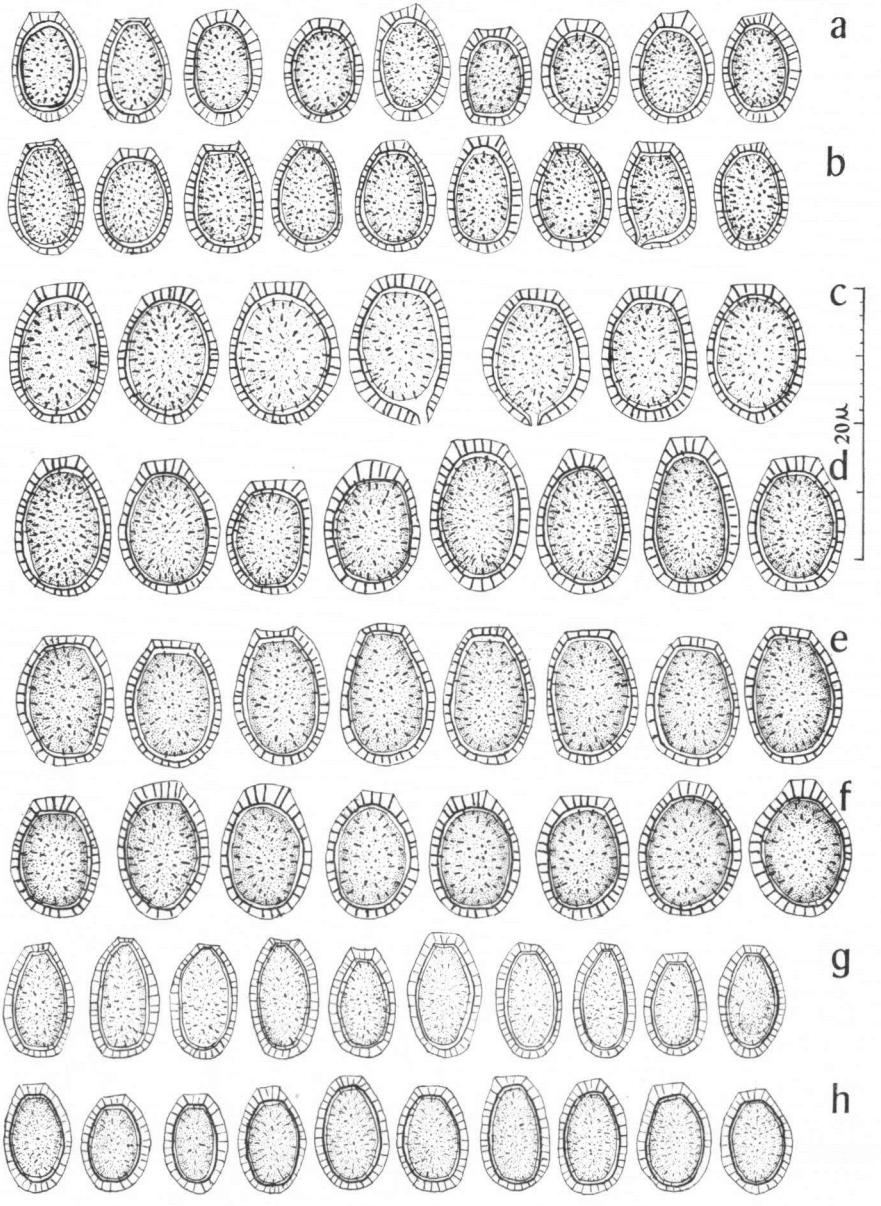

Fig. 1

58.DD.7; Dehra Dun, on stumps of *Pinus longifolia*, B. K. Bakshi (DD H.4199), 4-V-1939, 58.DD.9; Dehra Dun, on living *Morus alba* trunk, B. K. Bakshi (DD H.3025), I-1938, 58.DD.13. — Himachal Pradesh, Simla, alt. 2160 m, on logs of *Abies pindrow*, B. K. Bakshi (DD Khadrala 38/58), VI-1958, 58.DD.15. — Punjab: Kulu, on *Prunus pradus*, B. K. Bakshi (DD H.6096), 5-XI-1952, 58.DD. 12; Kulu, on log of *Pinus pindrow*, B. K. Bakshi (DD H.6080), 58.DD.14; Kulu valley, Manali, alt. 1850 m, on stumps of *Cedrus deodora*, R. A. Maas Geesteranus 14,315 (L), 20-VIII-1964, 66.L.13, 14. — Bombay, Maharashtra, on base of *Dipterocarpus* sp., B. K. Bakshi (DD H.3056), 4-V-1939, 58.DD.10.

NEPAL: s. loc., alt. 4500 m, Himalaya Everest Exp. 1953, s. coll. (K), 55.K.30.

PAKISTAN: Kagan Valley, Sharhan, s. hosp., S. Ahmad (Fungi of W. Pakistan 14,410), 21-VIII-1959, 59.LAH.2–4; Kagan Valley, Shogran, on a fallen log, S. Ahmad (Fungi of W. Pakistan 14,247), IX-1958, 58.LAH.18; Kagan Valley, Shogran, on a fallen log, S. Ahmad (Fungi of W. Pakistan 14,253), IX-1958, 58. LAH.19, 20; Kagan Valley, Sharhan, on logs, S. Ahmad (Fungi of W. Pakistan 14,701), 22-VIII-1959, 59.LAH.6; Nathia galli, s. hosp., S. Ahmad (Fungi of W. Pakistan s.n.), 9-VIII-1959, 59.LAH.7; Kagan Valley, Sharhan, on logs, S. Ahmad (Fungi of W. Pakistan s.n.), 20-VIII-1959, 59.LAH.13.

GANODERMA TORNATUM (Pers.) Bres.—Fig. 1b

Polyporus tornatus Pers. *apud* Gaud., Bot. *in* Freycinet, Voy. Uranie 173. 1827. — *Ganoderma tornatum* (Pers.) Bres. *in* Annls mycol. **10**: 502. Oct. 1912; *in* Hedwigia **53**: 55. Dec. 14. 1912. — *Ganoderma applanatum* var. *tornatum* (Pers.) Humphr. & Leus *in* Philipp. J. Sci. **45**: 543, 562, 565, 1931.

Ganoderma applanatum var. *laevisporum* Humphrey *apud* Humphr. & Leus *in* Philipp. J. Sci. **45**: 533, 565, 1931.

Ganoderma applanatum var. *philippinense* Humphrey *apud* Humphr. & Leus *in* Philipp. J. Sci. **45**: 535, 565, 1931.

Humphrey did not think it wise to maintain *G. tornatum* ("or *G. australe* of many writers", as he said, but to which the present author readily concurs) as a separate species from *G. applanatum*. Steyaert (*1967b*: 487–489) has indicated why they should be kept separate. In northern India and Pakistan, however, there are some specimens of *G. tornatum* that do not have the dark brown upper surface of the tropical specimens. The context is also of a lighter shade but in the author's opinion the presence of thin, shiny, horn-like layers (probably of melanoid substances) is

EXPLANATION OF FIGURE 1

Fig. 1. Basidiospores. — a. *Ganoderma applanatum*, Maas Geesteranus 14, 457, 66.L.6. — b. *G. tornatum*, C. & D. van Overeem & al. (BO 705), 66.L.92. — c. *G. brownii*, Lawrence 522, 66.L.24. — d, e. *G. adspersum*: d, Schulzer von Müggenburg, 68.BPU. 1; e. Swart, 66.L.3. — f. *G. kosteri*, Koster, 66.L.1 (Holotype). — g, h. *G. vanheurnii*: g, van Heurn, 66.L.119 (Holotype); h, ditto, 66.L.121.

decisive for classing them as *G. tornatum*. Besides, the fact that a typical specimen of *G. applanatum* has been collected in Bombay goes far towards confirming this point of view.

Discussions of taxonomic levels and the concept of what distinguishes varieties from species have not brought much enlightenment in this group. If the same problem would be considered in the *G. lucidum* group and the majority of species taken as varieties just because they have a hymenioderm as cutis the result would not only be a very cumbersome and unwieldy type of nomenclature but also a biologically incorrect concept.

Considering the wide distribution of both *G. applanatum* and *G. tornatum*, each covering several continents, the author arrived at a conclusion opposite to Humphrey's; he considers it wiser to decide that there are two species, each with some variation, that do not overlap except in the north of the Indian subcontinent as has been mentioned under *G. applanatum*.

As to his variety *philippinense*, Humphrey goes to several pages of considerations and descriptions to distinguish it from the type variety (*G. applanatum*). Yet when one has read this lengthy text the concept of the variety *philippinense* still remains vague. He seems to attribute some importance to the following feature (Humphrey & Leus, *1931*: 537): "One fairly constant feature of the context is the presence of distinct whitened flecks or areas from the size of a pin head to several millimeters . . .." This is simply a feature that cannot be brought forth to characterize a variety of *G. applanatum*; if that were the case the European *G. applanatum* would certainly have to be included in the variety. The bleaching of zones in the context and tube layers is evidently more frequent in the *G. applanatum* group but it is certainly not absent in the *G. lucidum* group. Steyaert (*1962*: 98–99) has suggested that in certain cases the bleaching of the hyphae could be due to parasitism.

It is remarkable indeed that Humphrey stressed the constancy of bleaching as a feature of the variety *philippinense* because on p. 517 he described the same anomaly for the main variety.

In regard to the spore sizes of variety *philippinense* and his variety *tornatum* Humphrey gave as averages 8.77 × 5.43 μ and 7.58 × 5.03 μ respectively. Examination of Gaudichaud's type material of *G. tornatum* from Lawak (Rawak) (Steyaert, *1967b*: 487) has shown that the spore measurements are 7.5–8.35–9.5 × 5–5.8–7 μ, which is very near to Humphrey's for variety *philippinense*.

In conclusion the author would consider *G. applanatum* var. *philippinense* redundant.

So is *G. applanatum* var. *laevisporum*. Non-echinulate spores can be observed in many species. It has yet to be discovered what the cause is of this anomaly in the spores and whether these are fertile. Abundance of non-echinulate spores may vary very much from one specimen to another, viz. from a few per cent to a majority of the spores. In variety *laevisporum* the cause of these abnormal spores is certainly dominant, be it cytological or physiological. Nevertheless of the collection M. S. Clements (Bureau of Science 50,084) the Paris specimen shows only a few echinulate spores when sections of the tube layer are examined. Humphrey (*1931*: 535) cites

also Javanese specimens collected by van Overeem *et al.* (BO 705). What the author has seen of this collection consists of two basidiomata, one is poreless, the other has perfectly normal spores with no detectable non-echinulate spores. The conclusion drawn from the re-examination of the problem set by variety *laevisporum* is that this taxon has no real systematic basis and that its name is a nomen monstrositatis. On the other hand the non-echinulate spores could be the result of genetic recombination and due to a recessive character manifesting itself occasionally.

Students of *Ganoderma* specimens should be aware that apparently all species potentially may produce this kind of anomalous spores. Among the about 3000 specimens examined by the author the collection Bureau of Science 50,084 is certainly the one where this is most pronounced.

Ganoderma cochlear (Bl. & Nees) Bres. (Merrill, *1917*: 58) could be related to *G. tornatum*. Blume & Nees's (*1826*) plate VI shows a stipitate basidioma of a dull greyish dark-brown colour. This should exclude all species with basidiomata that are blackish-shiny; all of these possess a hymenioderm cutis type. The dull grayish brown colour is also known for *G. philippii* (Bres. & P. Henn.) Bres. [syn., *G. pseudoferreum* (Wakef.) Over. & Steinm.], but neither the latter species nor *G. tornatum* are known to form such a long and thin stipe as figured by Blume & Nees. Among the specimens that have been examined BO 705 comes closest in having such a stipe. In this case however it seems to be a matter of 'strangled' growth of basidiomata rather than the forming of a real stipe.

Merrill neotypified the name *G. cochlear* by Robinson 610, August 30, 1913, but the specimen cited by him seems to be lost. Inquiries at the Manila herbarium and several American herbaria have not been successful in locating this specimen.

SPECIMENS EXAMINED.—PAKISTAN: Sialkot, on dead wood, M. Nawaz (Fungi of W. Pakistan 14,181), IX-1954, 58.LAH.3; ditto (Fungi of W. Pakistan 14,180), IX-1954, 50.LAH. 4; Changa-Manga, on *Dalbergia sissoo*, S. Ahmad (Fungi of W. Pakistan 4345), 29-X-1950, 58.LAH.12; Kagan Valley, Sharhan, alt. 2400 m, on logs, S. Ahmad (Fungi of W. Pakistan s.n.), 20-VIII-1959, 59.LAH.14–15.

INDIA: West Bengal: Agarpara, 24 Parganas, s. hosp., D. N. Chakravorti 1249 (Herb. M. A. Donk 8740), XI-1931, 66.L.107.; Dehra Dun, Sohararpur road, s. hosp., K. S. Thind, 28-VIII-1946, 63.K.35; Dehra Dun, on main stem of *Tectona grandis*, B. K. Bakshi (DD Lacch.30/58), 25-IX-1958, 58.DD.4.; Calcutta, on dead trunks of *Mangifera indica*, s. coll., 28-VIII-1946, 67.E. 12. — South India, s. loc., on stumps of *Shorea robusta*, B. K. Bakshi (DD. Lacch.87/58), 25-IX-1958, 58.DD. 3; s. loc., at base of living *Cedrela toona*, s. coll., (DD H.4242), 25–I–1946, 58.DD.2.

CEYLON: Naramwala, Berna Estate, on roots of *Cocos nucifera*, R. A. Bull, VII-1967, 69.K.26, 27, 28.

CHRISTMAS ISLAND: West coast, Dales, alt. 42 m, on fallen *Inocarpus*, D. A. Powell 121B, s. dat., 69.K.4.

INDONESIA: Java: Gunung Gedeh, Tjibodas, s. hosp., Bruggeman (BO 8760),

IX-1924, 66.L.89; G. Gedeh, Tjibodas, rott(ende) stammen en stompen, C. & D. van Overeem-de Haas & *al.* (BO 705), XI-1921, 66.L.91, 92; G. Gedeh, Tjibodas, s. hosp., Bruggeman (BO 8760), 23-IX-1924, 66.L.106; Oost-Java, Poedjon, s. hosp., W. C. van Heurn (Herb. M. A. Donk 8782), VII-1937, 66.L.141. — Kalimantan (Borneo), Bukit Raja, alt *circa* 1400 m, s. hosp., Hans Winkler 1047 (BO 3060), XII-1924, 66.L.55. — Amboina, s. loc., s. hosp., C. B. Robinson 2050, (Bur. Sci. Manila; Reliq. Robins., Pl. of Amb.), VII-XI-1913, 53.PC. 46.

MALAYSIA: Johore, Pontian Road, s. hosp., E. J. H. Corner (Singapore Field 23225), (Herb. M. A. Donk 8736), XII-1929, 66.L.134; s. loc., s. hosp., s. coll. (Dep. Agric. Fed. Malay St., Div. Pl. Path. 136), 1-XII-1954, 55.K.16.

PAPUA: Brown River, on *Tectona grandis*, K. J. White (Dep. Agric. & Livest. 6647), 20-VIII-1969, 69.TPNG.1.

CHINA: Hainan, Ling Shui Dist., Po Teng Shi (Bo Deng), on partly decayed living tree, H. Fung 20047 (Herb. Lingnan Univ., 6th Hainan Exp.), 26-29-IV-1932, 69.K.116.

PHILIPPINE ISLANDS: Palawan, Mt. Kabinbin, on dead wood, B. Reyes (Bur. Sci., Manila 50,021), 22-III-1929, 69.K.123. — Mindanao, dist. Davao, Todaya (Mt. Apo), s. hosp., A. D. E. Elmer (Philipp. Isl. Pl. 10,756), V-1909, 67.E.13. — Negros, Prov. Negros orient., Dumaguete, s. hosp., A. D. E. Elmer (Philipp. Isl. Pl. 10,017), IV-1908, 67.E.11. — Luzon, Prov. Laguna, Mt. Maquiling, profuse on large white Lauan, C. J. Humphrey 50,047 (part of Holotype of *G. applanatum* var. *philippense* Humphrey), 24-IX-1928, 53.PC.36; Prov. Bataan, s. loc., s. hosp., H. P. Curran (Forestry Bur. 19,234), XII-1909, 53.PC.22; Mountain Prov., Bontoc subprov., s. loc., s. hosp., in mossy forest, M. S. Clement (Bur. Sci., Manila 50,084) (part of Holotype of *G. applanatum* var. *laevisporum* Humphrey), II-1928, 53.PC.37.

GANODERMA BROWNII (Murrill) Gilbertson

Fig. 1c, Pl. 5 fig. 15

Elfvingia brownii Murrill, West. Polyp. 29. 1915. — *Ganoderma applanatum* var. *brownii* (Murrill) Humphr. & Leus *in* Philipp. J. Sci. **45**: 531, 565. 1931. — *Ganoderma brownii* (Murrill) R. L. Gilbertson *apud* Lowe & Gilbertson *in* Mycologia **53**: 505. 1962.

Basidioma dimidiate to subungulate, about 10 cm in radius and 7–8 cm thick. Upper surface irregular, sometimes with deep concentric grooves, dull Snuff Brown (Ridgway) with greyish blotches.

Section: cutis about 1000 μ thick, horny but fragmenting easily, sepia; context up to half the thickness of the basidioma, Auburn (Ridgway); tube-layer up to about equalling the thickness of the context but usually one third, concolorous with it.

Cutis a trichoderm (usually becoming deprived of the external hyphae in old specimens), about 1000 μ thick. Pores round, 120–165–270 μ in diam.; dissepiments 60–90–140 μ thick; distance between axes 225–255–265 μ. Basidiospores broad-ovoid, dark brown, 9.5–10.6–12 × 6.5–7.6–8 μ.

Where some abrasion by external factors has occurred, *Ganoderma brownii* has sometimes been misinterpreted since in old specimens the cutis is without hyphae protruding beyond the cutis. In younger specimens they are usually extant and Humphrey, faithful to his concept of varieties in the *G. applanatum* complex, considered this species a variety of *G. applanatum*. However there is significant difference in the spore morphology; since the size of the spores is considerably above that of the latter species or of *G. tornatum* it would seem preferable to consider such a difference sufficient for distinction at the species level; this has been done by Gilbertson.

SPECIMENS EXAMINED.—U.S.A.: California: Berkeley, Univ. Campus, Strawberry Canyon, on dead and decaying *Umbellularia*, V. S. Brown s.n., 27-IX-1913, 69.NY.17; Marin county, Alpine lake, on log of *Umbellularia californica* Nutt., J. F. Lawrence 522 (L 960.346–040), 30–I–1960, 66.L.24; Muir woods, San Francisco, on *Umbellularia californica*, Mrs. C. J. Humphrey (Herb. M. A. Donk 8738), XI-1915, 66.L.128.

GANODERMA ADSPERSUM (Schulzer) Donk—Figs. 1d, e

Polyporus adspersus Schulzer *in* Flora **61**: 11. 1878; *in* Linhart, Fungi hung. No. 55. 1882. — *Ganoderma adspersum* (Schulzer) Donk *in* Proc. Ned. Akad. Wet. (C) **72**: 273. 1969.

Polyporus linhartii Kalchbr. *in* Linhart, Fung. hung. No. 252. 1884. — *Ganoderma linhartii* (Kalchbr.) Igmándy *in* Acta phytopath. Acad. Sci. hung. **3**: 237. 1968.

Ganoderma europaeum Stey. *in* Bull. Jard. bot. Brux. **31**: 70. 1961.

Polyporus australis Fr. *sensu* Fr., Hym. europ. 556. 1874. — *Ganoderma australe* (Fr.) Pat. *sensu* Pat. *in* Bull. Soc. mycol. Fr. **5**: 71. 1889.

Through the courtesy of Dr. M. A. Donk and Dr. G. Bohus authentic specimens of *Polyporus adspersus* Schulzer and *Polyporus linhartii* Kalchbr. were located in, and loaned from, the Natural History Museum at Budapest. It is to be noted that the specimen Linhart 55 is not the type as it was collected in 1882 whereas Linhart 252 seems to be the type of *P. linhartii* as the specimen is accompanied by a diagnosis.

The cutis anatomy of both specimens is identical with that of *Ganoderma europaeum*; the spore sizes are 8.5–10.35–12 × 6.5–7.05–7.5 μ.

Schulzer did not publish a formal diagnosis in the current fashion. There are however enough characters, both morphological and anatomical, mentioned for *P. adspersus* by which his specimen can be related to *G. europaeum*. Schulzer describes the cutis as follows:—

„Bei der mikroskopischen Untersuchung fand ich den innern Bau völlig jenem verwandter Pilze [*Pol. applanatus* P. und *P. lucidus* P.] entsprechend .... Jene Fleischhyphen, welche sich der obern Pilzfläche zuwenden, treten mit sehr zarten, hyalinen Spitzen auf 0,025–0,05 Mm. über diese hervor, theilen sich in 2–3 Zweige und erzeugen an jeder Zweigspitze je eine Frucht, Sporen, die sich in gar keinem Stücke von den Sporen in den Röhrchen unterscheiden. Sie sind nämlich zuletzt purpurbraun, verkehrt-eiförmig, 0,009–0,011 Mm. lang und durchschnittlich 0,006 Mm. dick. Sie besitzen in der Mitte einen durchscheinenden, kugeligen Kern und aussen ein Exosporium, welches sich oben und seitlich an das Episporium dicht anschmiegt, unten aber weit davon getrennt ist, daher dort ein hyaliner Raum entsteht. Das

Episporium ist nämlich am untern Ende gleichsam abgestutzt, somit kürbiskernförmig. Nach dem Verschwinden des Exosporiums rundet sich das untere Ende des Episporiums ab und stellt wieder die verkehrte Eiform der Spore her."

Although Schulzer described the spores as attached by the apex he noticed that they collapsed and he also compared them to those of *P. lucidus* from which, he said, they cannot be distinguished.

It must also be noticed that Schulzer saw correctly the hyaline hyphae that branch off in the cutis. In the spore he also noticed that the spore-wall is made up of an exo- and an episporium but he does not mention the echinulae, probably because the optics he used were not powerful enough.

It is easy to recognize in his spore descriptions the spores of *Ganoderma* and as their sizes agree with those of *G. europaeum* it cannot be doubted that *Polyporus adspersus* is synonymous with the latter.

As regards *Polyporus linhartii* Kalchbr. the description that is appended to Linhart 252 could apply to many a species of *Ganoderma*; from the statement in the remarks that "Diese Art steht am nächsten zu *P. australis* Fr." it can be surmised that *G. adspersum* is involved. The specimen, however, removes all doubts; the spores measure 8.5–8.8–9.5 × 6–6.4–7 μ and the cutis anatomy is identical with that of *G. europaeum* or *G. adspersum*. The three binomials are therefore synonymous and 'adspersum' must prevail as the earliest epithet.

SPECIMENS EXAMINED.—YUGOSLAVIA: Slavonia, Vinkovce, on *Carpinus betulus*, Schulzer s.n. (Linhart, Fungi hungarici 55), XI-1882, 68.BP.1.

HUNGARY: Altenburg (apparently near Pressburg, which is now Bratislava), on *Populus nigra*, Linhart s.n. (Fungi hungarici 252), X-1883, 68.BP.2.

THE NETHERLANDS: Noord-Holland, Koog aan de Zaan, on pear tree, B. Swart (L 960.7–037), 27–IX–1932, 66.L.3.

Ganoderma kosteri Steyaert, *sp. nov.*
Fig. 1f, Pl. 1 fig. 1, Pl. 5 fig. 17

Basidioma sessile, flabelliforme, usque ad 180 mm diam. et usque ad 50 mm crassum. Pagina dorsalis concentrice corrugata, languida, brunneo-vinosa.

Sectio: cutis 1500 μ crassa, sepiacea, dura, fragilis; contextus tenuis, 3–5 mm crassus, umbrinus; tubuli usque ad 45 mm longi, umbrini, vulgo albo-striati.

Cutis anatomice anamixodermiformis, hyphis brunneis, apice subanticlinis, substantia ceracea. Pori circulares vel irregulares, 110–170–130 μ diam.; dissepimentis 30–60–120 μ crassis; axibus circa 230 μ distantibus. Basidiosporae ovoideae, vel subsphaericae, brunneae leviter fuscescentes, maturitate truncatae, 9–9.7–10.5 × 6.5–7.1–8 μ, echinulis valde conspicuis.

Basidioma sessile, flabelliform, up to 180 mm in diam. and 50 mm thick. Upper surface concentrically corrugated, dull, Blackish Brown (Ridgway).

Section: cutis 1500 μ thick, sepia, hard, fragmenting; context thin, 3–5 mm thick, Bay (Ridgway); tubes up to 50 mm long, Bay, generally striated by white lines.

Cutis of the anamixoderm type, with hyphal extremities generally anticlinal.

Pores round, often irregular, 110–170–300 μ in diam.; dissepiments 30–60–120 μ thick; distance between axes about 230 μ. Basidiospores ovoid or subspherical, brown, slightly fuliginous, 9–9.7–10.5 × 6.5–7.1–8 μ.

Although the cutis anatomy is of the anamixoderm type, it differs from that of *G. adspersum* in that the hyaline hyphae are more regularly anticlinal and do not intertwine as much as in the latter. The most marked difference lies in the reduction of the context. The maximum thickness reached at the base of Koster's specimen (66.L.1) is 13 mm but the context is nearly entirely 5 mm thick at the most. The other two specimens have almost exactly the same context and all are of a more dusky brown than is known for *G. adspersum*. In all three specimens of *G. kosteri*, although collected on two different host species and at different dates, the tubes have an almost identical layered disposition of the same thickness. They form whole solid blocks which is not observed in typical specimens of *G. adspersum*. It should be remarked that the tube layers are not interstratified by context tissue which characteristically distinguishes the three specimens from those of *G. applanatum*. All three specimens are intensively speckled or blotched by bleached mycelium or even have strands of this tissue running through context or tube layers.

By comparison the type specimens of *Polyporus adspersus* Schulz, *Polyporus linhartii* Kalchbr., and *G. europaeum* Stey. have contexts 50 mm, 36 mm, and 32 mm thick respectively.

SPECIMENS EXAMINED.—THE NETHERLANDS: Zuid-Holland, Gouda, in tuin, op *Pterocarya* sp., M. S. Koster (L 968.302–783), 13-III-1954, 66.L.1 (Holotype, fragment in BR), the other half of the basidioma (L 953.245–497); Gouda, op *Pterocarya*, M. S. Koster (L 953.245–466), 23-V-1954, 66.L.2. — Gelderland, Brummen, on *Fagus sylvatica*, F. Florschütz (Herb. M. A. Donk 3231), 23-IX-1919, 66.L.108.

Ganoderma vanheurnii Steyaert, *sp. nov.*

Figs. 1g, h, Pl. 1 fig. 2, Pl. 5 fig. 18

Basidioma sessile, ungulatum, triquetrum vel pulvinatum, languidum, olivaceum, sulcis concentricis paullum conspicuis, margine crassa sulcis profundis.

Sectio: cutis 1000 μ crassa; contextus tenuis, isabellinus, vulgo 2–5 mm crassus; tubuli usque ad 2.8 cm longi, isabellini ad sepiacei.

Cutis anatomice anamixodermiformis, ceracea, circa 130 μ crassa. Pori circulares, 100–140–170 μ diam., dissepimentis 30–70–110 μ crassis, axibus circa 210 μ distantibus. Basidiosporae ellipsoideae maturitate apice truncatae, melleae, 7–8.5–9 × 4.5–5.0–5.5 μ, echinulis paullum conspicuis.

Basidioma sessile, ungulate, triquetrous or pulvinate, up to 7.5 cm in diam. and 4.5 cm thick. Upper surface dull Saccardo Umber (Ridgway) with shallow concentric grooves; margin generally thick with deep grooves.

Section: cutis about 1000 μ thick, horny, Sepia (Ridgway); context thin, 2–5 mm thick up to 15 mm at the base; tubes up to 28 mm long, Tawny Olive (Ridgway) to Saccardo Umber (Ridgway).

Cutis of the anamixoderm type, horny, circa 130 μ thick. Pores round, 100–140–

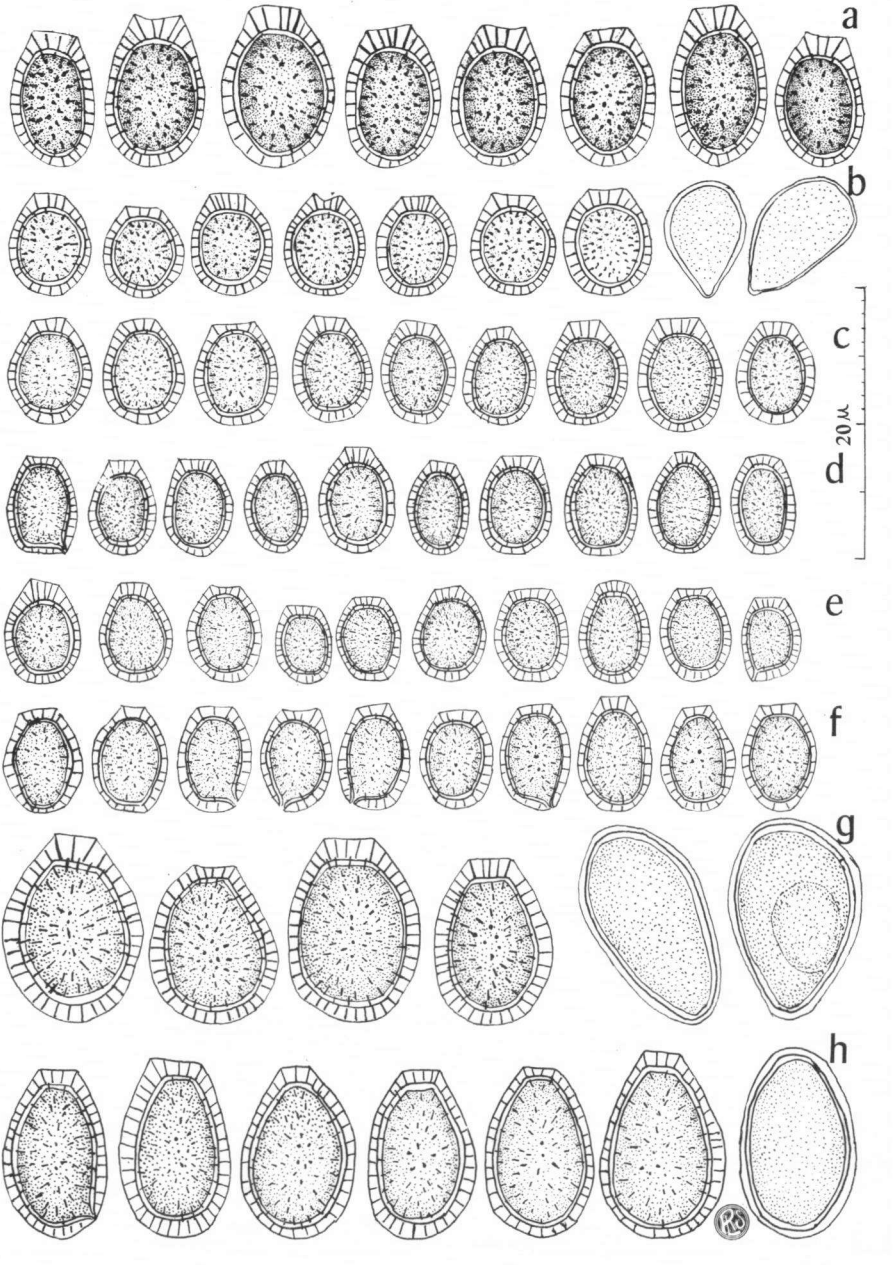

Fig. 2

170 μ in diam.; dissepiments 30–68–110 μ thick, distance between axes about 210 μ. Basidiospores ellipsoid, truncate at maturity, the echinulae little visible, chamois, 7–8.6–9 × 4.5–5.0–5.5 μ.

There is some variation in the tube length. Basidiomata 66.L.119 and 121 have the thinnest context and the longest tubes, whereas 66.L.122 and 123 have tubes only 3–4 mm long. Basidioma 66.L.120 has intermediate dimensions. Only basidiomata 66.L.119 and 121 sporulated. No differences in the cutis anatomy can be recorded for any of the five specimens.

SPECIMENS EXAMINED.—INDONESIA: J a v a, Probolinggo, Bremi, s. hosp., W. C. van Heurn (Holotype, Herb. M. A. Donk 13,596; fragment in BR), VII–1935, 66.L.119, other basidiomata: 66.L.120, 121, 122, 123.

Ganoderma manoutchehrii Steyaert, *sp. nov.*
Fig. 2a, Pl. 6 fig. 19

Basidioma applanatum, subungulatum, circiter 100 mm diam.; pagina dorsalis valde irregularis, verrucosa, brunneo-vinosa, nitens.

Sectio: cutis valde crassa, circa 2400 μ, olivacea sed centro fulva, ceracea; contextus 4–5 mm crassus, ferrugineus; tubuli stratosi, contextu nullo interposito, quidque stratum 6–13 mm crassum; in toto 16–20 mm, testacei.

Cutis subcharacodermiformis, hyphis hyalinis suberectis leviter intricatis et hyphis brunneis erectis subparallelibus. Pori circulares, 160–181–210 μ diam; dissepimentis 40–45–60 μ crassis; axibus circa 225 μ distantibus. Basidiosporae ovoideae, maturitate truncatae, obscure brunneae, 9.5–10.6–12 × 6.5–7.0–8.5 μ, echinulis conspicuis.

Basidioma flat, subungulate, circa 100 mm in diam.; upper surface very irregular, Warm Blackish Brown (Ridgway), laccate.

Section: cutis very thick, about 2400 μ thick, Mummy Brown (Ridgway) with a central zone Ochraceous Tawny (Ridgway), horny; context 4–5 mm thick, Kaiser Brown (Ridgway); tube layers stratified without intervening layers of context tissue, 16–20 mm thick, Cacao Brown (Ridgway).

Cutis of a type close to characodermiform, viz. with the hyaline hyphae suberect, slightly intertwining and the brown hyphae erect, subparallel. Pores round, 160–181–210 μ in diam.; dissepiments 40–45–60 μ thick; distance between axes 225 μ. Basidiospores ovoid, truncate at maturity, dark brown, 9.5–10.6–12 × 6.5–7.0–8.5 μ; echinulae conspicuous.

Dedicated to the memory of my esteemed colleague, Professor of Plant Pathology at the Karadj Faculty of Agronomy, Iran, Dr. Ali Manoutchehri.

A cursoryexaminati on might lead to referring this basidioma to *G. pfeifferi* since the

EXPLANATION OF FIGURE 2

Fig. 2. Basidiospores. — a. *Ganoderma manoutchehrii*, Manoutchehri, BR (Holotype). — b, c. *G. mirabile*: b, Merrill 3693, 69.S.1 (holotype of *Fomes fusco-pallens*); c, Corner, Sing. Field 24.199, 66.L.133. — d, e. *G. philippii*: d, Nongnong (BO 1028), 66.L.88; e, Nongnong 474a (BO 1028), 66.L.35. — f. *G. dejongii*, de Jong (BO 14,994), 55.K.8. — g, h. *G. williamsianum*: g, Williams, 69.NY. 12 (Holotype); h, 66.L.15.

spores have similar sizes, but the cutis anatomy is different, the skeletal hyphae reaching the upper level of the cutis and the hyaline hyphae being suberect and more or less intertwining.

SPECIMENS EXAMINED.—IRAN: Ramsar, Mazanderan, on *Acacia* sp., A. Manoutchehri s.n. (Holotype, fragment in BR), 15-IV-60.

GANODERMA MIRABILE (Lloyd) Humphrey
Figs. 2b, c, Pl. 1 fig. 3, Pl. 6 fig. 20

Fomes mirabilis Lloyd, Mycol. Writ. **3** (Letter 33): 3. 1911 ("Ussher"). — *Ganoderma mirabile* (Lloyd) Humphrey *in* Mycologia **30**: 332. 1938.
Fomes fusco-pallens Bres. *in* Hedwigia **56**: 294. 1915.

Basidioma sessile, dimidiate, 23 cm radius; upper surface covered by small warts, Sepia (Ridgway).
Section: cutis about 1200 μ thick, horny, fragmenting; context 7–8 mm thick, up to 40 mm at the base, Cinnamon Buff (Ridgway); tube layer up to 8 mm thick, Snuff Brown (Ridgway).
Cutis of the anamixoderm type with hyphae subparallel, densely impregnated by melanoid substances thus giving the illusion of brown hyphae. Context of light coloured hyphae 3 μ thick with no skeletal hyphae. Pores round, 100–125–150 μ in diam.; dissepiments 50–70–110 μ thick; distance between axes about 200 μ. Basidiospores ovoid to subspherical, chamois to brownish yellow, truncate at maturity, 7–7.7–8.5 × 5.5–6.0–6.5 μ.

Bresadola's original description of *Fomes fusco-pallens* states that the spores are globose and 3.5–4 μ in diameter; this would contradict the above-accepted synonymy. The loan of the type specimen from Stockholm showed however that it had spore and pore sizes and shapes identical with those of *Fomes mirabilis* specimens. The two taxa are also morphologically alike; all this confirms Humphrey's opinion that they are conspecific and that both have typical, although subglobose, *Ganoderma* spores. It may be reminded that Lloyd had already pointed out this synonymy in 1922.

SPECIMENS EXAMINED.—PHILIPPINE ISLANDS: Luzon, Bataan, s. hosp., E. D. Merrill 3693 (holotype of *Fomes fusco-pallens* Bres.), 69.S.1.
MALAYSIA: Pahang, Tembeling, parasitic on large Dipterocarp tree, E. J. H. Corner (Singapore Field 24,199), (Herb. M. A. Donk 8737), XI-1930, 66.L.133. — "Straits Settlements" s. loc., s. hosp., C. B. Ussher 12 (C. G. Lloyd Mycol. Coll. 38,731); IV-1910, 55.BPI.10 (Holotype) and 62.K.19.

GANODERMA PHILIPPII (Bres. & Henn.) Bres.
Figs. 2d, e, Pl. 1 fig. 4, Pl. 6 figs. 21, 22

Fomes philippii Bres. & Henn. *apud* Sacc., Syll. Fung. **9**: 180. 1881. — *Ganoderma philippii* (Bres. & Henn.) Bres., Iconogr. mycol. **21**: text to pl. 1014. 1932.
Fomes pseudoferreus Wakef. *in* Bull. misc. Inf. Kew **1918**: 208. — *Ganoderma pseudoferreum* (Wakef.) Over. & Steinm. *apud* Over. *in* Bull. Jard. bot. Buitenz. III **7**: 437. 1925.

There is considerable variation in the morphology of the basidiomata although the anatomical and spore characters are constant. The type specimen of *F. pseudoferreus*, kept in Kew, is unfortunately a small, non-fertile, misshapen specimen (6.5 cm in radius by 3.5 cm thick), almost useless for describing the gross morphology. On the other hand the type specimen of *G. philippii* is normal in shape but only a quarter or a third of it remains in Berlin. Both specimens have however a Bone Brown (Ridgway) upper surface.

In the twenty odd specimens available most basidiomata are very flat and thin with the upper surface Army Brown (Ridgway) to Bone Brown. Some have the upper surface finely concentrically grooved but with silvery patches and lines. Others have no apparent grooves while still others have a most irregular and knobbly upper surface. The basidiomata are mostly thin, not more than 10 mm towards the middle of the radius or sometimes in knobbly specimens up to 30 mm thick. In contrast the context colours are very constant, Tawny to Russet (Ridgway), interspersed with tiny, shiny, horny layers. The context seen in section is often marked by concentric lines of light and dark brown. Under the cutis there is a light brownish yellow zone. Tubes one-layered, 4–9 mm long, whitish ochraceous tawny, not matched in the Ridgway scale.

Cutis of the anamixoderm type (no external hyphae). Pores round, 80–125–240 μ in diam.; dissepiments 29–55–130 μ thick; distance between axes 160–180–205 μ. Spores obovoid, 6–7.5–8.5 × 4–5.2–8 μ, chamois. Only one specimen bears non-echinulate spores mixed with the normal 7–7.9–9.5 × 5.5–5.7–6 μ.

SPECIMENS EXAMINED.—INDIA: West Bengal, Sree mai Paliyn (low Chillagong hills), dead standing tree, R. S. Runge 470 (Herb. M. A. Donk 8727), 29-II-1921, 66.L.125.

BURMA: Mergui, s. hosp., T. Philippi s.n. (Holotype), 1846, 70.B.4.

MALAYSIA: s. loc., *Hevea brasiliensis*, K. P. Johr 858, (IMI 109,651), comm. 8-IX-1964, 68.K.48. — Selangor, Kuala Lumpur, s. hosp., W. N. C. Belgrave (holotype of *Fomes pseudoferreus* Wakef.), 1917. 55.K.6; Kuala Lumpur, *Hevea* stump no. 6, s. coll. (R.R.I.M.), 63.K.18–19; Sungei Lalang (20 miles south of Kuala Lumpur), s. hosp., J. Hadley, 1967, 69.K.19; Sungei Buloh Exp. Stn, *Hevea brasiliensis* (diseased rubber stump incubated under conditions ideal for continuous growth and spore production), B. Sripathi Rao (R.R.I.M. 871), IV-1970, 70.RRIM. 2; Sungei Buloh Expt Stn, *Hevea brasiliensis* dead as a result of red root disease, B. Sripathi Rao (R.R.I.M. 870), IV–1970, 70.RRIM.1; Kuala Lumpur, diseased *Hevea* stump, Lim Kow Ming (R.R.I.M. 877), 8–I–1971, 71.RRIM.1. — Pahang, Kuala Tekai, s. hosp., E. J. H. Corner (Singapore Field 24,890), 7-VI-1931, 55.K.9; Tembiling, s. hosp., E. J. H. Corner (Singapore Field 24,892), s. dat., 55.K.10. — Johore, Gunong Panti, parasitic at foot of large tree, E. J. H. Corner (Singapore Field 24,889), 16-IV-1931, 55.K.35.

SINGAPORE: Botanic Gardens, s. hosp., E. J. H. Corner (Singapore Field 24,887), 20-VIII-1931, 55.K.12; ditto (Singapore Field 24,888), 24-VIII-1931; ditto, E. J. H. Corner (Singapore Field 24,885), 28-VIII-1931, 55.L.11.

INDONESIA: Java, Buitenzorg, s. hosp., F. von Höhnel 1907–08, 69.K.136, 137; Hortus bogoriensis, afstervende *Albizia* boom, Nongnong (BO 1028), 66.L.35, 88; Buitenzorg, rottende stomp, C. van Overeem (BO 874), V–1922, 66.L.31; Depok (Natuurmonument) bij Buitenzorg, aan de voet van rottende stammen, J. G. B. Beumée (BO 2147), IV-1925, 66.L.52; West Java, s. loc., *Hevea*-boom, van der

Meulen (BO 8642), IX-1924, 66.L.87. — Sumatra, Bergen Est., *Hevea*, J. van Baalen (BO 14,992), VII-1934, 66.L.59, 60.

Ganoderma dejongii Steyaert, *sp. nov.* —Fig. 2f

Basidioma dimidiatum, semi-circulare, circiter 15 cm diam; pagina dorsalis applanata, olivaceo-nigra, languida; margo crassa alba.

Sectio: cutis leviter crassa, circiter 120 μ, nigra, subnitens; contextus usque ad 2/3 crassitudinis basidiomatis crassus, umbrinus, concentrice zonatus; tubuli unistratosi usque ad 1/3 crassitudinis basidiomatis longi, sepiacei.

Cutis anatomice anamixodermiformis, hyphis brunneis subparallelis leviter imbricatis. Pori circulares, 90–125–150 μ diam, dissepimentis 50–75–100 μ crassis, axibus circiter 200 μ distantibus. Basidiosporae ovoideae, maturitate truncatae, leviter brunneae, 7.5–7.9–8.5 × 5.5–5.6–6 μ.

Basidioma dimidiate, semi-circular, about 15 cm in diam.; upper surface applanate, Andover Green (Ridgway); about 30–40 mm thick at the base; margin thick (at least in growing specimens), white.

Section: cutis of medium thickness, 120 μ thick, black, somewhat shiny; context about 2/3 of the total thickness, Auburn (Ridgway), with concentric growth lines. Tubes about one third of the thickness of the basidiomata, Sepia (Ridgway).

Cutis of the anamixoderm type, made up mostly of subparallel anticlinal, brown hyphae, loosely intermixed. Pores round, 90–125–150 μ in diam.; dissepiments 50–75–100 μ thick; distance between axes about 200 μ. Basidiospores ovoid, truncate at maturity, light brown, 7.5–7.9–8.5 × 5.5–5.6–6 μ.

The specimen listed below was determined *in schedulis G. pseudoferreum* (Wakef.) Over. & Steinm. Although the basidiospores are undistinguishable from those of the latter species, the cutis anatomy, on the other hand, is very much at variance and so is the morphology of the basidiomata.

SPECIMEN EXAMINED.—INDONESIA: Java, Bogor (Buitenzorg), on *Albizia* sp., de Jong (Holotype, BO 14,994), VII–1934, 55.K.8.

GANODERMA WILLIAMSIANUM Murrill

Figs. 2g, h, 3a, b, Pl. 7 figs. 23, 24

Ganoderma williamsianum Murrill *in* Bull. Torrey bot. Club **34**: 478. 1907.

Basidioma generally dimidiate, semi-circular but becoming triquetrous with age, up to 15 cm in diam. and from 15 to 60 mm thick; upper surface dull brown or Hair Brown (Ridgway), with many narrow grooves; margin usually thin.

Section: cutis very thin, breaking easily, 20–30 μ thick; context usually half the thickness of the basidioma, sometimes only 3–4 mm thick, Russet (Ridgway); tubes usually up to 30 mm long but in ungulate specimens up to 50 mm, Cinnamon Brown (Ridgway).

Cutis of the anamixoderm type but composed of hyaline hyphae only, strongly impregnated with melanoid substances. Pores round, 100–160–250 μ in diam.; dissepiments 20–65–140 μ thick; distance between axes about 225 μ. Basidiospores ovoid, truncate at maturity, the echinulae thick and relatively few, slightly reddish brown, 9.5–12–14.5 × 6.5–8.5–10 μ; non-echinulate spores none too abundant, 11–13.1–14.5 × 7–8.7–10 μ. Hyphae grow in characteristic wavy or zig-zag manner.

The cutis anatomy of this species is unique. It can be placed more or less in the same group as *G. adspersum* but the long terminal, hyaline hyphae impregnated with melanoid substances sets it sharply apart. The most characteristic feature however is certainly the wavy course of the brown hyphae, unknown in any other species.

Holttum 11,355 is mentioned because of a correction that has to be made with regard to it. This specimen was determined by Stevenson & Cash (*1936*: 85) as *Fomes Petchii* Lloyd but it belongs unmistakably to *G. williamsianum*.

SPECIMENS EXAMINED.—PHILIPPINE ISLANDS: Luzon, Prov. Bataan, Mt. Mariveles, Lamao River, s. hosp., R. S. Williams (Expl. of the Philippines 152; Holotype), I-1904, 66.NY. 12.

MALAYSIA: Pahang, Fraser Hill (alt. 4000 ft), s. hosp. R. E. Holttum 11,355, (Lloyd Mycol. Coll. 42,145), 4-IX-1923, 69.BPI.1, *vide infra*; Tembeling, s. hosp., E. J. H. Corner Singapore Field 23,693 (Herb. M. A. Donk 8734), 20-XI-1930, 66.L.124.

INDONESIA: S. loc., s. hosp., s. coll. (originally named *Boletus Apus odoratus*; *Ganoderma japonicum*, det. Bresadola), 66.L.15, 16. — Java, Hortus bogoriensis, stam van *Cinnamomum* sp. C. van Overeem (BO 161), VIII-1923, 66.L.76, 77, 78; Hortus bogoriensis, s. hosp., C. van Overeem (BO 619), I-1922, 66.L.93; Hortus bogoriensis, s. hosp., W. M. Docters van Leeuwen 3794 (BO 1638), 17-V-1919, 66.L.73, 74; Gunung Bundur, doode en afstervende stammen van *Albizia*, K. B. Boedijn 3635 (BO 14,494), 21-V-1933, 66.L.44; G. Salak, s. hosp., L. G. M. Baas Becking (BO 16,701), IV-1939, 66.L.36, 37. — Sumatra: Sebesie Isl., s. hosp., W. M. Docters van Leeuwen (BO 1584), IV-1921, 66.L., 94, 97, 98; Sumatra's Oostkust, Onderneming Haboko, s. hosp., W. M. Docters van Leeuwen 3349 (Bo. 1432), II-1919, 66.L.75, 95, 96.

Ganoderma donkii Steyaert, *sp. nov.*

Fig. 3c, Pl. 2 fig. 5, Pl. 5 fig. 16

Basidioma sessile, semi-circulare, triquetrum, 10–11 cm diam., ad basim 4–5 cm crassum; pagina dorsalis radialiter corrugata, concentrice cingulis griseis, cingulis latis olivaceis et cingulis angustis olivaceo-bubalinis zonata; margine similiter colorato.

Sectio: cutis 1000 μ crassa, sepiacea, dura; contextus 5–35 mm crassus, umbrinus, cum multis concretionibus directione hypharum parallelibus; tubuli 15 mm longi, umbrini.

Cutis anatomice anamixodermiformis, hyphis apice dense intricatis, ceracea. Pori circulares vel irregulares, 100–165–220 μ diam., dissepimentis 50–70–100 μ crassis, axibus circa 235 μ distantibus. Basidiosporae ovoideae, leviter brunneae, maturitate truncatae, 7.5–8.25–9 × 5.5–6.05–7 μ.

Basidioma sessile, semi-circular, triquetrous, 10–11 cm in diam. and 4–5 cm thick at the base; upper surface radially corrugated, concentrically zoned of Pearl Grey (Ridgway), wide bands dark Grayish Olive (Ridgway) and thin bands of Colonial Buff (Ridgway); wide margin of same colour.

Section: cutis 1000 μ thick, sepia, hard; context 5–35 mm thick, Brussels Brown (Ridgway), with many linear, horny deposits following the direction of the hyphae; tubes 15 mm long, concolorous with the context.

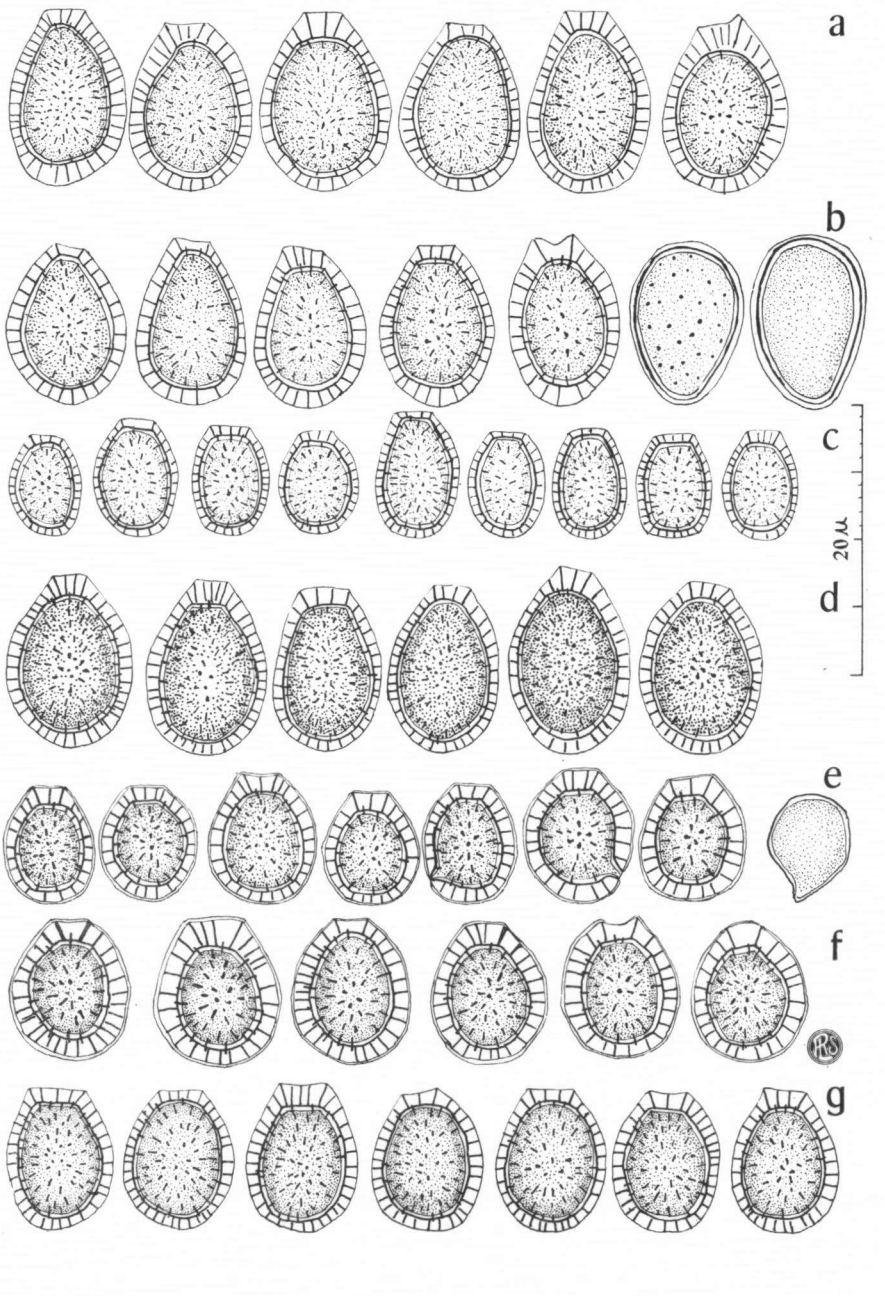

Fig. 3

Cutis of the anamixoderm type, with the hyphal extremities closely interwoven, hard. Pores round or irregular, 100–165–220 μ in diam.; dissepiments 50–70–100 thick; distance between axes about 235 μ. Basidiospores ovoid, slightly brownish, truncate at maturity, 7.5–8.25–9 × 5.5–6.05–7 μ.

SPECIMEN EXAMINED.—INDONESIA: West Java, s. loc., s. hosp., M. A. Donk 13,598, s. dat., 66.L.138 (Holotype), 66.L.139, 140 (Isotype).

Ganoderma puglisii Steyaert, *sp. nov.*
Fig. 3d, Pl. 2 fig. 6, Pl. 7 fig. 25

Basidioma sessile, dimidiato-ungulatum, saepe satis magnum, 36 cm diam. et 10–12 cm crassum, pagina dorsalis concentrice profunde corrugata, languida, griseo-olivacea.

Sectio: cutis 70–900 μ crassa, dura, ceracea, sepiacea; contextus tenuis, 5–13 mm crassus, umbrinus (cum maculis mycelii albi); tubuli usque ad 100 mm longi, stratosi, strata 5–20 mm crassa, vulgo albostriata, contextu nullo interposito, testacea.

Cutis anatomice characodermiformis, elementis apice leviter inflatis, ceracea. Pori circulares, 210–230–280 μ diam., dissepimentis 30–55–60 μ crassis, axibus circa 285 μ distantibus. Basidiosporae ovoideae, brunneo-fuscecentes, maturitate truncatae, 12–12.85–14 × 8–8.7–9 μ, echinulis crassis valde conspicuis.

Basidioma sessile, dimidiate, ungulate, becoming relatively large, 36 cm in diam. and 10–12 cm thick; upper surface deeply concentrically corrugated, dull, olivaceous-black.

Section: cutis 700–900 μ thick, horny, sepia. Context thin, 5–13 cm thick, Hazel (Ridgway), with flecks of white mycelium; tubes up to 100 mm long, finely striate with white, stratified; layers up to 5–20 mm thick, without intervening layers of context, Pecan Brown (Ridgway).

Cutis of the characoderm type, its elements slightly inflated at their extremity. Pores round, 210–230–280 μ in diam.; dissepiments 30–55–60 μ thick; distance between axes about 285 μ, Basidiospores ovoid, brown, more or less fuliginous, truncate at maturity, 12–12.85–14 × 8–8.7–9 μ.

This species, named after its Italian collector, is very close to *G. kosteri* Stey, but the cutis reminds one more of *G. pfeifferi* Bres. The spore size is however quite distinctive. In consulting Saccardo (*1916*) it was noticed that none of the eight Italian species and one variety he described has the large spores of *G. puglisii*. It would appear therefore that this species had remained undetected.

SPECIMEN EXAMINED.—ITALY: Potenza, Faggeto (30 km from Casso Castalda), Puglisi 1 (Holotype, BR), 19-VI-1965.

EXPLANATION OF FIGURE 3

Fig. 3. Basidiospores. — a, b. *Ganoderma williamsianum*: a, Holttum 11,355, 69.BPI.1; b, Boedijn 2625, 66.L.45. — c. *G. donkii*, Donk 13.598, 66.L.138. — d. *G. puglisii*, Puglisi 1, BR (Holotype). — e, f. *G. bruggemanii*: e, Bruggeman (BO 7304), 66.L.47 (Holotype); f, Donk 58, 66.L.50. — g. *G. tropicum*, Junghuhn, 66.L.9.

Ganoderma bruggemanii Steyaert, *sp. nov.*
Figs. 3c, f, Pl. 2 fig. 7, Pl. 7 fig. 26

Basidioma sessile vel pedicellatum, dimidiatum vel ungulatum; pagina dorsalis saepe laccata, gibbulosa, concentrice striata, margine albo et crasso.

Sectio: cutis tenuis, 110–130 μ crassa, atra; contextus 5–20 mm crassus, ochraceus, fulvo-zonatus, ad medium avellaneus; tubuli usque ad 35 mm longi, umbrini.

Cutis anatomice hymeniodermiformis, elementis claviformibus 30–40 μ longis, 8–12 μ diam. Contextus hyphis hyalinis et melleis in zonis hyphis densius coloratis et crassioribus intermixtis. Pori circulares, 180–260–370 μ diam.; dissepimentis 30–55–90 μ crassis, axibus circa 315 μ distantibus. Basidiosporae subsphaericae, 8.5–10–12 × 6.5–8.2–9.5 μ, luteo-brunneae.

Basidioma sessile or pedicellate, dimidiate or ungulate; upper surface normally laccate, black, sometimes dull reddish-black, coarsely striate and concentrically plicate; margin black, or thick and white.

Section: cutis thin, 110–130 μ thick, black; context 5–20 mm thick, Cinnamon Buff (Ridgway), with central zone Tawny Olive (Ridgway). Tubes up to 35 mm long, Saccardo Umber (Ridgway).

Cutis hymeniodermiform, its elements clavate, 35–40 μ long, 8–12 μ in diam. Context of thin hyphae, intermixed in the tawny olive zone with thicker, dark brown hyphae. Pores round, 180–260–370 μ in diam.; dissepiments 30–55–90 μ thick; distance between axes about 315 μ. Basidiospores subspherical, yellowish-brown, 8.5–10–12 × 6.5–8.2–9.5 μ.

G. bruggemanii is morphologically very close to *G. ostracodes* Pat. from La Pho, Tonkin (North Vietnam), Demange 328 (FH 3344) although according to the type specimen the latter is of a dull dark brown colour; the context and tube layers however are in both cases concolorous, Cinnamon Buff (Ridgway).

On the other hand the cutices are anatomically very different; the elements of *G. ostracodes* are very thin and more or less wavy, whereas in *G. bruggemanii* they are thick, straight, club-shaped, and well individualized. The spores in *G. ostracodes* are also smaller, being 7–7.35–7.5 × 5.5–5.7–6 μ.

SPECIMENS EXAMINED.—INDONESIA: Java, Tjibodas, Gunung Gedeh, s. hosp., M. L. A. Bruggeman (BO 7304), 14-I-1926, 66.L.47 (Holotype BO, fragment in BR); Tjibodas, G. Gedeh. s. hosp., K. B. Boedijn & M. A. Donk (Herb. M. A. Donk 8753), 8-VII-1934, 66.L.111; G. Patuha, above Tjimanggu, s. hosp., M. A. Donk 58 (BO 18,243), 24-IX-1941, 66.L.50, 51.

GANODERMA TROPICUM (Jungh.) Bres.
Figs. 3g, 4a, Pl. 2 fig. 8, Pl. 8 fig. 28

Polyporus tropicus Jungh. *in* Verh. Bataviaasch Genootsch. **17** (II): 63. 1838 ["1839"]. — *Ganoderma tropicum* (Jungh.) Bres. *in* Annls mycol. **8**: 586. 1910.
Ganoderma oroleucum Pat. & Har. *in* Bull. trimest. mycol. Soc. Fr. **22**: 118. 1906.

Basidioma dimidiate, flabelliform, up to 12 cm in diam.; upper surface usually black, laccate with fine, radial and concentric folds or grooves, with white margin

when in full growth; pore surface white when fresh, Cinnamon to Clay (Ridgway) when dry.

Section: cutis thin, about 65–70 μ thick; context up to 10 mm thick, divided about equally in a Cinnamon (Ridgway) upper part and a Walnut (Ridgway) lower part next to the tube layer; tube layer up to 10 mm thick, one-layered, Verona Brown (Ridgway).

Cutis hymeniodermiform, its elements subovoid to subcylindrical, 30–35 × 5–6 μ. Context in the upper part made up of light coloured hyphae 3 μ thick, those of the darker layer with brown hyphae up to 4.5 μ thick. Pores round, 80–145–240 μ in diam.; dissepiments 20–55–190 μ thick; distance between axes about 205 μ. Basidiospores ovoid, brown chamois, 8.5–9.9–12 × 6–7.3–8 μ.

SPECIMENS EXAMINED.—INDONESIA: J a v a: s. loc., s. hosp., F. W. Junghuhn (L 910.222–3540), s. dat., 66.L.9 (Holotype); Hortus bogoriensis, s. hosp., s. coll. (BO 7306), XII-1924, 66.L.69; Klangon bij Madiun, op *Cassia javanica*, L. G. E. Kalshoven (1665a) (BO 1920), II-1925, 66.L.105; between Tjibodas and Tjibeureum, s. hosp., J. Westenberg (BO 17,132) 13-VII-1929, 66.L.86; Surabaja, Simpang Park, op een dood boom-stompje, W. C. van Heurn (herb. M. A. Donk 8762), III-1934, 66.L.116; Surabaja, s. hosp., W. C. van Heurn (herb. M. A. Donk 8749), s. dat., 66.L.126, 127; Surabaja, s. hosp., W. C. van Heurn (herb. M. A. Donk 8750), XII-1933, 66.L.131. — S u m a t r a, Sumatra's Westkust, Batang Palupa(h) (1000 m), aan de voet van dode boomstam, E. Jacobson (BO 6813), 19-VII-1924, 66.L.82.

The Paris Museum specimens Zollinger, Plantae javanicae 2087, 53.PC.9 and Java, s. loc., Serre (Consul de France), 53.PC.15 belong to this species.

Ganoderma weberianum (Bres. & Henn.) Steyaert, *comb. nov.*
Figs. 4b, c, d, e, Pl. 3 fig. 9, Pl. 8 figs. 29, 30

Fomes weberianus Bres. & Henn. *in litt. apud* Sacc., Syll. Fung. **9**: 174. 1891.
Ganoderma rivulosum Pat. & Har. *in* Bull. trimest. Soc. mycol. Fr. **22**: 119. 1906.

Basidioma sessile to long, horizontally pedicellate. Pileus flabelliform to conchate, up to 13 cm in diam., Blackish Brown (Ridgway) to Mars Violet (Ridgway) gradually changing to Orange Rufous (Ridgway) towards the margin, which is pure white only at the very edge, rivulose with narrow grooves. Stipe, when present, usually short and stumpy but sometimes up to 11 cm long and only 7–8 mm in diam.

Section: cutis very thin, only 20–30 μ thick, context up to 15 mm thick, Light to Warm Buff (Ridgway), Buckthorn Brown (Ridgway) near the tube layer. Tube layer at most half the thickness of the basidioma, concolorous with the lower part of the context.

Cutis hymeniodermiform, the elements either 30 μ long by 7–8 μ thick at the tip or 20 μ long by 10–12 μ thick, in the latter case with thick deposits of melanoid substances within the cutis elements along the cell wall, leaving an empty central column (see comments below). Context made up of thin, yellowish hyphae, without brown hyphae, often with an abundance of gasterospores, in which case the cutis elements are of the second type, short and thick; frequently also with only a few gasterospores, the cutis is then of the first type; exceptionally only without or with few gasterospores. Pores round, 80–140–240 μ in diam.; dissepiments 20–60–180 μ

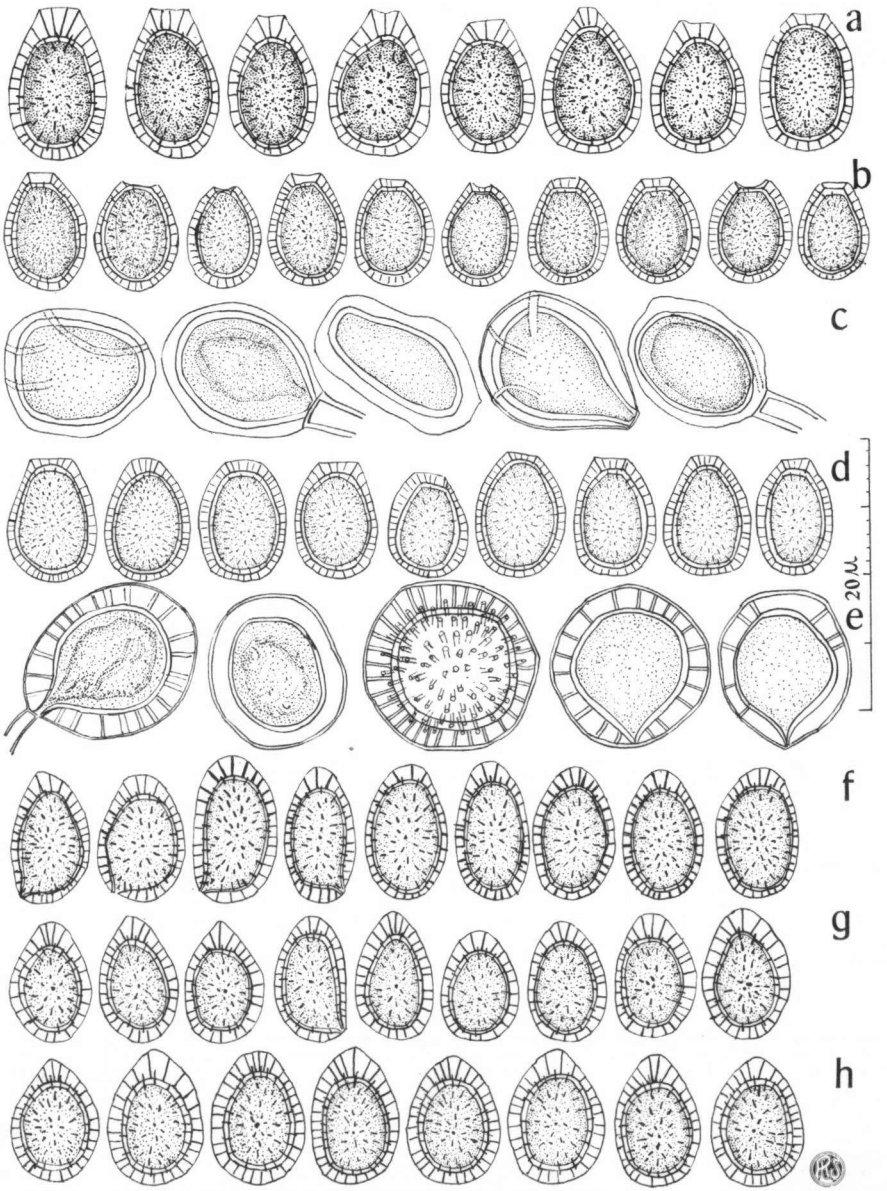

Fig. 4. Basidiospores (mainly). — a. *Ganoderma tropicum*, Kalshoven 1665a, 66.L.105. — b–e. *G. weberianum*: b, Boedijn 1035, 66.L.57, basidiospores: c, ditto, gasterospores; d, Donk (BO 18,030), 66.L.72, basidiospores; e. ditto, gasterospores. — f–h. *G. flexipes*: f, Eberhardt 103, 53.PC. 44; g, Joshi (holotype of *G. lucidum* f. *naiae*); h, Maas Geesteranus 14,510, 66.L.8.

thick; distance between axes about 195 μ. Basidiospores ovoid, thin-walled, the echinulae barely visible, very light yellowish, 6–8.0–10 × 4.5–5.9–7 μ. Gasterospores generally spherical but often spindle-shaped, normally with concentric double walls kept apart by columns or partitions 1–1.5 μ high, sometimes with single walls or with double walls without columns or partitions.

It seems that the basidiospores have lost much of their propagation potential; many basidiomata bear either few normal spores or the latter may be non-echinulate. In other instances gasterospores may be produced profusely; in some specimens the context may be choked up with them. It probably means that they play an important rôle in the propagation of the fungus.

It should be noted that the gasterospores may vary to a large extent in size and shape. If the majority of them are spherical, double-walled with cristae separating the walls, a high proportion of the gasterospores are either spherical but lacking the cristae or are variable in shape and cristate or not cristate.

Although the type localities for *G. weberianum* and *G. rivulosum* are Samoan and Javanese respectively, the species has probably a world wide tropical distribution. It is at least abundant in Africa and probably extant in tropical America although no specimen has been available from this region.

As to differences in the cutis anatomy, either the cutis elements are long, relatively narrow and with very little deposit of melanoid substances or they are short and thick with heavy deposit of melanoid substances within the elements. Taking into consideration the existence of these two types of cutis anatomy one could be tempted to believe in the existence of two distinct taxa. Yet, all the other characters, such as gross morphology, spores, gasterospores, sizes of the pores are absolutely identical. The difference in cutis anatomy must then have a reason.

If one sorts out the iconography of the examined specimens and arranges them according to the two types of cutis anatomy, one is struck by the difference in gasterospore development. Those of the first type of cutis anatomy, viz. those with long and narrow cutis elements, have very few gasterospores (Fig. 29) whereas those with an abundance of this kind of spores have a cutis anatomy of the second type (Fig. 30). On examining the two microphotographs it can be noticed that in the latter there is a relative paucity of hyphae producing cutis elements. This indicates that the gasterospores are produced at the expense of the hyphae. As lesser hyphae arrive at the cutis level their tips find more space to expand than in those basidiomata with relatively few gasterospores, where the hyphae reaching the cutis level are much more numerous. Their tips therefore have individually much less room to expand, and the cutis elements are for that reason thinner and more elongated.

The latter type should be considered normal. It has still to be explained what produces the abundance of gasterospores and consequently the other type of cutis anatomy. An explanation might perhaps be found by observing the stage of decay of the host. A possible hypothesis might be that the further the decay has advanced the more the fungus must raise its propagation potential and the more gasterospores are produced. This is perhaps an anthropocentric manner of reasoning but the

suggestion amounts to assuming either an abundance or a dearth of nutriment.

It happens that the holotype specimens of *Fomes weberianus* and *Ganoderma rivulosum* both have the cutis anatomy with the long and narrow elements, although in the type of *G. rivulosum* the elements are somewhat more swollen than in that of *G. weberianum*.

The variation in the cutis anatomy is also observable in the African specimens.

SPECIMENS EXAMINED.—SAMOA ISLANDS; s. loc., s. hosp., G. Weber (Holotype), s. dat., 70.B.5.

INDONESIA: J a v a: Gedangan, Onderzoek naar de flora der Djatibossen, Pilawa 2639 (BO 16,586), 17-VII-1936, 66.L.56; Island Nusa Kambangan, op hout, K. B. Boedijn 1035 (BO 12,054), s. dat., 66.L.57, 58; Rawah near Tangerang, on rotten stumps which are inundated several times a year, alt. 2500 m, M. A. Donk R7 (BO 18,030), s. dat., 66.L.70, 71, 72; Buitenzorg (Bogor), Hortus bogoriensis, s. hosp., J. Massart 827 (BO 3345), XI-1894, 66.L.79; Hortus bogoriensis, aan de voet van *Photinia serrulata*, C. en D. van Overeem-de Haas 25 (BO 523), 25-II-1921, 66.L.83; Surabaja, stadstuin, s. hosp., W. C. van Heurn (herb. M. A. Donk 8745), IV-1935, 66.L.129, 130; Surabaja, op een reeds sedert jaren dooden stronk, in een stadstuin, W. C. van Heurn (herb. M. A. Donk 8747), II-1936, 66.L.109, 110; Surabaja, s. hosp., W. C. van Heurn (herb. M. A. Donk 8748), 2-IV-1936, 66.L.117, 118; Surabaja, op een dooden boomstronk, W. C. van Heurn (herb. M. A. Donk 8744), 5-XI-1935, 66.L.132. — I r i a n B a r a t (W. New Guinea), Meervlakte, in een bosrand, H. J. Lam 1089 (BO 2255), 8-IX-1920, 66.L.53, 54.

GANODERMA FLEXIPES Pat.

Figs. 4f, g, h, Pl. 3 fig. 10, Pl. 9 fig. 31

Ganoderma flexipes Pat. *in* Bull. trimest. Soc. mycol. Fr. **23**: 75. 1907.
Ganoderma lucidum var. *naiae* Chona & Munjal *in* Indian Phytopath. **8**: 189. 1956 ("1955").

Basidioma pulvinate, up to 85 mm in diam.; stipitate; upper surface very irregular, warty, vaguely plicate, Roods Brown (Ridgway); stipe up to 170 mm long, 15 mm thick, but sometimes nearly sessile.

Section: cutis thin, about 150 μ thick, soft, Roods Brown (Ridgway); context mostly thin, up to 8 mm at the base, white or Light Buff (Ridgway); tubes up to 6 mm long, in a single layer, Clay (Ridgway).

Cutis hymeniodermiform, the elements about 30 μ long, 6—7 μ in diam. at the top. Context made up mostly of fine, hyaline hyphae. Pores round, 100—150—200 μ in diam.; dissepiments 10—40—90 μ thick; distance between axes 150—180—200 μ. Basidiospores ovoid, with non-collapsible permanent apex, brownish yellow, 8—9.9—13 × 5.5—6.5—8 μ.

It should be noticed that the two specimens of the Everest Expedition 1953 (RLS.61.K.26 and 106) bear in the context spherical gasterospores which are either crested or smooth, 5.4–5.8–7 μ in diameter.

The basidiospores have the peculiarity of usually keeping their apex unaltered at maturity; a few show however a slight flattening at the very tip.

The stipe may vary to a great extent in length and breadth. The holotype (Eberhard 103) has a stipe 170 mm long and 7 mm thick; on the other hand there are also some subsessile specimens, such as S. Ahmad (Fungi of W. Pakistan 14,183). The collection Maas Geesteranus 14,510 (RLS. 66.L.7, 8; now destroyed) had thick and short stipes, 100 × 15 mm. Joshi's specimen has a stipe 100 × 7 mm.

It seems possible that *Polyporus pisachapani* Bl. & Nees belongs to this species but this can not be proved otherwise than through its outer morphology known only from a plate showing a monstrosity.

SPECIMENS EXAMINED.—VIETNAM: Annam, s. loc., s. hosp., Eberhardt 103 (Holotype). 1912, 53.PC.44.

NEPAL: Himalaya, s. loc., alt. 4500 m, s. hosp., s. coll. (Everest Expedition), 1953, 61.K.26, 106.

INDIA: Uttar Pradesh, Mussoorie near Charleville, alt. about 2000 m, gregarious particularly under *Quercus incana*, R. A. Maas Geesteranus 14,510, 13-IX-1964, 66.L.7, 8 (later completely destroyed by insects). — Himachal Pradesh, Simla, Christian Lodge, alt. 2160 m, in dead humus [?] on ground, L. M. Joshi (holotype of *G. lucidum* f. *naiae* Chona & Munjal., VII-1949).

PAKISTAN: Murree, alt. 2100 m, on pieces of buried wood, S. Ahmad (Fungi of W. Pakistan 2470), VIII-1948, 58.LAH.2, 7, 8; Swar States, s. loc., alt. 1950 m, s. hosp., S. Ahmad (Fungi of W. Pakistan 14,183), 22-VIII-1952, 58.LAH.5, 9; Kagan Valley, Sharhan, alt. 2400 m, s. hosp., S. Ahmad (Fungi of W. Pakistan 14,387), s. dat., 59.LAH.5.

Ganoderma trulla Steyaert, *sp. nov.*
Fig. 5a, Pl. 3 fig. 11, Pl. 9 fig. 32

Basidioma lateraliter et horizontaliter stipitatum; pileus reniformis, diametro transversali 30–75 mm et radio longitudinali 25–40 mm; pagina dorsalis concentrice tenuiter undulata et radiatim gibboso-rugata; margine atro, strati tubulorum crassitudinem aequante; stipes 35–80 mm longus et 5–10 mm crassus, fusco-niger, nitens.

Sectio: cutis nigra, nitens, circa 50 μ crassa; contextus umbrinus, 2–7 mm crassus; tubulorum strata 1–2, usque ad 10 mm crassa, sepiacea.

Cutis hymeniodermiformis, elementis cylindraceis, rigidis, circa 20 μ longis et 3 μ diam. Contextus hyphae rectae, leniter coloratae, imbricatae. Pori circulares, 120–140–160 μ diam., dissepimentis 20–45–70 μ crassis, axibus 195 μ distantibus. Basidiosporae ovoideae, interdum apice truncatae, luteo-brunneae, 9.5–10–11 × 6.5–7.1–8 μ, echinulis pro rata paucis crassisque.

Basidioma horizontal and pleuropodial; pileus kidney-shaped, 30–75 mm in transversal diam. longitudinal radius 25–40 mm, Dusky Purplish Gray (Ridgway), shiny; upper surface with fine concentric undulations and lumpy radiating folds; margin black, shiny, as thick as the tube layer.

Section: cutis black, shiny, very thin, 50 μ thick; context Hazel (Ridgway),

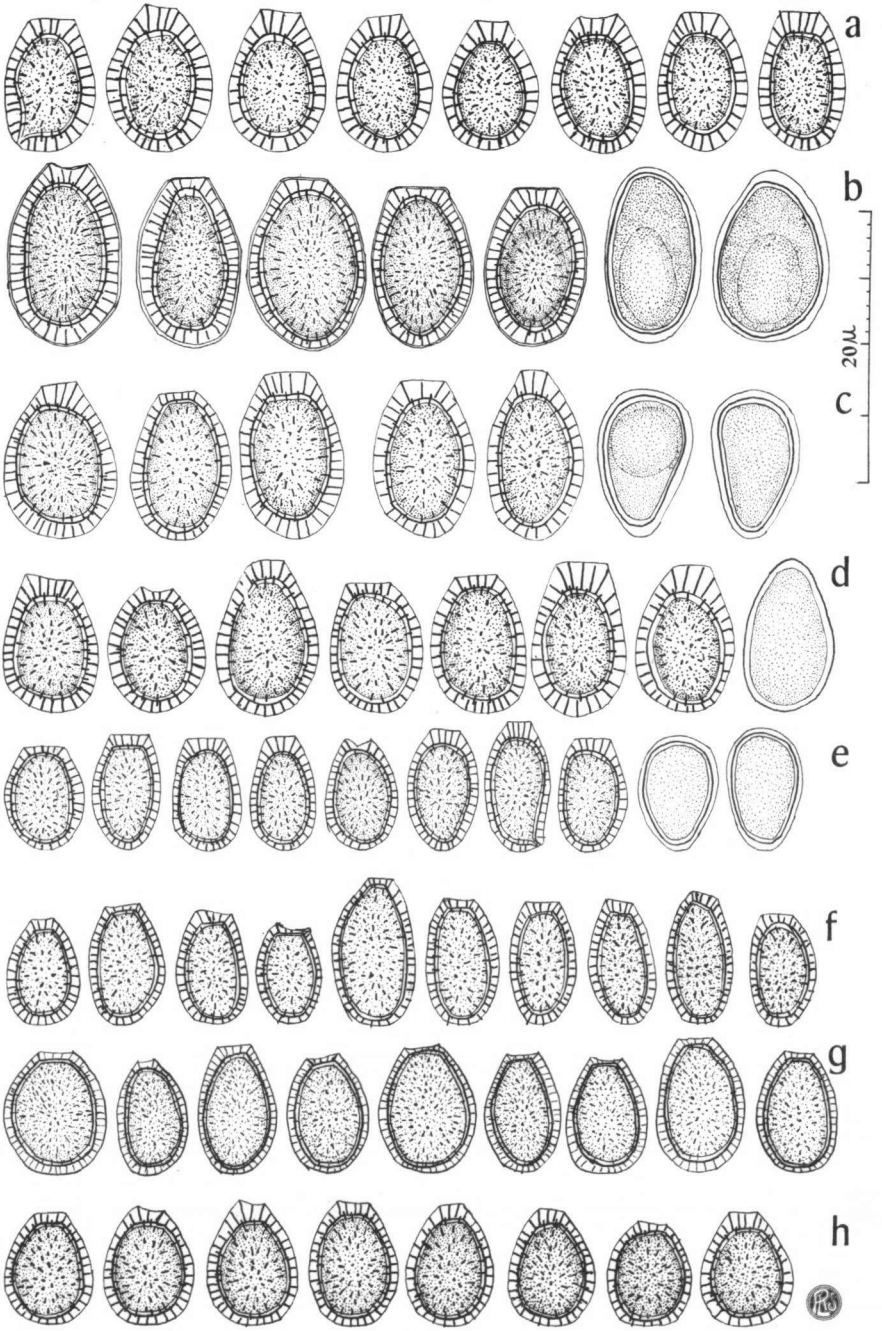

Fig. 5

2–7 mm thick; tubes in one or two layers without prominent separating layer, each layer up to 10 mm thick, Snuff Brown (Ridgway).

Cutis hymeniodermiform, with cylindrical rigid elements 20 × 3 μ. Context hyphae more or less rigid, anticlinal but very much intermixed, light coloured. Pores round, 120–140–160 μ in diam.; dissepiments 20–45–70 μ thick; distance between axes about 195 μ. Basidiospore ovoid, the apex flat at maturity, brownish yellow, with relatively few thick echinulae, 9.5–10–11 × 6.5–7.1–8 μ.

SPECIMENS EXAMINED.—INDONESIA: J a v a, Buitenzorg (Bogor), Hortus bogoriensis, s. hosp., s. coll. (BO 5511), 66.L.101 (Holotype), 102 (Isotype).

Ganoderma trulliforme Steyaert, *sp. nov.*

Figs. 5b, c, Pl. 3 fig. 12, Pl. 9 fig. 33

Basidioma ostreiforme, lateraliter et horizontaliter stipitatum, atronitens, usque ad 110 mm diam.; pagina dorsalis concentrice irregulariter late undulata et radialiter inconspicue paullum rugata, margine atro, strati tubulorum crassitudinem aequante. Stipes in paginam dorsalem insertus, 100 mm longus, 15 mm diam.

Sectio: cutis nigra, laccata, circa 180 μ crassa; contextus 2 mm usque ad stipitem 15 mm crassus, badius senato-zonatus; tubulorum stratum 1–18 mm crassum, umbrinum.

Cutis hymeniodermiformis, elementis plusminusve sphaero-pedunculatis cum hyphis contextus continuis sed paullum distinctis, 30–35 × 9–10 μ, hyphis hyalinis et brunneis contextus in substantia melanoides conglobatis. Pori circulares, 100–167–210 μ diam., dissepimentis 30–55–110 μ crassis, axibus circa 220 μ distantibus. Basidiosporae subellipsoideae, 10–11.7–13.5 × 6–7.2–9 μ, echinulis interdum numerosis sed pro rata longis et valde conspicuis.

Basidioma with ostreiform pileus, pleuropodial, up to 110 mm in diam.; upper surface with irregularly spaced undulations and some inconspicuous radial folds; margin black, as thick as the tube length; stipe inserted partly on upper surface, up to 100 mm in length and 15 mm thick, laccate, black.

Section: cutis black, laccate, some 180 μ thick; context from 2 mm near margin up to 15 mm near insertion of stipe, Chestnut (Ridgway) with zone Mars Yellow (Ridgway); tubes in one layer, up to 18 mm thick, Cinnamon Brown (Ridgway).

Cutis hymeniodermiform with spheropedunculate elements, which are continuous with, and not distinct from, the context hyphae and 30–35 μ long and 7–10 μ thick at the tip, with hyaline and brown hyphae embedded in melanoid substances. Pores round, 100–165–210 μ diam.; dissepiments 30–55–110 μ thick; distance between axes about 220 μ. Basidiospores subellipsoid, at maturity with truncate apex, yellow, 10–11.7–13.5 × 6–7.2–9 μ; echinulae well visible, rather numerous, but long and moderately thick.

SPECIMENS EXAMINED.—INDONESIA: J a v a, Priangan, Pengalengan, Gunung Kantjana, s. hosp., A. Maitland (BO 11,047), X-1929, 66.L.66 (Holotypus); Gunung

EXPLANATION OF FIGURE 5

Fig. 5. Basidiospores. — a. *Ganoderma trulla*, BO 5511, 66.L.101 (Holotype). — b, c. *G. trulliforme*: b, Maitland (BO 11,047), 66.L.66 (Holotype); Vischer (BO 1862), 66.L.32. — d. *G. petchii*, Petch 3238, 69.K.87 (Holotype). — e. *G. amboinense*, Schuitemaker (BO 13,446), 66.L.43 (Neotype). — f. *G. subtornatum*, Williams, 69.NY.10 (Holotype). — g. *G. lamaoense*, Williams 153?, 69.NY.26 (Holotype). — h. *G. leytense*, Elmer 7213 (Holotype).

Salak near Buitenzorg (Bogor), rottend hout, W. Vischer (BO 1862), X-1921, 66.L.32; Tjibodas, stam (?), K. B. Boedijn 3062, (BO 15,007), VII-1934, 66.L.33, 34, 103, 104; Tjibodas, Gunung Gedeh, s. hosp., K. B. Boedijn et M. A. Donk (herb. M. A. Donk 8456), VII-1934, 66.L.114, 115.

Ganoderma petchii (Lloyd) Steyaert, *comb. nov.*
Fig. 5a, Pl. 9 fig. 34

Fomes petchii Lloyd, Mycol. Writ. **4** (Syn. Fomes): 268. 1915; Petch *in* Ann. R. bot. Gdns Peradeniya **6**: 133. 1916; Trotter *in* Sacc., Syll. Fung. **23**: 392. 1925 (Latin diagnosis).

Some confusion has arisen concerning this species since a specimen belonging to *G. williamsianum* (Stevenson & Cash, *1936*: 85) was mistakenly determined as *G. petchii* and since Lloyd's type specimen had been reported as unretrievable. It should be noticed however that Stevenson & Cash cite a specimen '3235' whereas Petch mentions his as '3238'. Was '3235' a misprint or did the two authors look for the wrong specimen?

In the Kew herbarium two half basidiomata are found under the collection number Petch 3238. These show a remarkable likeness of Lloyd's (*1915*) published figure 605 of *Fomes petchii*.

Considering the similarity it may be presumed that Lloyd when he described *Fomes petchii* had in hand the two corresponding halves at Kew. It must be concluded then that the type is still extant if not in BPI then in any case as Petch's collection at Kew. As stated above Lloyd's figure 605 fits exactly one of the Kew specimens of Petch's collection No. 3238. It also shows that Lloyd's illustration is life-size.

Basidioma pulvinate, ungulate, laterally stipitate,[1] some 70 mm in radius, 30–40 mm thick, somewhat concentrically corrugated especially on the more vertical sides, Hessian Brown (Ridgway).

Section: cutis thin, at the most 100 μ thick; context thin, at the most 7–8 mm thick, two-coloured, upper half Cinnamon Buff (Ridgway), half nearest tube layer Pecan Brown (Ridgway) to Rood's Brown (Ridgway); tubes in one layer or in two (one rather thin), Mikado Brown (Ridgway).

Cutis hymeniodermiform, the elements claviform, about 6 μ thick at the top, about 25 μ long with skeletal hyphae in the sub-cutis. Context principally of sinuate, poorly coloured hyphae; generative hyphae in the upper part with denser skeletal hyphae in the lower part. Pores very regularly round, 140–170–210 μ in diam.; dissepiments 20–35–60 μ thick; distance between axes about 205 μ. Basidiospores ovoid, truncate at maturity, with long thick echinulae, 9.5–10.5–11.5 × 6.5–7.2–7.5 μ; non-echinulate spores obpyriform, 11 × 6.5–7 μ, yellowish, rare.

The last two specimens cited below have a short stipe.

It should be noticed that *G. petchii* (Lloyd) Stey. and *G. boninense* Pat. are very

[1] According to Petch's description. The two Kew specimens are without a stipe, but the stipe may have broken off when the specimens were cut into halves. The two Javanese specimens mentioned may therefore be a more complete representation of the species.

similar as to their outer morphology. The spores however are very different, those of *G. boninense* being rather narrowly ellipsoid with short echinulae, approximately 0.5 μ long, whereas the echinulae of *G. petchii* are at least 1 μ long and up to 2 μ at the apex of the spores.

Although the cutis elements are longer and thinner in *G. boninense* than in *G. petchii* it needs careful scrutiny to distinguish the two species by their cutis anatomy. Therefore in the absence of spores, which is the case in the Javanese specimens, care must be taken in directing the sectioning of the cutis so that the elements can be properly observed. This and the fact that the Javanese specimens have a second layer of tubes (a feature that has not yet been observed in *G. boninense* although an appreciable number of them have been examined) seems to justify their inclusion in *G. petchii*. The stipes are another feature in favour of this conclusion.

SPECIMENS EXAMINED.—CEYLON: Hakgala, s. hosp., (Petch's name not given but label is in his handwriting) 3238, V-1910, 69.K.87 (Holotype), 69.K.88 (Isotype).

INDONESIA: J a v a, Udjong Kulon, s. hosp., P. F. Franck (BO 13,988), s. dat., 66.L.67, 68.

GANODERMA CHALCEUM (Cooke) Steyaert

Polyporus cupreus Fr. *in* Nova Acta R. Soc. Sci. upsal. III **1**: 64. 1851, non *P. cupreus* Berk. 1839. — ≡ *Polyporus chalceus* Cooke *in* Trans. Proc. bot. Soc. Edinb. **13**: 135. 1878. — *Ganoderma chalceum* (Cooke) Stey. *in* Bull. Jard. bot. Brux. **37**: 481. 1967.

The various sizes recorded for the set of specimens cited below are within the limits observed previously (Steyaert, *1967b*). Basidiospores 8.5–10–11.5 × 4.5–5.9–7.5 μ. Pores 80–140–210 μ. Dissepiments 20–55–110 μ thick. Distance between axes of pores 155–195–245 μ. Non-echinulate spores 8.5–10–12 × 5–6.1–7 μ.

There is a slight discrepancy in that the non-echinulate basidiospores have a maximum breadth of 7 μ whereas the maximum recorded previously was 5.5 μ.

The determination of König's specimen as *Boletus polymorphus* Hoffm. appears to have no relationship with a type specimen. This ante-Friesian binomial is currently considered to be a synonym of *Trametes odorata* (Wulf. ex Fr.) Fr.

SPECIMENS EXAMINED.—CEYLON: s. loc., ad radices arborum in lucis et ad truncos putrides cocciferarum, [J. G.] Konig (L 910.219–543), 66.L.10, 11;

INDONESIA: K a l i m a n t a n (Borneo), Karimata, s. hosp., Mondih (BO 12,473), III-1931, 66.L.27, 41; Nunukan (northern part), s. hosp., W. Meijer (BO 18,157), 28-X-1953, 66.L.80, 81. — J a v a: unlocalized but perhaps Java, s. hosp., s. coll. (L 910.217–515), 66.L.12; Isl. Nusa Kambangan, s. hosp., A. J. G. H. Kostermans & C. L. L. H. van Woerden (BO 16,634), XI-1938, 66.L.39, 40, 65; ditto (BO 16,644), 66.L.33; Buitenzorg (Bogor), Hortus bogoriensis, on palm doeri (spiny palm), Nongnong (BO 5898), XI-1924, 66.L.90; Gunung Salak, s. hosp., W. Vischer (BO 1862), X-1921, 66.L.99; Grisée (sea level), on dead stem of *Arenga saccharifera*, W. C. van Heurn (Herb. M. A. Donk 8758, 8759), 13-IX-1926, 66.L.112, 113.

NEW GUINEA: s. loc., s. hosp., W. E. de M. Armit (L 910.252-1710), s. dat., 66.L.17, 18.

MALAGASY (Madagascar): Soaniëran'a-Antasibé, (alt. 250 m), dead wood, H. J. Lam et A. D. J. Meeuse 5829, (L 938.93–186), 9-XII-1938, 66.L.19, 20.

GANODERMA AMBOINENSE (Lam. ex Fr.) Pat.

Fig. 5c, Pl. 4 fig. 13, Pl. 10 fig. 35

Agaricus amboinensis Lam., Encycl. méth. Bot. **1**: 51. 1783. — *Polyporus amboinensis* (Lam.) *ex* Fr., Syst. mycol. **1**: 354. 1821. — *Ganoderma amboinense* (Lam. ex Fr.) Pat. *in* Bull. Soc. mycol. Fr. **3** (3): 171. 1888.

Lamarck, who introduced the name *Agaricus amboinensis*, referred to Rumphius' "Herbarium amboinense" (**6**: *pl. 57 fig. 1*). This figure shows a pulvinate fungus with a long and thin stipe. Merrill (*1917*), in the same publication in which he neotypified *G. cochlear*, designated the collection Robinson No. 572 as the neotype of *G. amboinense*. Attempts to locate this specimen or parts of it had no better results than in the case of *G. cochlear q.v.*; neither of the two neotypes has been found. It is therefore necessary to try a second neotypification, a procedure that must heed the original description or illustration or the opinion of former authors. Merrill wrote, "I have little hesitation in interpreting true *Ganoderma amboinense* (Lam.) Pat, as the form currently known as *Ganoderma rugosum* Bres." It is not possible to agree with this opinion. Rumphius' illustration of his *Agaricus amboinensis* is very much at variance with *G. rugosum*, which typically has a central stipe, whereas *G. amboinense* is definitely pleuropodial. Fortunately the Bogor herbarium possesses a specimen which corresponds fairly well with Rumphius' illustration; the pileus is decidedly smaller but it would be a miracle if a second specimen exactly the same were collected. Consequently the Bogor specimen is here chosen as neotype.

Basidioma stipitate; pileus 25 mm in radius, 35 mm broad and 20 mm thick, shiny laccate, Blackish Brown (Ridgway), the upper surface concentrically corrugated, attached laterally to a knobbly stipe 80 mm long and 4–8 mm thick and like the pileus black, shiny laccate.

Section: cutis 60 μ thick, shiny black; context 2 mm thick, Vinaceous Tawny (Ridgway) to Pecan Brown (Ridgway); tubes 15 mm long, Rood's Brown (Ridgway).

Cutis hymeniodermiform with club-shaped elements 28 μ long 4–5 μ thick at the top. Pores round, 70–80–90 μ in diam.; dissepiments 70–90–100 μ thick; distance between axes about 170 μ. Basidiospores ellipsoid, very light chamois, 7.5–8.4–9 × 5–5.35–6 μ. Non-echinulate spores same colour, 7.5–8.3–9 μ.

The second collection cited below, this time of a sessile basidioma, has all the anatomical and microscopic characters of the neotype: same type of hymenioderm, same type and dimensions of the spores. The size of the pilei and the colours of the context are also similar.

SPECIMENS EXAMINED.—INDONESIA: K a l i m a n t a n (Borneo), Pontianak, s. hosp., J. P. Schuitemaker (BO 13,446), s. dat., 66.L.43 (Neotype). — R i a u A r c h i p e l a g o, Pulau Durian, s. hosp., Rachmat (BO 1822), s. dat., 66.L.84, 85.

GANODERMA SUBTORNATUM Murrill
Fig. 5f, Pl. 10 f. 36

Ganoderma subtornatum Murrill *in* Bull. Torrey bot. Club **34**: 477. 1907.

Ganoderma subtornatum Murrill has given rise to many misinterpretations. The name would suggest that it is closely related to *G. tornatum* (Pers.) Bres., yet when one reads Murrill's original description it will be noticed at once that there are significant differences; the upper surface is described as "shining-black" and the context as "punky, white above, chestnut-colored below." This shows it to be very unlike *G. tornatum*, which has a dull dark brown upper surface and a nearly uniformly Bay coloured context. Graff (*1921*) went so far as to reduce *G. subtornatum* to the rank of a variety of *G. tornatum*, notwithstanding Murrill's description opposes such an association in all details.

Anatomically the difference is clearly demonstrated by the fact that the type specimen has a cutis of the characoderm type (Steyaert, *1961a*: 70) and thereby belongs to another section of the genus than *G. tornatum*. The other basidiomata that Murrill cited do not agree with his description. There exists in the New York herbarium another collection numbered 153 marked "type". It is made up of two basidiomata (RLS.69.NY.26, 27), the context of which is bay brown but is largely replaced by discoloured white hyphae. Both these two specimens have a typical hymenioderm. The collections Elmer 7213 and 6943 are both different species. This is not all: where there are several basidiomata in one collection these may be a mixture of species, for instance, Elmer 7213 in Kew (RLS.62.K.48; see *G. leytense* Stey.) is a different species from Elmer 7213 in New York (RLS.69.NY.11), which belongs to *G. chalceum* (Cooke) Stey.

In view of this extreme confusion it is imperative to amplify and redress the description of the type specimen:—

Basidioma spathulate, about 45 mm in diam.; dorsal surface black, shiny laccate, concentrically grooved; margin recurved, shiny laccate.

Section: cutis about 250 μ thick, black, shiny; context 3–4 mm thick, chamois above, chestnut close to the tube-layer. Tubes one-layered, light brown, about 7 mm long.

Cutis of the characoderm type, the elements about 30 × 3 μ; melanoid substances barely soluble by KOH. Some skeletal hyphae reaching into the cutis. Pores round, small, 80–90–110 μ; dissepiments 40–55–70 μ thick; distance between axes about 150 μ. Basidiospores ellipsoid, light chamois, 7.5–9.1–11 × 5–5.3–6 μ.

SPECIMEN EXAMINED.—PHILIPPINE ISLANDS: Luzon, Prov. Bataan, Mt. Mariveles, Lamao River, s. hosp., R. S. Williams (N.Y. Bot. Gdn Expl. Philipp. 153), XI-1903, 59.NY.10.

Ganoderma lamaoense Steyaert, *sp. nov.*
Fig. 5g, Pl. 10 fig. 37

Ganoderma subtornatum Murrill *in* Bull. Torrey bot. Club **34**: 477. 1907 in part.

Among the many specimens identified by Murrill as *G. subtornatum* Murrill but whose characters do not correspond with the original description there are two specimens that bear collectively the number 153; they have been given our numbers 69.NY.26 and 27. These specimens are marked "type" but they are not mentioned by Murrill in any special way. The author wonders whether there has not been a mistake in including these two specimens in the type because of the great differences with regard to the description. They are more suggestive of *G. tornatum*, if only the external morphology is taken into consideration by which they do not correspond at all with Murrill's description of *G. subtornatum*. All things considered there appears to be no justification to assign to those two specimens the status of either holotype (see under *G. subtornatum*) or isotype.

This conclusion was not rashly made: it rests on careful consideration of the available evidence necessitated by the fact that several species are involved. These two specimens do not correspond to any species known to the author; they are therefore described as representing a new species.

Basidioma flabelliforme, substipitatum, diametro transversali 60–120 mm, ad basin usque ad 20 mm crassum; stipes usque ad 10 mm longus; pagina dorsalis fere applanata, concentrice leviter undulata.

Sectio: cutis brunneo-atra, circa 25 μ crassa; contextus usque ad 10 mm crassus, lateritius pro majore parte plagis hypharum albarum successus); tubulorum stratum 1, usque ad 10 mm crassum, lateritium.

Cutis hymeniodermiformis, elementis subcylindricis, apice fere subsphaericis 35–40 × 7 μ, valde regulariter dispositis. Hyphae contextus rectae, circa 6 μ crassae, cum hyphis ligativis 2–3 μ crassis intermixtae. Pori circulares, parvi, 80–110–130 μ diam., dissepimentis 30–80–160 μ crassis, axibus 160–190–220 μ distantibus. Basidiosporae ovoideae, flavae, 8–9.3–10 × 5.5–6.3–7.5 μ, echinulis inconspicuis pro rata numerosis.

Basidioma flabelliform, substipitate, 60–120 mm in diam., up to 20 mm thick at the base, stipe up to 10 mm long; upper surface nearly plane, only slightly concentrically undulate, Blackish Brown (Ridgway).

Section: blackish brown, about 25 μ thick; context up to 10 mm thick, Van Dyck Brown (Ridgway) (but nearly completely replaced by large patches of white discoloured hyphae in both specimens); tubes in one layer, up to 10 mm long, Van Dyck Brown (Ridgway).

Cutis hymeniodermiform, with nearly cylindrical elements scarcely subspherical at the tip, 30–40 μ long, 6 μ in diam. and very regularly arranged. Context hyphae straight about 6 μ in diam., intertwined by binding hyphae about 2–3 μ thick. Pores round, small, 80–110–130 μ in diam.; dissepiments 30–80–160 μ thick; distance between axes of pores 160–190–280 μ. Basidiospores ovoid, light chamois, 8–9.3–10 × 5.5–6.3–7.5 μ, with short inconspicuous relatively numerous echinulae.

SPECIMENS EXAMINED.—PHILIPPINE ISLANDS: L a m a o, s. loc., alt. 150 m, s. hosp., R. S. Williams? 153, XI-1903, 69.NY.26 (Holotype). 69.NY.27 (Isotype).

Ganoderma leytense Steyaert, *sp. nov.*
Fig. 5h, Pl. 10 fig. 38, Pl. 11 fig. 39

Basidioma sessile, flabelliforme, usque ad 80 mm diam., pagina dorsalis concentrice corrugata, subnitens, atro-vinosa.

Sectio: cutis 120 μ crassa, atro-nitens, mollis; contextus ferrugineus, usque ad 8 mm crassus (interdum aliquot plagis decoloratis hypharum albarum successus); tubulorum stratum 1, usque ad 10 mm crassum, umbrinum, a contextu haud circumdatum.

Cutis hymeniodermiformis, elementis sphaeropedunculatis circa 16–17 μ longis, circa 4 μ diam. Hyphae contextus atro-brunneae anticlinae, subrectae, tenuiter ramosae; hyphae hyalinae in cutis elementa terminantes. Pori circulares, 100–118–140 μ diam.; dissepimentis 30–50–70 μ crassis; axibus circa 170 μ distantibus. Basidiosporae ovoideae, brunneae 8–8.8–9.5 x 6.5–6.8–7 μ.

Basidioma sessile, flabelliform, up to 80 mm in diam.; upper surface with concentrical irregularly spaced corrugations, somewhat shiny, black vinaceous (Ridgway: not matched.).

Section: cutis 120 μ thick, soft, shiny black; context Kaiser Brown (Ridgway), up to 8 mm thick (with a few blotches of discoloured white tissue); tubes up to 10 mm long, Cinnamon Brown (Ridgway), in one layer, not enveloped at margin by context and cutis.

Cutis hymeniodermiform; elements spheropedunculate, about 16–17 μ long and about 4 μ in diam. Context hyphae dark brown, sub-erect, little branched; hyaline hyphae ending up in the cutis elements. Pores round, 100-118-140 μ in diam.; dissepiments 30–50–70 μ thick; distance between axes about 170 μ. Basidiospores ovoid, brown, 8–8.8–9.5 × 6.5–6.8–7 μ.

The Elmer collection 6943 has been included in this species for its spore and cutis characters but its outer morphology shows some discrepancy.

As already stated under *G. subtornatum*, Elmer 7213 (69.NY.11; in NY) belongs to *G. chalceum* (Cooke) Stey. This is an example that shows the confusion and the misunderstanding that may arise when portions of a single collection are sent abroad as duplicates. It should be pointed out that the specimen Elmer 7213 (62.K.48) is one of the paratypes of the name *G. subtornatum*.

One cannot but stress the need for utmost caution in selecting subsidiary types and duplicates. The greatest care should be taken that all features, including microscopic ones, agree. Otherwise the distribution of subsidiary types or duplicates may become nothing but a damaging practice.

When possible the best way to proceed is to distribute portions of the holotype accompanied by natural-size photographs made of the entire specimen before it is cut up.

SPECIMENS EXAMINED.—PHILIPPINE ISLANDS: Leyte, Palo, s. hosp., A. D. E. Elmer 7213, I-1906, 62.K.48 (Holotype). — Luzon, Prov. Bataan, Mt. Mariveles, s. hosp., A. D. E. Elmer 6943, XI-1904, 60.NY.9.

INDONESIA: Verlaten Island, dead stems, K. B. Boedijn 2551 (BO 14,293), IV-1933, 66.L.30.

Ganoderma ahmadii Steyaert, *sp. nov.*
Fig. 6e, Pl. 4 fig. 14, Pl. 11 f. 40

Basidioma latum, leviter infundibuliforme, mesopodium. Pileus circularis; pagina dorsalis in centro sublucida et fusco-nigra, ad marginem fulva, parte intermedia annulis plusminusve

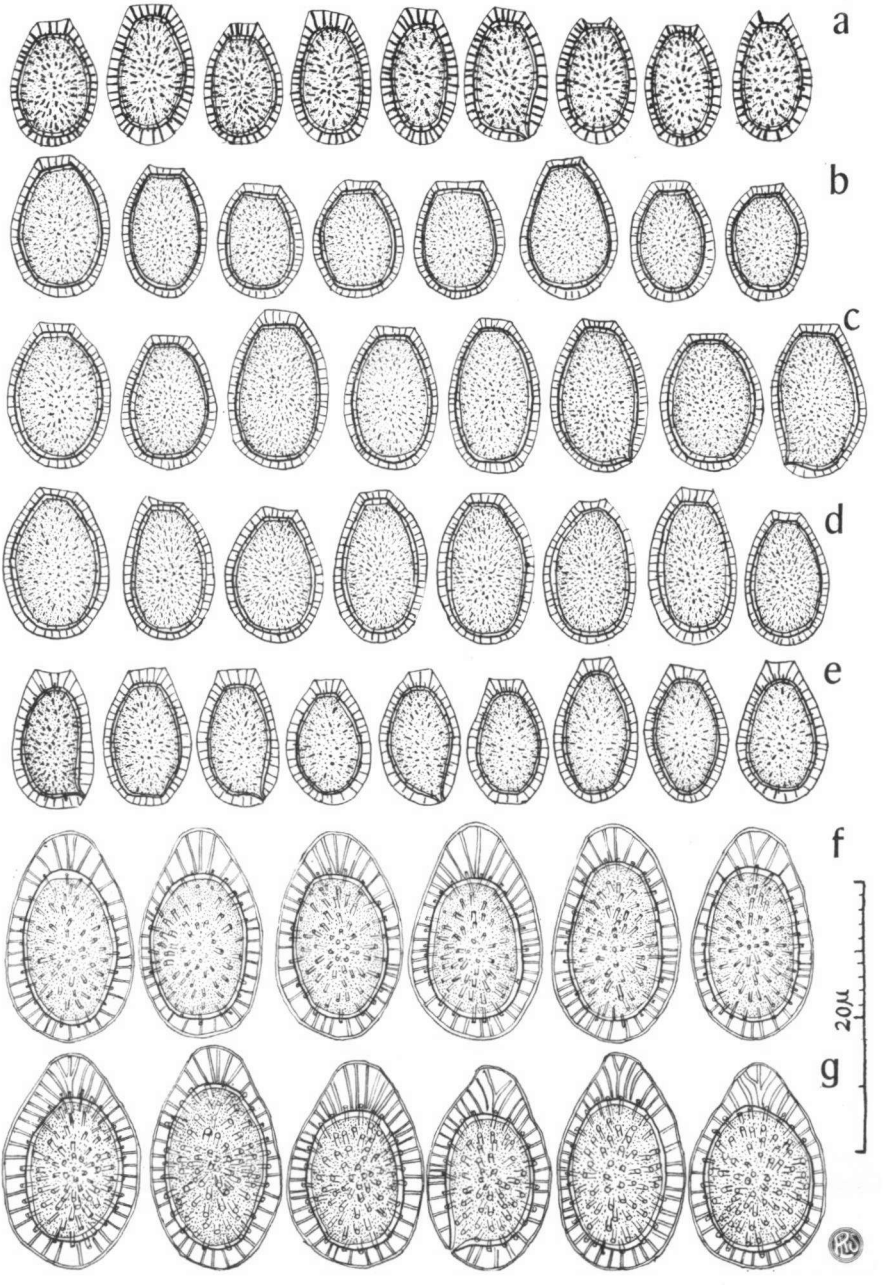

Fig. 6

distinctis alternis umbrinis et fulvis ornata; pagina ventralis in sicco albo-grisea vel avellanea, margine tenui, albo. Stipes fusco-niger, laccatus, usque ad 50 mm longus, circa 15 mm crassus.

Sectio: 1) Pileus: cutis tenuissima, vix 30 μ crassa; contextus prope cutem roseo-bubalinus, in medio usque ad tubulorum stratum brunneo-vinosus; tubuli isabellini, usque ad 5 mm longi. 2) Stipes: cutis nigra, nitida; contextus ut pilei contextus bicolor.

Cutis hymeniodermiformis, elementis claviformibus ad cylindricis, circa 25 μ longis, 4–5 μ latis. Contextus hyphae luteo-brunnescentes, 3–4 μ latae, sinuatae et ramosissimae, cum hyphis hyalinis elementis cutis producentibus intermixtae. Pori circulares, 110–159–220 μ diam.; dissepimentis 30–45–70 μ crassis; axibus circa 180–205–245 μ distantibus. Basidiosporae ovoideae, luteae 8–9.6–11 × 5.5–6.4–7 μ.

Basidioma wide and shallow, funnel-shaped, mesopodial. Pileus round, somewhat shiny, from Blackish-Brown (Ridgway) in the centre to Cinnamon-Rufous (Ridgway) at the margin with more or less distinct alternate rings Chestnut-Brown (Ridgway) and Cinnamon-Rufous (Ridgway) in between. Pore surface Greyish to Clay colour (Ridgway) when dry. Margin thin, white. Stipe Blackish Brown (Ridgway), laccate, up to 50 mm long and about 15 mm thick.

Section: (i) Pileus, cutis very thin, at most 30 μ thick; context near cutis Cinnamon Buff (Ridgway) in the middle down to the tube layer Verona Brown (Ridgway). Tubes Cinnamon Buff (Ridgway) up to 5 mm long. (ii) Stipe: cutis, black, laccate, context two-coloured like the pileus context.

Cutis hymeniodermiform, the elements claviform to cylindrical, about 25 μ long and 4–5 μ wide. Context hyphae yellow-brown, 3–4 μ thick, sinuate and much ramified, mixed with hyaline hyphae that produce the cutis elements. Pores round, 110–159–220 μ in diam.; dissepiments 30–45–70 μ thick; distance between pore axes 180–205–220 μ. Basidiospores ovoid, yellow, 8–9.6–11 × 5.5–6.4–7 μ.

SPECIMENS EXAMINED.—PAKISTAN: Sialkot, on *Dalbergia sissoo*, S. Ahmad (Fung of W. Pakistan 14,329), XI-1958, 58.LAH.15 (Holotype), 58.LAH.16, 17; Kagan Valley, s. hosp., S. Ahmad (Fungi of W. Pakistan 14,700), 20-VIII-1959, 59.LAH.1; Sialkot, s. hosp., M. Akram, VIII-1959, 59.LAH.8; Sialkot, on stumps of *Acacia arabica*, M. Akram (Fungi of W. Pakistan 14,702), VIII-1959, 59.LAH. 9, 10, 11. INDIA: Uttar Pradesh, Dehra Dun, on stumps of *Areca catechu*, B. K. Bakshi (DD H. 5316), 26-VIII-1949, 58.DD.14.

GANODERMA LUCIDUM (Curtis ex Fr.) Karst.

Boletus lucidus Curt., Fl. londin. **2**: *pl. 224*. 1781. — *Polyporus lucidus* (Curt.) ex. Fr., Syst. mycol. **1**: 533. 1821. — *Ganoderma lucidum* (Curt. ex Fr.) Karst. *in* Revue mycol. **3** / No. 9: 17. 1881.

Boletus laccatus Timm, Fl. megalop. Prodr. 269. 1788. — *Polyporus laccatus* (Timm) *ex* Pers., Mycol. europ. **2**: 54. 1825.

EXPLANATION OF FIGURE 6

Fig. 6. Basidiospores. — a. *Ganoderma lucidum*, Harper, 66.L.21. — b–d. *G. resinaceum*: b Boudier?, 69. PC. 1 (Holotype); c, Welden 257, 66.L.22; d, Timber and Forest Disease Survey 12,123, 69.NY.24 (holotype of *G. sessile*). — e. *G. ahmadii*, Ahmad (Fungi of W. Pakistan 14,329), 58.LAH.15. — f, g. *G. colossus*: f, Welden 2408, 66.L.25; g, Oersted, 58.UPS.1 (Holotype).

The *Ganoderma lucidum* complex, viz. those species whose cutis of the basidioma is of the hymenioderm type, has long been a stumbling block for taxonomists. Too much stress has been laid on whether the basidiomata are sessile or stipitate. *Ganoderma lucidum* was considered the stipitate and *G. resinaceum* the sessile form. This distinction is not borne out by the microscopic characters. When one examines in detail a rather large set of specimens one is struck by the clear-cut differences shown by the spores, to which Haddow (*1931*) had already called attention some forty years ago and which the author of the present paper also stressed at the Third European Mycological Congress at Glasgow in 1963 (Steyaert, *1967a*).

There are spores with relatively few, long and thick echinulae and others with numerous, short and thin echinulae (Steyaert, *1967a*: figs. 17 and 18). Haddow called these the "rough" and the "smooth" types and associated *G. lucidum* and *G. oregonense* with the first and *G. sessile* with the second type. The author confirms what Haddow wrote (p. 39): "The writer, therefore, unhesitatingly concludes that *G. lucidum* and *G. sessile* are distinct species each of which is found in Europe and America . . .."

While the types of *G. resinaceum*, *G. sessile*, and of other species are still in existence there is unfortunately no type specimen of *G. lucidum*, although there is an illustration of it. The binomial *G. lucidum* stems from *Boletus lucidus* published in Curtis's "Flora londinensis", 1781 (Steyaert, *1961b*). A beautiful plate in colour of a pedicellate basidioma collected in Peckham, in the South London area, illustrates the text. As the specimen does not exist anymore the illustration is to be considered the substitute type. Unfortunately it does not reveal the morphology of the spore. It is possible however to form an opinion of it in an indirect way. On the other hand the types of *G. resinaceum* Boud. apud Pat. (see following species) and *G. sessile* Murrill have spores undistinguishable from each other; in both they are of the "smooth" type, viz. with relatively numerous, short, and thin echinulae. Attempts to find a neotype for *G. lucidum* in the type locality (Peckham) have failed; only a public park remains. A remnant of woodland in a neighbouring area gave no better results. Karsten, who published the genus *Ganoderma* in 1881 has left a specimen in H. This specimen has spores of the "rough" type. Thus if Karsten's specimen is selected as the neotype it will be possible to arrive at a satisfactory *modus vivendi* for distinguishing between the two species.

Basidioma sessile dimidiate or stipitate either centrally, excentrally, or laterally. Pileus up to 200 mm in diam.; upper surface radially and concentrically plicate, usually irregular, sometimes warty, usually laccate, shiny, from Brick Red (Ridgway) to Blackish Brown (Ridgway); margin usually thick, white in actively growing specimens, turning yellowish, orange, and reddish brown from the extreme outline inward, of same colour as upper surface in mature specimens, then somewhat reflexed. Stipe blackish brown, up to some 100 mm long. (Stipes are not an exclusive characteristic of *G. lucidum*).

Section: 15–20 mm thick at mid-radius, thicker at the base; cutis thin, black, shiny; context about as thick as tube layer, but thicker toward the base, Pale Ochraceous Buff (Ridgway) in the upper parts, usually lighter, nearly white when fresh

to Russet (Ridgway) in a narrow layer close to the tube layer; tube layer about 10 mm thick, Tawny (Ridgway).

Cutis hymeniodermiform, its elements (when fully developed, viz. when upper surface is shiny black brown) up to 50 × 9 μ, swollen by melanoid substances easily soluble in KOH. Pores more or less rounded, often very irregular, 120–195–390 μ; dissepiments 10–65–390 μ thick; distance between axes 195–265–400 μ. Basidiospores obovoid, chamois, 8.5–10.8–13 × 5.5–7–8.5 μ, echinulae comparatively few, long and thick (Fig. 6a).

There may be some variation in the size of the elements of the cutis. Normally they fall within the extremes given above, but in some specimens they may be much shorter and more blunt. They may also vary in size within one specimen, the shorter elements being found in the more recently formed parts of the basidioma. In the stipe—when there is one—the elements are always the longest.

In the Harper specimen the cutis is a brownish yellow, very fragile and brittle. The cutis elements are barely 15 μ long.

There is also variation in the colour of the context. Karsten's specimen has a context practically totally white while the tube layer is of a very light cocoa colour. The more southward on the European continent, the more coloured the context becomes; a Portuguese specimen (Pinto-Lopes 863) has the context variegated with brown stripes; the context of an African specimen from the slopes of Mount Ruwenzori has patches of shades of a light reddish brown. Perhaps the darkening of the colour of the context is due to the gradual increase in the mean temperature from north to south, and from the higher to the lower altitudes.

SELECTED SPECIMENS EXAMINED.—FINLAND: Aboa, Runsala, s. hosp., P. A. Karsten (Fungi Fenn. exs. 239 in H) a. 1858.

[EUROPE], s. loc., s. coll., s. dat. (Herb. Persoon, L 910.263–590, as *Polyporus laccatus*). 54.L.2.

U.S.A.: I l l i n o i s, s. loc., on *Quercus coccinea* var. *tinctoria*, E. T. & S. A. Harper, 66.L.21.

GANODERMA RESINACEUM Boud. apud Pat.

Figs. 6b, c, Pl. 11 f. 41

Ganoderma resinaceum Boud. *apud* Pat. *in* Bull. Soc. mycol. Fr. **5**: 72. 1889.
Ganoderma chaffangeonii Pat. *in* Bull. Soc. mycol. Fr. **5**: 74. 1889.
Ganoderma sessile Murrill *in* Bull. Torrey bot. Club **29**: 604. 1902; in N. Am. Fl. **9**: 120. 1908.
Polyporus polychromus Copel. *in* Annls mycol. **2**: 507. 1904. — *Ganoderma polychromum* (Copel.) Murrill *in* N. Am. Fl. **9**: 119. 1908.
Ganoderma praelongum Murrill *in* N. Am. Fl. **9**: 121. 1908.
Ganoderma argillaceum Murrill *in* N. Am. Fl. **9**: 122. 1908.
Ganoderma subperforatum Atk. *in* Bot. Gaz. **46**: 337. 1908.

Under *Ganoderma lucidum* we have discussed the distinction between two spore types: the *G. resinaceum* spores, as evidenced by Boudier's specimen at PC, are of what Haddow called the "smooth" type. The word 'smooth' is properly speaking

incorrect as there are numerous, short and thin echinulae between endo- and episporium, as is revealed by the use of an oil immersion objective but not with a dry one of relatively low magnification. In the latter case the spores appear to be smooth, whereas the echinulae are visible in the "rough" or *G. lucidum* type of spores.

Basidioma dimidiate to flabelliform, substipitate to long stipitate, usually laterally, sometimes centrally stalked; pileus very variable in size, may reach 220 mm in breadth or 150 mm in radius in the middle, often very irregular in shape; upper surface shiny laccate, May's Maroon (Ridgway) or nearly black in fully mature pilei, may have a thick white margin when these are not mature, gradually turning yellow, red, brown, and finally black from the margin toward the base.

Section: cutis thin, about 100 μ thick, shiny black. Context from white to Cinnamon Buff (Ridgway) in the upper parts but with zone close to tube layer Cacao Brown (Ridgway).

Cutis of the hymenioderm type with subcylindrical elements 45–55 × 9–12 μ. Pores from somewhat rounded to very irregular 90–210–760 μ; dissepiments 20–35–50 μ; distance between axes 180–275–440 μ. Basidiospores from subellipsoid to broadly ovoid, chamois, 8–10.6–13 × 6.5–7.1–9.5 μ with short, thin, closely packed echinulae.

Considering the characters of the basidiomata and paying special attention to those of the spores (sizes, colour, type of echinulation), it becomes evident that *G. resinaceum* has a respectable synonymy. The distribution of this species then becomes extended from Venezuela through the West Indies, North America to the Euro-Asiatic continent and to Central Africa, but in the latter continent it is restricted in the tropical regions to the central highlands.

The typification of *G. sessile* is open to doubt. Although the specimen on *Liquidambar styraciflora* mentioned above is marked as the type in the New York herbarium it was not listed by Murrill when he described the species. His list is to be taken as one of examples of the specimens that were sent to him; none of these bears indications that would point to the type. It is possible that Murrill himself indicated the type in the herbarium but he did not publish his choice until later (1908: 120), selecting Ellis & Ev., Fungi columb. 202.

SPECIMENS EXAMINED.—FRANCE: Blois (Blesiacum, *fide* Pat. *in* Bull. Soc. mycol. Fr. 5: 72. 1889), s. hosp., J. L. E. Boudier (Holotype), s. dat., 69.PC.1.

U.S.A.: L o u i s i a n a, St. Tammamy parish, Slidell, A. L. Welden 257 (distributed as *G. sessile*, Murrill from NO) 19-I-1956, 66.L.22; s. loc., on dead fallen trees of *Liquidambar styraciflora*, s. coll. (Timber and Forest Disease Survey 12,123; as *G. sessile* Murrill), s. dat., 69.NY.24, — C a l i f o r n i a, Searsville, on *Quercus lobata*, E. B. Copeland (holotype of *G. polychromum* (Copel.) Murrill), X-1902, 55.NY.23. — O h i o, Chillicote, growing among *Datura stramonium*, M. E. Haid & G. F. Atkinson (CUP 19,560; holotype of *G. subperforatum* Atk.), 69.CUP.5.

CUBA: Prov. Santiago de Cuba, Alto Cedro, S. F. Earle & W. A. Murrill 536 (holotype of *G. praelongum* Murrill), 19-20-III-1905, 55.NY.15; Prov. de Habana,

vecindad de Santiago de las Vegas, Fecha, F. S. Earle 658 (holotype of *G. argillaceum* Murrill), 56VII-1904, 55.NY.19.

VENEZUELA: s. loc., s. hosp., J. Chaffangeon (holotype of *G. chaffangeonii* Pat.), s. dat., 53.PC.40.

GANODERMA COLOSSUS (Fr.) C. F. Baker

Figs. 6f, g, Pl. 11 fig. 42

Polyporus colossus Fr. *in* Nova Acta Soc. Sci. upsal. III **1**: 56. 1851. — *Dendrophagus colossus* (Fr.) Murrill *in* Bull. Torrey bot. Club **32**: 473. 1905. — *Tomophagus colossus* (Fr.) Murrill *in* Torreya **5**: 197. 1905. — *Ganoderma colossus* (Fr.) C. F. Baker, V Cent. Fungi. Malay. No. 425. 1918, on sheet with index to the series.

Ganoderma obockense Pat., Hymen. Eur. 63. 1887; *in* Bull. Soc. mycol. Fr. **3** (3): 119. 1887.

Polyporus hollandii Mass. *in* Bull. misc. Inf. Kew **1901**: 163.

Basidioma dimidiate, bulky, up to 350 mm in radius and 90 mm thick, soft, tender, light-weight; upper surface dull to somewhat shiny, Mars Yellow (Ridgway) to approximately Buffy Brown (Ridgway); pore surface probably white when in full growth but quickly a dark Buffy Brown or Buffy Citrine (Ridgway) when dried.

Section: cutis very thin, dark dull yellow, scaling off easily; context usually two thirds of the thickness of the basidioma, Chamois (Ridgway); tube-layer up to 30 mm thick, Buffy Brown (Ridgway).

Cutis hymeniodermiform; elements club-shaped, about 40 μ long and 7–8 μ thick at the top. Pores round to irregular, 180–315–420 μ in diam.; dissepiments 20–72–180 μ thick; distance between axes 345–385–480 μ. Basidiospores ovoid, chamois, 13–16.3–19.5 × 8–9.7–12.5 μ; echinulae about 1 μ long at the sides, up to 4 μ long at the apex which does not collapse at maturity or exceptionally only slightly so. Gasterospores globular, covered with short, stumpy spines or ridges, chamois, 16–18–21 μ.

Murrill, considering the tumid aspect of the basidioma, was of the opinion that segregation of the present species from *Ganoderma* was justified. He called the new genus *Tomophagus* after the name *Dendrophagus* had been found preoccupied. It is easy to agree that the outer morphology of this particular species is very much at variance with that of the bulk of the species of *Ganoderma*. Yet, when the anatomical features are considered it is impossible to find any outstanding characters departing from those of *Ganoderma*: the cutis anatomy is hymeniodermiform, the context hyphae have all the features of those of *Ganoderma*, viz. the skeletal hyphae produce hyaline, thinner hyphae that form the cutis elements, and the spores are also typical of *Ganoderma*, although their features are considerably amplified. On the other hand, even if it is true that exclusion of *G. colossus* on the basis of its deviating anatomy is not justified, there is little doubt that the species has quite an isolated position in the genus. It belongs evidently to the group of species with a hymeniodermiform cutis, of which *G. lucidum* is the outstanding representative. The outer morphology of *G. colossus* would justify setting up within this group a sub-group. *Ganoderma nevadense* Murrill could be placed in its neighbourhood because apparently its morphology shows many similarities but such a grouping of species would need further study.

SPECIMENS EXAMINED.—COSTA RICA: pr. Puntanera, ad caudices *Cedrelae odoratae*, A. S. Oersted (Holotype), s. dat., 58.UPS.1.

MEXICO: Yautepec, Town Plaza, on *Platanus*, P. A. Lemke, 17-VIII-1961.

SURINAME: Santo Boma Banana Expt Stn, s. hosp., A. L. Welden 2408 (Fungi of Suriname 00304, in L), 9-VII-1961, 66.L.25.

SENEGAL: s. loc., on *Acacia adansonii*, s. coll., s. dat., 53.PC.32.

NIGERIA: 20 miles south of Ibadan, on *Gmelina arborea*, s. coll., 12-V-1953, 55.K.78; Old Calabar, s. hosp., J. A. Holland 21 (holotype of *Polyporus hollandii* Mass.), s. dat., 54.K.28.

CHAD: dist. Baguirmi, s. loc., s. hosp., A. J. B. Chevalier 11,422, VIII-1902, 53.PC.33.

CAMEROONS: s. loc., s. hosp., T. D. Maitland 29, 1929, 55.K.28.

ZAIRE: s. loc., s. hosp., Dewèvre s. n. (BR), 1897; Ubangi, Binga, sur troncs brulés, M. Goossens-Fontana 2053 (BR), s. dat.; s. loc., s. hosp., M. Goossens-Fontana 959 (BR), s. dat.

PAKISTAN: Lahore, Botanic Garden, on bamboo stumps, S. Ahmad (Fungi of W. Pakistan 8050, 8058), 3-I-1954, 58.LAH.6, 13; Lahore, on stump of *Morus alba*, S. Ahmad (Fungi of W. Pakistan s.n.), 62.LAH.1; Sialkot, Marala headworks, on trunk of *Ficus religiosa*, S. Ahmad (Fungi of W. Pakistan 21,219), 6-IX-1968, 68.LAH.3, 4.

INDIA: Bombay, on stump of *Tectona grandis*, Chanda 1/54, 12-X-1954, 58.DD.17.

CEYLON: Tirukovil, s. hosp. Petch 5827, s. dat., 55.K.29.

Humphreya Steyaert, *gen. nov.*

Basidioma convexo-infundibuliforme, meso- vel pleuropodum, brunneo-griseum. Contextus melleus, hyphis peri- vel pantoclinis.[2]

Cutis circa 150 μ crassa, distincte delimitata, substantia melanoidea illae generis *Ganoderma* similis sed magis cornea, glauca et natura distincte diversa. Basidiosporae bitunicatae, episporium endosporiumque cristis reticulatis vel disjunctis separata.

SPECIES TYPICA. — *Ganoderma lloydii* (Pat. & Har.) Trott.

Basidioma convex funnel-shaped, centrally or laterally stipitate, greyish brown. Context and tube-layer concolorous, honey coloured, hyphae peri- or pantoclinal.[2] Cutis more or less than 150 μ thick, sharply defined; melanoid substance similar to that in *Ganoderma* but more horny, glaucous, of distinctly different composition. Basidiospores bitunicate, the epi- and endosporium separated by reticulate or disjointed cristae.

Dedicated to the memory of Dr. C. J. Humphrey, pioneer of the anatomical study of the genus *Ganoderma*.

[2] While admitting in the mycological terminology the anatomical notions 'anticlinal' and 'periclinal' for hyphal dispositions respectively perpendicular and parallel to the cutis it should be realized that there are however structures in which the hyphae bend, zig-zag and intertwine freely; such an arrangement is not covered by these two terms. For this type of hyphal growth the author suggests the word 'pantoclinal'.

Ever since the author first examined *Ganoderma lloydii* in detail this species appeared so different from typical *G. lucidum* that strong doubts were entertained whether it belonged to the genus *Ganoderma*; all anatomical characters showed marked differences. When it appeared that *Humphreya endertii* and *H. coffeatum* (both, *vide infra*) had similar characters the doubt became stronger. It then became clear that it was justified to segregate the three species and to set up a new genus for them.

It seems questionable, considering these anatomical characters, whether the genus *Humphreya* is closely related to *Ganoderma* and even whether it can be included in the Ganodermataceae.

We shall see below that the same problem arises when *Amauroderma*, as currently understood, is considered. Whereas only two species, viz. *A. longipes* (Lév.) Torrend and *A. renidens* (Bres.) Torrend, have a cutis of the hymenioderm type, only the second species has a context anatomy similar to that of *Ganoderma*, with brown skeletal hyphae. In contradistinction *A. longipes* has a context with pantoclinal hyphae. Its spores also appear widely different in that they do not have an episporium and are therefore unitunicate. We will also see below that all the other species of *Amauroderma* have an anatomy very different from that of *Ganoderma*.

At least one conclusion can be drawn from what is said above: spore structure by itself is not sufficient for grouping species into genera and genera into families; they must be seconded by other, mainly anatomical, characters. *Humphreya* is a case in point.

Humphreya lloydii (Pat. & Har.) Steyaert, *comb. nov.*
Fig. 7a, Pl. 12 fig. 43

Amauroderma lloydii Pat. & Har. *in* Bull. trimest. Soc. mycol. Fr. **28**: 281. 1912. — *Ganoderma lloydii* (Pat. & Har.) Trott. *in* Sacc., Syll. Fung. **23**: 407. 1925.

Basidioma stipitate, mesopodial; pileus convex-infundibuliform, up to 120 mm in diam; dorsal surface with many radial, ramified folds, dull Clay Color (Ridgway) to Sepia (Ridgway), in the latter case sometimes near the centre with narrow Dark Olive (Ridgway) rings. Pore surface white, usually remaining so upon drying; stipe may reach the formidable length of more than 500 mm, but is only 10–15 mm thick, usually about 200 mm long and 5–10 mm thick, dull Clay Color (Ridgway).

Section: cutis very hard, dull dark olive, 60 μ thick; context varying in thickness with the folds of the surface, 1–4 mm, probably white when fresh, Light Buff (Ridgway) when dry, often with a dark olive layer of melanoid substances near the tube layer of up to 1 mm thick; tubes up to 5–6 mm long, concolorous with context; under the cortex of the stipe sometimes a layer of melanoid substances which continue upwards in the pileus as a dark line over the tube layer.

Cutis anamixodermiform, sharply defined, composed of the same hyphae as the context, the extremities somewhat inflated, impregnated by melanoid substances scarcely soluble in KOH. Context with periclinal or sometimes pantoclinal hyphae; hyphae 3–4 μ thick, thick-walled, not producing skeletal hyphae. Pores round, 60–190–310 μ in diam.; dissepiments 10–95–280 μ thick; distance between axes about 285 μ. Spores ovoid, light yellowish, 12.5–16–20 × 8–10.5–15 μ, with crests in honeycomb pattern.

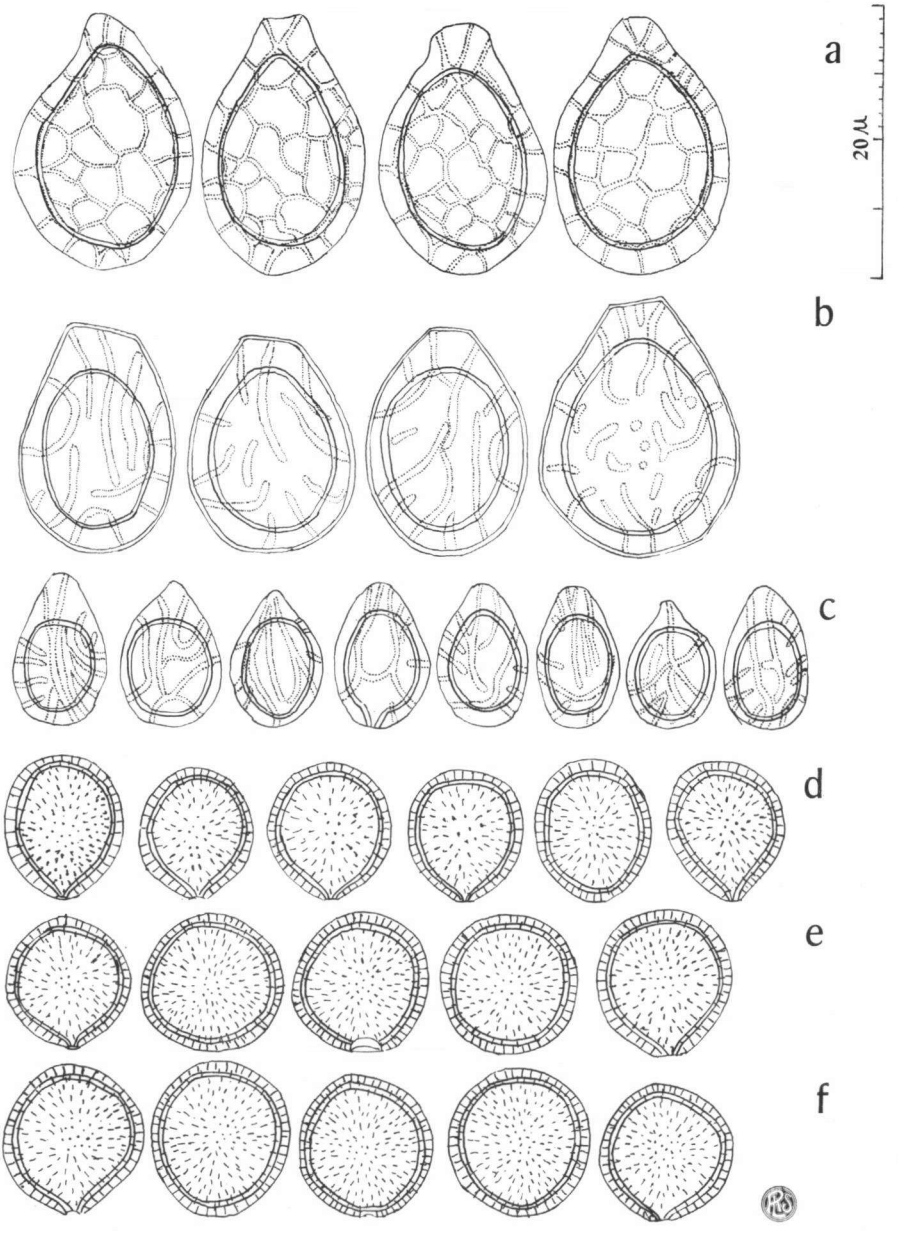

Fig. 7

Those who are familiar with *Ganoderma* will be struck immediately by the unusual appearance of the specimens of this species. The surfaces are nowhere glossy or shiny. On the contrary these appear to be velvety, especially of the stipes, which in *Ganoderma* are practically always very shiny. Some deformities of the pileus that may take the appearance of a stipe should not be so considered; these pileal abnormalties are always much more massive than a true stipe. These false stipes are all horizontal and their dorsal surface cannot be distinguished from that of the pileus, whereas in *G. lucidum* when a pileus is produced on a stipe, whether it be vertical or horizontal, the stipe assumes characters of its own that makes it sharply distinguishable from the pileus. True stipes in *Ganoderma* are always glossier than the pileus and as a rule darker.

In *H. lloydii* pileus and stipe are equally velvety in appearance and strictly of the same shade and colour.

SPECIMENS EXAMINED.—WEST AFRICA, s. loc., s. hosp., s. coll., s. dat., 53.PC.32. CAMEROONS: Tiko, s. hosp., Dunlap, 29-I-1926, 54.K.33.

ZAIRE: Ubangi, Binga, sol humide de la forêt, en bordure (marécageuse) de rivière. M. Goossens-Fontana 1094 (BR), 1939; Ubangi, Boketa-Gemena, galerie forestière de l'Ubangi, s. hosp., H. van Oosten 3B, 6B (BR), X-1955; distr. Haut-Congo, Yangambi, on *Paramacrolobium coeruleum*, B. Fassi 995 (BR), VI-1956.

Humphreya endertii Steyaert, *sp. nov.*

Fig. 7b, Pl. 12 fig. 44

Basidioma convexum, verticaliter pleurostipitatum, circa 30 mm diam.; pagina dorsalis umbrina; pagina ventralis alba, in sicco cinnamomea.

Sectio: cutis vix distincta, cornea, circa 100 μ crassa, umbrina; contextus melleus, 2–3 mm crassus; tubulorum stratum 1, usque ad 15 mm crassum, isabellinum; stipes minimus 120 × 5 mm.

Cutis hyphis periclinis vel subpericlinis dense intermixtis, substantia melanoidea brunneo-fulva imbutis. Hyphae contextus[3] pantoclinae dense intermixtae, flexuosae. Pori circulares, 140–165–200 μ diam, dissepimentis 30–50–80 μ, axibus circa 215 μ distantibus. Basidiosporae obovatae, melleae, maximae, 16–17.25–15 μ, endosporio cristulato.

Basidioma convex, laterally and vertically stipitate, about 30 mm in diam.; upper surface Cinnamon Brown (Ridgway), pore surface white, Cinnamon when dry.

Section: cutis sharply delimitated, hard, about 100 μ thick, umber; context

[3] The context hyphae are not exactly periclinal although none can be taken as anticlinal. The hyphae certainly have a general horizontal trend but they are densely interwoven.

EXPLANATION OF FIGURE 7

Fig. 7. Basidiospores. — a. *Humphreya lloydii*, 53.PC.32 (Holotype). — b. *H. endertii*, Endert (BO 6268), 66.L.38 (Holotype). — c. *H. coffeatum*, Blanchet, 53.PC.11 (holotype of *Polyporus opacus*). — d. *Magoderma infundibuliforme*, Maitland, 70.K.1 (Holotype). — e, f. *M vansteenisii*: e, van Steenis 10,170, 66.L.61 (Holotype), 66.L.62.

Cinnamon Buff (Ridgway), 2–3 mm thick; tubes up to 15 mm long, in one layer, Tawny Olive (Ridgway). Stipe about 120 × 5 mm.

Cutis hyphae periclinal or subpericlinal, densely interwoven, agglomerated by a tawny-brown melanoid substance. Context hyphae peri-pantoclinal, subparallel, flexuous. Pores round, 140–165–200 μ in diam.; dissepiments 30–50–80 μ thick; distance between axes about 215 μ. Basidiospores ovoid, chamois, 16–17.25–19.5 × 11–12.15–15 μ, bitunicate with cristulate endosporium.

This species is as yet known only by one specimen; it is so characteristic that one cannot but consider it to be an as yet unknown species.

Although the basidioma recalls by many features—periclinal hyphae, texture of the cutis, spore type, never sessile—those of *H. lloydii* these also distinguish them from *Ganoderma*.

SPECIMEN EXAMINED.—INDONESIA: K a l i m a n t a n (Borneo), West-Koetai, s. hosp., F. H. Endert (Holotype BO 6268; fragment in BR), 1925, 66.L.28.

Humphreya coffeatum (Berk.) Steyaert, *comb. nov.*

Fig. 7c, Pl. 12 figs. 45, 46

Polyporus coffeatus Berk. *in* Ann. Mag. nat. Hist. **3**: 385. 1839. — *Fomes coffeatus* (Berk.) Cooke *in* Grevillea **15**: 51. 1886. — *Ganoderma coffeatum* (Berk.) Murrill *in* Bull. Torrey bot. Club **32**: 367. 1905.

Polyporus opacus B. & Mont. *in* Annls Sci. nat. (Bot.) III **11**: 236. 1849.[4] — *Fomes opacus* (B. & Mont.) Cooke *in* Grevillea **13**: 118. 1885. — *Ganoderma opacum* (B. & Mont.) Pat. *in* Bull. Soc. mycol. Fr. **5**: 67. 1889.

Basidioma stipitate, vertically pleuropodial; pileus convex, about 40 mm in diam.; dorsal surface sometimes concentrically subundulate, either Buckthorn Brown (Ridgway) or Saccardo Umber (Ridgway); margin thick, grooved.

Section: cutis about 130 μ thick, sharply delimitated, dark brown; context 2–6 mm thick, probably white when fresh, Cream Buff (Ridgway) when dry; one-layered, concolorous with context, up to 5 mm thick.

Cutis of the anamixoderm type with hyphae anticlinal and with short hyaline extracuticular hyphae in unweathered specimens. Context with thick, hyaline skeletal hyphae. Pores round, small, 90–100–120 μ; dissepiments about 35 μ thick; distance between axes about 135 μ. Basidiospores bitunicate, with cristulate endosporium, 9.5–10.8–11.5 × 6.5–7–8 μ.

SPECIMENS EXAMINED.—BRAZIL: B a h i a, s. hosp., Blanchet, s. dat., 51.PC.11.

TRINIDAD: Caroni River, St. Joseph, on buried wood, Dennis & Baker, X-1949, 66.L.23.

CUBA: Tetas de Santa Tereza, ad truncum emortuis arboris frondosis, F. Kotlaba, 17-III-1967, 68.PR.10.

[4] The type specimen in Paris is unfortunately reduced to fragments so one cannot but rely on Berkeley and Montagne's description and on the anatomical details observed from the débris. The description of the outer morphology given in this paper is based on Dennis & Baker's and Kotlaba's specimens.

AMAURODERMA Murrill

The genus *Amauroderma* as currently understood still has many unsatisfactory aspects as to its homogeneity with regard to anatomical features and also because of aberrations of the spore structure of some species. The spores of *Amauroderma*, yielding the principal character delimitating the genus, are understood to be globose, bitunicate, with numerous short echinulae between epi- and endosporium. When this type of spores is accepted as typical some species, such as *A. longipes* (Pat.) Torrend with unitunicate, cristate spores, can be readily excluded.

But even when restricted to species with globose, bitunicate, echinulate spores there is so much variation in the anatomy of the context and cutis that it is impossible not to conclude that the genus in its present circumscription is still very strongly artificial. The various types of anatomy found in the genus as conceived by Furtado (*1968*) can be separated as follows:—

I. Context and cutis with anticlinal hyphae.
   1. Cutis hymeniodermiform as in *Ganoderma*.—*A. renidens* (Bres.) Torrend.
   2. Cutis hyphae anticlinal but septate, remote from the *Ganoderma* type.—*A. conjunctum* (Lloyd) Torrend, *A. elmerianum* Murrill, *A. infundibuliforme* Wakef., *A. praetervisum* (Pat.) Torrend, *A. subrugosum* (Bres. & Pat.) J. S. Furtado, *A. fasciculatum* (Pat.) Torrend. This last species has an oblong spore with relatively few, thick, moderately long echinulae.
   3. Cutis hyphae sub-anticlinal, subhyaline, slanting and swollen at the tips; somewhat reminiscent of a hymenioderm but the elements not densely crowded together.—*Polyporus rugosus* Bl. & Nees, (syn., *Ganoderma sprucei* Pat., *fide* Spruce 44).

II. Context hyphae periclinal.
   1. No distinct cutis anatomy.—*Polyporus variabilis* Berk. (*fide* Paris specimen Leprieur 965, not mentioned by Furtado), *A. expallens* (Bres.) J. S. Furtado (*fide* Maitland, Mazeras area, Kenya, BPI), *A. calcigenum* (Berk.) Torrend, *A. camerarium* (Berk.) J. S. Furtado, *A. exile* (Berk.) Torrend, *A. macrosporum* J. S. Furtado, *A. oblongisporum* J. S. Furtado, *A. schomburgkii* (Mont. & Berk.) Torrend, *typus generis*.
   2. Cutis composed of spheroid cells.
      a. No free extracuticular hyphae.—*A. rude* (Berk.) Torrend var. *rude*, *A. sikorae* (Bres.) J. S. Furtado.
      b. Free extracuticular hyphae.—*A. rude* (Berk.) Torrend var. *intermedium* (Bres. & Pat.) J. S. Furtado.
   3. Cutis densely compressed, hyphae slanting upwards.—*A. bataanense* Murrill, *A. omphalodes* (Berk.) Torrend.
   4. Long free extracuticular hyphae, more or less in wisps.—*A. trichodermatum* J. S. Furtado ("*trichodematum*").

III. Context hyphae pantoclinal.
   1. No free extracuticular hyphae.—*A. boleticeps* (Pat. & Gaill.) Torrend, *A. pseudoboletus* (Speg.) J. S. Furtado.
   2. Cutis with subanticlinal, interwoven hyphae.—*Polyporus leptopus* Pers. (*fide* Gaudichaud's type specimen in Paris), Pl. 15 fig. 57.

The above arrangement of species according to their most striking features shows, with the exception of group I, 1, distinct anatomical differences with *Ganoderma*. Group II, 1, with the type species of *Amauroderma*, must be taken as the nucleus of

Amauroderma, which is therefore characterized by its context with periclinal hyphae and lack of a distinct cutis. The hyphae themselves have very thick, slightly coloured walls. These hyphae may have short, contorted ramifications but there are no other types of hyphae, either thicker- or thinner-walled. This type of anatomy puts this group taxonomically in a remote position from *Ganoderma*. Assuming that group I, 1 is anatomically close to *Ganoderma*, then groups I, 2 and I, 3 have much less relationship with it, and the entire group III is decidedly remote from it.

Two species have not yet been mentioned, i.e. *Ganoderma subresinosum* (Murrill) Humphrey and *Ganoderma lignosum* Pat. They will be examined now. Both these species have ovoid, bitunicate spores with an echinulation similar to that of *Amauroderma*. The apical echinulae are identical to all the other on the spore and the apex itself is not collapsible at maturity. The spores of these two species show therefore a closer affinity to those of *Amauroderma* than to those of *Ganoderma*. When the anatomy of the two is compared a similar conclusion can be arrived at. *Ganoderma subresinosum* has a context and cutis anatomy showing similarities with those of *A. infundibuliforme*, whereas *G. lignosum* shows some relationship to the typical *Amauroderma* group as to context and cutis anatomy. All the same both the context and the cutis of *G. lignosum* also have peculiarities of their own. Thus the cutis layer, which is only 30 μ thick, is made up of very thin periclinal hyphae impregnated with a melanoid substance, and the context consists of three layers, the uppermost, under the cutis, about 350 μ thick, is made up of periclinal hyphae, while the one below it is of about the same thickness and composed of pantoclinal hyphae. Below this second layer the hyphae are all periclinal. This kind of anatomy is not comparable with that of any of the species of *Amauroderma* described up till now.

A feature that should be stressed, and which is common to both G. *subresinosum* and *G. lignosum*, is that they have dimidiate basidiomata, whereas all species of *Amauroderma*, or those currently regarded as such, have stipitate pilei.

Although their spore characters put them in close relationship to *Amauroderma*, the absence of stipes should apparently exclude them from that genus. This would suggest grouping them in a single genus but this would contradict the features of their anatomy which are as widely divergent as possible. No solution with regard to *G. lignosum* will be offered now; this should be postponed until more and better knowledge has been gained of other species. However with regard to *G. subresinosum* a solution is offered below by grouping it with two other species in the new genus *Magoderna*.

Before closing this discussion, attention should be called to *A. rubeolum* (Bres.) Otieno, which according to Furtado is a synonym of *A. sikorae* (Bres.) J. S. Furtado. If one refers to Bresadola's type specimen in Vienna the synonymy is correct. However, if one refers to Furtado's illustration of the cuticular anatomy of *A. sikorae* it must be concluded that there is some discrepancy; his illustration shows a cutis made up of haphazardly disposed spheroid cells. This is not in agreement with the anatomy revealed by Bresadola's type specimen, which has for each hypha a characteristic short chain of fuliginous cells in the cutis itself and above it a short hyaline hypha.

AMAURODERMA RUGOSUM (Bl. & Nees) Torrend

Polyporus rugosus Bl. & Nees *in* Nova Acta phys.-med. Acad. Caes. Leop.-Carol. **13** (1): 21. 1826; Fr., Elench. Fung. **1**: 74. 1828. — *Ganoderma rugosum* (Bl. & Nees) Pat. *in* Bull. Soc. mycol. Fr. **5**: 68. 1889. — *Amauroderma rugosum* (Bl. & Nees) Torrend *in* Broteria (Ci. nat.) **18**: 127. 1920, in obs.

Porotheleum rugosum Berk. *in* Hook. J. Bot. **8**: 237. 1856, non *Amauroderma rugosum* (Bl. & Nees) Torrend 1920. — ≡ *Ganoderma sprucei* Pat. *in* Bull. Soc. mycol. Fr. **10**: 75. 1894. — *Amauroderma sprucei* (Pat.) Torrend *in* Broteria (Ci. nat.) **18**: 125. 1920.

A considerable confusion has arisen with regard to this species. In 1826, Blume & Nees published the binomial *Polyporus rugosus* for a Javanese collection. Fries took up the name in 1828; in 1838 he admitted two varieties, an African and a Javanese but he did not mention a specimen for the African (Guinean) plant. In 1851 he placed Afzelius' Guinean collection in *P. rugosus* without distinguishing varieties.

In 1856, Berkeley studied a Brazilian fungus (Spruce 44), which he described as a new species, *Porothelium rugosum*. There is every reason to assume that he fortuitously gave the same specific epithet to his fungus; he does not mention Blume & Nees' Javanese fungus. The Brazilian and the Javanese fungi could well belong to the same species considering their morphology, although *P. rugosus* from Java often has mesopodial fruitbodies whereas those from Brazil are pleuropodial.

In 1889 when Patouillard published the recombination *Ganoderma rugosum* (Bl. & Nees) Pat. he referred to Blume & Nees von Esenbeck's description and illustration; the new combination was introduced in connection with a Guianan collection (Leprieur 862). Since he referred to Blume & Nees' publication there can be no doubt that Patouillard considered the South American and the Javanese collections to be one and the same species. In 1894, Patouillard took up the name *Porothelium rugosum* Berk.; this is the Brazilian taxon based on Spruce 44. He changed the name to *Ganoderma sprucei* Pat. because he considered that there already existed an epithet 'rugosum' in a combination with the generic name *Ganoderma*, without however specifying the combination. It may be assumed that he had in mind the combination he published in 1889. It is necessary to point out that Patouillard's description of 1889 contains some contradictions. He described the spores as "ovales, fortement échinées, 11 × 8 μ . . . et par ses spores presque rondes." In case the sizes he gave were correct, the spores would indeed be ellipsoid although he ended by saying that they are nearly round. Since he referred to Blume & Nees' plate VII of *Polyporus rugosus* this clearly indicates that he was not dealing with a species of *Ganoderma* but with one that is currently placed in *Amauroderma*. Therefore the last words of his description of the spores should be taken as correct.

In 1968 Furtado, in his thesis on the genus *Amauroderma*, self-evidently listed *Porothelium rugosum* Berk. in the synonymy of *Amauroderma sprucei* (Pat.) Torrend; like Patouillard he rejected the specific epithet 'rugosum Berk.' apparently in view of the existence of the earlier homonym. It is impossible to obtain unquestionable proof that *Porothelium rugosum* Berk. (≡ *G. sprucei* Pat.) and *Ganoderma rugosum* (Bl. & Nees) Pat. sensu Patouillard were really one and the same species since Leprieur's

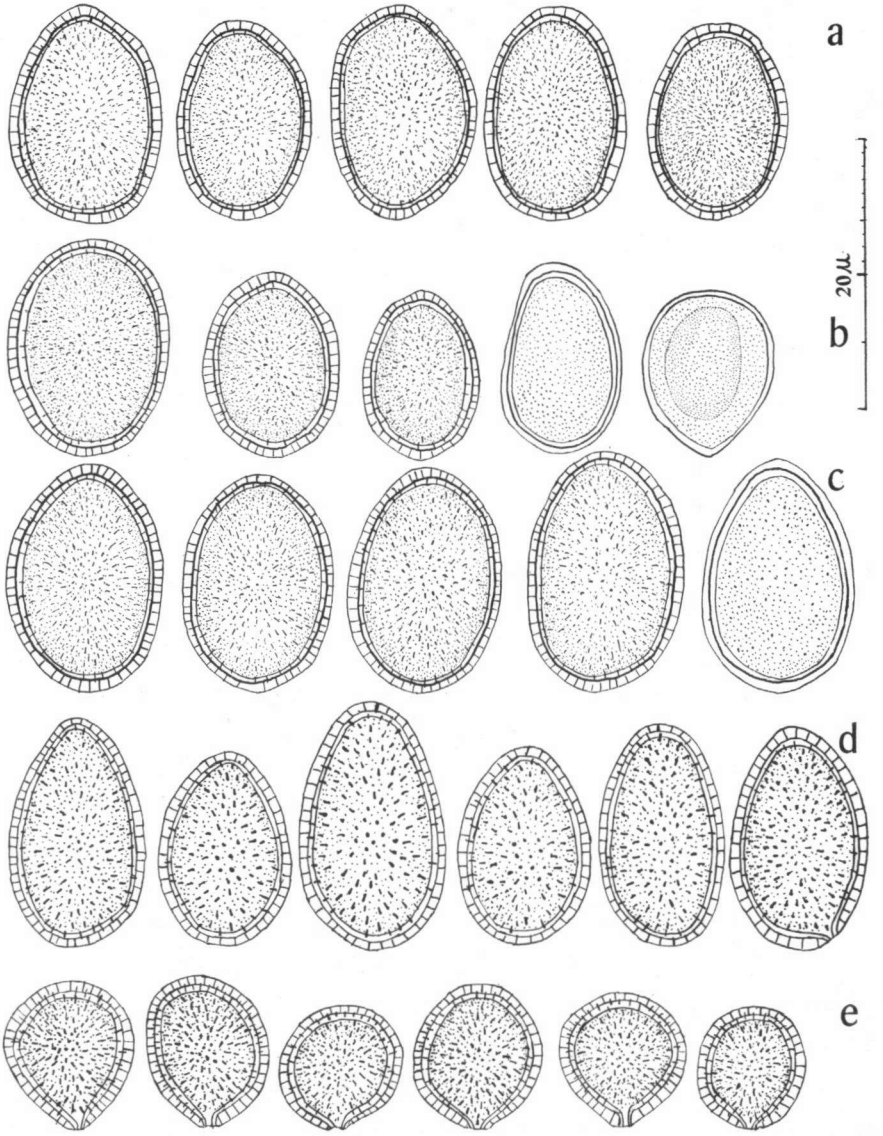

Fig. 8. Basidiospores. — a–d. *Magoderna subresinosum*: a, b, Mondih (BO 12,473), 66.L.28 & 42; c, Brooks, 62.K.54; d, Goossens-Fontana 184, BR (holotype of *Polyporus mamelliporus*). — e. *Amauroderma preussi*, Fassi 556, BR.

specimen 862 seems to be lost; in any case inquiries and visits to the museum in Paris have not brought it forth. The only fact substantiating their conspecifity is that (as stated above) Patouillard referred to Blume & Nees' illustration in connection with *Ganoderma sprucei.*

When Torrend transferred *G. sprucei* Pat. to the genus *Amauroderma* he did not realize that there existed no obstacle to recombine the epithet of the basionym *Porothelium rugosum* with the generic name *Amauroderma.*

It should be noticed that Lloyd's figure 404 (*1912*) shows a specimen of Spruce 44, from the Museum in Paris, which is a portion of the type of *Porothelium rugosum* (≡ *G. sprucei*). This specimen is pleuropodial whereas Blume & Nees' illustration shows mesopodial as well as pleuropodial basidiomata. Conditions of growth may sometimes induce a normally mesopodial species to develop an aberrant shape; no overrated importance should be attributed to this feature.

It has been thought appropriate to fix the emended species by giving a description of Spruce 44.

Basidioma meso- or pleuropodially stipitate, pileus convex; upper surface radially deeply corrugated and bumpy, Mummy Brown (Ridgway), 30–50 mm in diam.; stipe about 50 mm long and 4–5 mm thick, concolorous with the pileus or of some lighter, more yellow shade.

Section: cutis dull Mummy Brown, about 70 μ thick; context Chamois (Ridgway), 3–5 mm thick; tube layer concolorous with the context, 4–6 mm thick.

Cutis with hyphae directed obliquely and ending in a swollen apex somewhat reminiscent of the elements of a hymeniodermiform cutis but not densely aggregated as in the latter, with moderately conspicuous septa, 20–30 × 5–6 μ. Context hyphae periclinal near the cutis but pantoclinal and freely intertwining in the middle of the context and near the tube layer, yellowish, 2–3 μ thick. Pores round, 90–112.5–130 μ in diam.; dissepiments 40–65–90 μ thick; distance between axes about 180 μ. Basidiospores subspherical, yellowish, 8–7.8–9.00 × 6.5–7.0–7.5 μ.

This species is temporarily kept in *Amauroderma* although the cutis anatomy is very close to that of *A. elmerianum* Murrill, which is at variance with that of *A. schomburgkii* (Mont. & Berk.) Torrend, which includes the type species of *Amauroderma.*

SPECIMENS EXAMINED.—BRAZIL: s. loc., s. hosp., Spruce 44, s. dat., 53.PC.45; s. loc., s. hosp., Spruce 48, s. dat., 63.K.116.

GUIANA: Bartica, s. hosp., D. H. Linder (BO 16,814), 7-XII-1923, 66.L.100.

Amauroderma preussii (P. Henn.) Steyaert, *comb. nov.*
Fig. 8e, Pl. 14 figs. 55, 56

Ganoderma preussii P. Henn. *in* Bot. Jb. **14**: 342. 1891. — *Fomes preussii* (P. Henn.) Sacc., Syll. Fung. **11**: 89. 1895.

Ganoderma sikorae Bres. *in* Zahlbr. *in* Annls naturh. Hofmus. Wien **26**: 157. 1912. — *Amauroderma sikorae* (Bres.) J. S. Furtado, Revisão Gên. Amauroderma 280. 1968.

Ganoderma rubeolum Bres. *in* Mycologia **17**: 73. 1925. — *Amauroderma rubeolum* (Bres.) Otieno *in* Sydowia **22**: 177. 1969.

Basidioma stipitate, meso- or more often pleuropodial; pileus subcircular to circular, radially finely plicate, somewhat concentrically undulate, Cinnamon Brown (Ridgway), in large specimens with concentric darker shades, up to 90 mm in diam.; margin recurved, enveloping the tube layer, horizontally grooved, vertically plicate; stipe up to 280 mm long and up to 8 mm in diam. at the base, Dresden Brown (Ridgway).

Section: cutis dull dark brown, about 180 μ thick, context of about equal thickness as tube layer, Antimony Yellow (Ridgway); tube layer Bister (Ridgway), up to 5 mm thick.

Cutis hyphae slanting, with 4–5 fuliginous cells, extending externally as a free, hyaline hypha usually almost appressed to the cutis or slanting upward, near the base of the pileus nearly anticlinal. Context hyphae periclinal, subhyaline, 3–5 μ thick. Basidiospores spherical with thin, short echinulae between endo- and episporium, subhyaline, 7–9.1–11.5 × 6.5–8.5–10 μ. Pores round, 90–116–160 μ in diam.; dissepiments 10–57–110 μ thick; distance between axes about 180 μ.

Amauroderma preussii is temporarily kept in the genus *Amauroderma* although the cutis has a distinctive anatomy different from typical species of *Amauroderma*.

Although Furtado mentions one specimen from New Guinea *A. preussii* appears to be mainly an African species. The type is the third mentioned in this paper that escaped destruction in the Berlin herbarium.

SPECIMENS EXAMINED.—CAMEROONS: Barombi Station, ad truncos, Preuss s.n. (Holotype), s. dat., 70.B.3.

UGANDA: Magomba Forest, ad truncos, T. D. Maitland 398 (holotype of *Amauroderma rubeolum* Bres.), s. dat., 56.BPI. 2.

ZAIRE: Yangambi, sur débris ligneux au sol, B. Fassi 411, 412 (BR), 5-III-1956; Yangambi, sur sol, B. Fassi 556 (BR), 26-III-1956; Yangambi, sur sol, B. Fassi 676 (BR), 17-III-1956; Yangambi, sur *Garcinia punctata*, B. Fassi 819 (BR), VI-1956; Yangambi, s. hosp., B. Fassi 1107 (BR), IX-1957; Yangambi, sur feuilles mortes de *Gilbertiodendron dewevrei*, B. Fassi 1111 (BR), 15-IX-1957.

MALAGASY (Madagascar): pr. Antananarivo, ad truncos, J. Sikora (holotype of *Ganoderma sikorae* Bres.), s. dat., 71.W.1.

Haddowia Steyaert, *gen. nov.*

Basidioma stipitatum, forma et colore Ganodermatis simile; cutis hymeniodermiformis; sporae illis Ganodermatis valde distinctae; costis longitudinalibus ornatae, costae cristis longitudinalibus 2 a parietibus transversalibus junctis constitutae, sporarum costae paries exterior nullus. Contextus sicut tubulorum stratum albus, in sicco stramineus.

SPECIES TYPICA.—*Amauroderma longipes* (Lév.) Torrend.

Basidioma stipitate, similar in shape and colour to those of the species of *Ganoderma* with hymeniodermiform cutis, differing in the spores, which are longitudinally costate; costae made up of two longitudinal crests connected by transverse membranes; no outer wall to the spores which appear unitunicate.

The name is a tribute to W. R. Haddow (*1931*) in view of his careful studies in the genus *Ganoderma*.

Haddowia longipes (Lév.) Steyaert, *comb. nov.*
Figs. 9a, b, c, Pl. 13 fig. 47

Polyporus longipes Lév. *in* Annls Sci. nat. (Bot.) III **5**: 124. 1846. — *Amauroderma longipes* (Lév.) Torrend *in* Broteria (Ci. nat.) **18**: 33, 135. 1920.
Polyporus costatus Lloyd, Mycol. Writ. **4** (Letter 56): 9, 1915; Mycol. Writ. **6**: 889. 1919. — *Amauroderma costatum* (Lloyd) Torrend *in* Broteria (Ci. nat.) **18**: 136. 1920, in obs.

Basidioma stipitate, pleuropodial or excentrally mesopodial; pileus 40–55 mm in diam., stipe up to 180 mm long and 5 mm thick; stipe and upper surface of pileus Blackish Brown (Ridgway), laccate, upper surface rugulose, slightly radially plicate.
Section: cutis very thin, 20–30 μ thick, blackish brown; context white (straw-coloured when dry), 4–5 mm thick; tube layer concolorous with context, up to 5 mm thick.
Cutis hymeniodermiform, its elements obovoid, swollen by melanoid substances, approximately 20 × 6 μ; context without brown skeletal hyphae. Pores irregularly rounded, more or less polygonal, 590–700–780 × 320–500–650 μ; dissepiments 30–45 μ thick; distance between axes about 550 μ. Basidiospores ellipsoid, yellowish, 12–15.3–19 × 10–12–14.5 μ.

Photographs of *Polyporus longipes* were published by Lloyd, Mycol. Writ. **6** (Mycol. Notes 62): pl. 154 figs. 1742, 1743, 1920.

SPECIMENS EXAMINED.—FRENCH GUIANA: s. loc., sur troncs, s. coll., s. dat., 53.PC.13 (Holotype); près St Laurent du Maroni, s. hosp., R. Heim 657, 24-VIII-1952, 53.PC.12.
KENYA: Mazeras, Mwashi River area, growing up from dead roots, T. D. Maitland 556, III-1921, 55.K.68.

Haddowia aëtii Steyaert, *sp. nov.*
Fig. 9d. Pl. 13 fig. 48

Basidioma verticaliter stipitatum plusminusve mesopodum; pileus usque ad 40–50 mm diam, 15 mm crassus; stipes et pagina superior fusco-nigri, laccati; pagina superior leviter rugulosa.
Sectio: cutis 20–30 μ crassa, fusco-nigra; contextus albus, in sicco stramineus, 2–4 mm crassus; tubuli contextus concolores, usque ad 10 mm longi.
Cutis anatomice hymeniodermiformis, elementis longi obovoideis vel subcylindraceis, substantia melanoidea instructis, circa 20 × 6 μ. Hyphis pantoclinis, sine hyphis brunneis. Pori irregulariter circulares, 360–415–480 × 360–410–450 μ, dissepimentis 30–40–70 μ crassis, axibus circa 465 μ distantibus. Basidiosporae subsphaeroideae, costatae, unitunicatae, melleae, 9.5–10.1–11 × 8–8.6–9.5 μ.

Basidioma vertically, excentrically mesopodial; pileus 40–50 mm in diam., 15 mm thick; stipe and dorsal surface Blackish Brown (Ridgway), laccate, dorsal surface slightly rugulose.
Section: cutis 20–30 μ thick, blackish brown, context white, straw-coloured when dry, 2–4 mm thick; tubes concolorous with context, up to 10 mm long.
Cutis hymeniodermiform; its elements long obovoid or subcylindrical, swollen by melanoid substances, and about 20 × 6 μ. Hyphae pantoclinal, without brown skeletal hyphae. Pores irregularly rounded, 360–415–480 × 360–410–450 μ; disse-

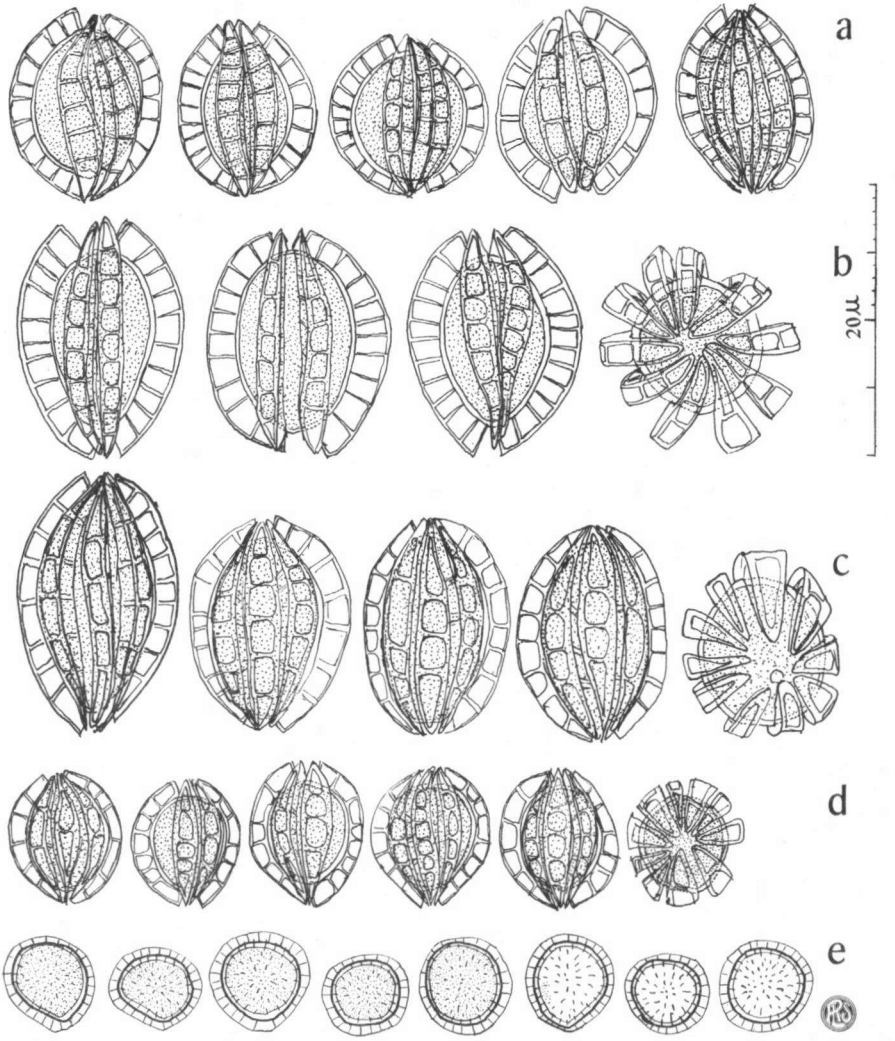

Fig. 9. Basidiospores. — a–c. *Haddowia longipes*: a, 55.PC.13 (Holotype); b, Heim 657; 53.PC.12; c, Maitland 556, 55.K.68. — d. *H. aëtii*, Aët (Exp. M. E. Walsh) 122, 66.L.46. — e. *Amauroderma rugosum*, Linder (BO 16,814), 66.L.100.

piments 30–40–70 μ thick, distance between axes about 450 μ. Basidiospores subspherical, costate, unitunicate, 9.5–10.1–11 × 8–8.6–9.5 μ.

Comments on the two species of *Haddowia*.

There seems to be some variation in the anatomy of the cutis. In some specimens the elements are very thick, more or less obovoid (the two Guianan specimens cited above for *H. longipes*), whereas in the African material of *H. longipes* and the Asiatic *H. aëtii* these elements are more cylindrical and narrower, with the apex more or less swollen. Such a case of variation has previously been observed in *Ganoderma weberianum* but in that case the variation seems to be concurrent with a more or less intense production of gasterospores, whereas in *Haddowia* these have not yet been reported. In both cases however the variation seems the result of the greater or fewer number of context hyphae curving upward to produce the cutis elements.

The spore morphology attracts attention. When they are observed with the top of the spore closest to the eye no episporium can be seen and only hiatuses are noticed between the costae produced on what is known as the endoporium in *Ganoderma*. Before expressing a definite statement on the absence of an episporium however the initial stages of the spore development should be observed; these might possess an ephemeral episporium. Confirmation of the absence of the outer spore wall could probably mean that *Haddowia* must be removed from the neighbourhood of *Ganoderma* although they seem to be related by some anatomical features.

SPECIMEN EXAMINED.—INDONESIA: Kalimantan (Borneo), Sangkulirang, s. hosp., Aët (exp. M. E. Walsh) 122, (BO; Holotype), middle 1937, 66.L.46.

Magoderna Steyaert, *gen. nov.*

Basidioma dimidiatum vel pleuropodum. Contextus bubalinus; hyphae in contextus zonis superioribus et in cute anticlinae, ibi cum inflatae tum hymenioderma constituantes. Sporae ovato-ellipsoideae usque ad sphaericae, bitunicatae; echinulis aequilongis inter endosporium episporiumque ubique insertis minutae.

SPECIES TYPICA.—*Fomes subresinosus* Murrill.

Basidioma dimidiate or pleuropodial; context Light Buff (Ridgway); tube layer Buckthorn Brown (Ridgway); hyphae bending anticlinally near the cutis, anticlinal in the latter. Spores ovoid-ellipsoid to spherical, bitunicate, episporium separated from endosporium by echinulae of equal lengths all around the spore.

The name *Magoderna* is an anagram of *Ganoderma*.

Because of its spores *Magoderna* is much closer to *Amauroderma* than to *Ganoderma*, but the anticlinal disposition of the subcuticular and cuticular hyphae differentiates it from *Amauroderma*.

The spores of *M. subresinosum*, although slightly ovoid or ellipsoid can be distinguished from those of *Ganoderma* by the echinulae which are uniformly distributed all around the spore with no particularities in the apex, whereas in *Ganoderma* the episporium bulges out at the apex and is either not supported by echinulae or separated from the endosporium by much longer echinulae. In the former case the

apex collapses and gives a truncate appearance to the spore. As to the cutis hyphae, those of *Magoderna* are produced directly by context hyphae whereas in *Ganoderma* the brown skeletal hyphae first produce hyaline hyphae which terminate as swollen ends filled with melanoid substances. These swollen ends constitute the elements of the hymenioderm.

Magoderna infundibuliforme (Wakef.) Steyaert, *comb. nov.*
Fig. 7d, Pl. 13 fig. 49

Amauroderma infundibuliforme Wakef. *in* Bull. misc. Inf. Kew **1917**: 309. — *Ganoderma infundibuliforme* (Wakef.) Sacc. & Trott. *apud* Trott. *in* Syll. Fung. **23**: 406. 1925.

Basidioma infundibuliform, mesopodial; upper surface of pileus radially plicate, Hair Brown (Ridgway), up to 80 mm in radius from the centre; pore surface Light Mouse Gray (Ridgway),[5] covering incompletely the underside of the funnel, leaving a narrow radial zone from the stipe to the margin of cuticular tissue apparently as the result of the junction of the two extreme edges of the pileus[6]; stipe relatively short, 50 × 5 mm, concolorous with upper surface of pileus.[7]

Section: cutis dull grey, about 100 μ thick, brittle; context thin, 1–2 mm thick, light Buff (Ridgway), with one or two parallel deposits of melanoid substances in the middle; tubes one-layered, 3–4 mm thick, Saccardo Umber (Ridgway).

Cutis hymeniodermiform, hyphae anticlinal, distinctly septate, impregnated with fuliginous melanoid substances up to the middle of the inflated extremities, the upper part of the latter hyaline and hymeniodermiform, up to 5 μ thick. Context hyphae very lightly chamois coloured, 3–4 μ thick; no distinct skeletal hyphae. Pores round, 90–125–170 μ in diam.; dissepiments 20–35–60 μ thick; distance between axes about 160 μ. Basidiospores spherical or slightly obovoid, light chamois, 9–9.9–10.5 × 8–8.5–9 μ.

Maitland added the following note to the specimens he collected: "Only one was standing out from the tree, the others were bracketed against the dead trunk as can be seen in the accompanying specimen. The stalks were glossy when gathered, much like the pileus of *Fomes mastoporus* but when exposed to sun and air soon became dull."

SPECIMENS EXAMINED.—BUGANDA: Bumpenge Forest, on base of erect dead tree, T. D. Maitland 24A, I-1915, 70.K.1.

Magoderna subresinosum (Murrill) Steyaert, *comb. nov.*
Figs. 8a, b, c, d, Pl. 13 figs. 50, 51

Fomes subresinosus Murrill *in* Bull. Torrey bot. Club **35**: 410. 1908. — *Ganoderma subresinosum* (Murrill) Humphrey *in* Mycologia **30**: 332. 1938. — *Trachyderma subresinosum* (Murrill) Imaz. *in* Bull. Govt Forest Exp. Stn Japan No. 57: 119. 1952.

[5] Maitland indicates that the hymenium was purplish when collected.
[6] This might perhaps indicate that the pileus is not always funnel-shaped.
[7] In Maitland's notes the stalk was indicated as glossy when collected but becoming dull soon afterward.

Ganoderma simulans Wakef. *in* Bull. misc. Inf. Kew **1922**: 161.
Polyporus mamelliporus Beeli *in* Bull. Soc. r. Bot. Belg. **42**: 62. 1929.

Basidioma dimidiate to pleuropodial; pileus up to 110 mm in radius, sometimes several small pilei on congregate stipes arising from a common base; upper surface black, very shiny, densely radially plicate, indurated; margin usually thick, recurved and horizontally plicate or recurved and deeply and very irregularly vertically indented; pore surface from Cinnamon Buff (Ridgway) to Buffy Brown (Ridgway), limited by a raised cuticular margin. Stipe usually short (longest measured, 50 mm, but basidiomata appear to have been broken off above the point of attachment on the host).

Section: cutis indurated, heavily impregnated with melanoid substances; context variable in thickness, from one to two-thirds of the thickness of the pileus, usually Light Buff (Ridgway), sometimes in old specimens spotted by deposits of melanoid substances; tube layer up to 15 mm thick, Tawny (Ridgway), finely vertically striated Warm Buff (Ridgway).

Cutis hyphae anticlinal, the extremities swollen, fuliginous in the lower part, the upper remaining hyaline, the swollen hypha about 4 μ thick, collected into a hymeniodermcovered by a deposit of melanoid substances 4–6 μ thick and easily detachable on sectioning the cutis. Pores round, surrounded by 'sclerified' cells (probably a deposit of some melanoid substance) which at first form a perfect, thin circle which later widens irregularly up to the point that the whole dissepiment is involved, 60–185–310 μ in diam.; dissepiments 10–95–300 μ in diam.; distance between axes 190–280–375 μ. Basidiospores subovoid to ellipsoid, bitunicate, pale yellowish, between epi- and endosporium with short echinulae of the same length all around the spore, 12.5–16–20 × 8–10.5–11.75 μ.

There appears to be some important variation in the sizes of the pores and the dissepiments, sizes that fluctuate much more than in the species of *Ganoderma*.

The known distribution extends from the Philippines to West Africa through Malaysia, Burma, India, Ceylon, Kalimantan and Eastern and Central Africa. No specimen is available from the American tropics and there seems to be no mention of this species in the literature from there. It is also surprising that in the Bogor collections no specimens are found from Java and Sumatra which have been intensively explored botanically.

Imazeki included this species in the genus *Trachyderma* of which name *T. tsunodae* Imazeki is the type. This species has spores of the *Ganoderma* type with a bulging apex. The cutis anatomy is also very much at variance with that of *M. subresinosum*; it can also be distinguished from that of the species of *Ganoderma*. *Trachyderma tsunodae* certainly stands apart from *Ganoderma* but *M. subresinosum* can be grouped with other species into a distinct genus.

SPECIMENS EXAMINED.—PHILIPPINE ISLANDS: Luzon, Prov. Bataan, Lamao Forest Reserve, s. hosp., F. W. Foxworthy (Bur. Sci. 1628) (Holotype), X-1906, 70.NY.1, 62.K.55; Prov. Rizal, Bosoboso, s. hosp., M. Ramos (Bur. Sci, 1215), VII-1906, 70.NY.2; Prov. Rizal, s. loc., s. hosp., H. S. Yates (Bur. Sci. 25,001), IX-1915, 62.K.53; s. loc., s. hosp., E. D. Merrill (ex Herb. J. Bresadola), 1908, 62.K.52.

INDIA: s. loc., s. hosp., s. coll. (comm. S. R. Bose), V-1948, 62.K.58.

CEYLON: Ritigala, s. hosp., Petch? (label is in his handwriting) 4814, 25-IV-105, 62.K.60; Peradenyia, s. hosp., Petch? (label is in his handwriting) 2470, 62.K.61, 62.

MALAYSIA: Sungei Choh, on rotten wood in rubber estate, F. T. Brooks, 19-IX-1914, 62.K.54.

BURMA: Mergui, s. hosp., s. coll., s. dat., 62.K.56.

INDONESIA: K a l i m a n t a n (Borneo), Karimata, s. hosp., Mondih (BO 12,473) III-1931, 66.L.28, 42.

ZAIRE: s. loc., s. hosp., F. Demeuse (BR), s. dat.; Kwango, s. loc., s. hosp., H. Vanderyst 16,861 (BR), 1925; Kisantu (Kimakundi), s. hosp., H. Vanderyst 15,067 (BR), s. dat.; Kasai, Kole, croissant sur un arbre mort, J. Claessens 976 (BR), XII-1909; Prov. Equateur, Eala, sur bois mort, P. Staner 473 (BR), VIII-1930; Eala, s. hosp., M. Goossens-Fontana 184 (BR) (holotype of *Polyporus mamelliporus* Beeli), 1923; s. loc. (either Eala or Ubangi), s. hosp., M. Goossens-Fontana 70 (BR), s. dat.; Bokumu sur Ruki, s. hosp., Father Lootens 40 (BR), 14-VII-1954; Ubangi, Bongabo, on *Gilbertiodendron dewevrei*, B. Fassi 835, 840, 845 (BR); Ubangi, Gwaka, on *Gilbertiodendron dewevrei*, B. Fassi 807 (BR), 2-V-1956; Prov. Orientale, Yangambi, on *Irvingia grandifolia*, B. Fassi 797 (BR), 26-VI-1956; Yangambi, B. Fassi 821 (BR), s. dat.; Yangambi, on *Gilbertiodendron dewevrei*, B. Fassi 846 (BR), 9-XI-1956; Yangambi, Lusambilo, sur *Paramacrolobium coeruleum*, B. Fassi 1465 (BR), 19-VII-1958; Banalia, Afata, on *Gilbertiodendron dewevrei*, B. Fassi 878 (BR), 18-1-1957; Prov. Kivu, Parc National Albert, Mt. Hoyo, Saga-saga, s. hosp., P. Van Schuytbroeck (P.N.A. 012,534, 012,551 (BR)).

KENYA: Mazera, Mwashi River, s. hosp., T. D. Maitland 556, III-1921, 54.K. 10, 69.K.101, 102, (Lloyd Mycol. Coll. 26,833) (holotype of *Ganoderma simulans* Wakef.), 51.BPI.9; Mau Forest natn. Park, Rasongo Forest, alt. 900 m, on floor, H. K. Brown 1020, 25-IV-1964, 65.K.106.

Magoderna vansteenisii Steyaert, *sp. nov.*
Fig. 7e, f, Pl. 14 figs. 52, 53

Basidioma pulvinatum, longe stipitatum, pileo 15–60 mm diam., pagina dorsalis fusconigra, languida, pauce gibbosa, circulatim undulata; stipes longus et tenuis, 110–380 mm longus et 3–8 mm crassus, paginae dorsali concolor.

Sectio: cutis grisea, circa 60 μ crassa; contextus roseo-bubalinus, 1/2–1/4 pilei crassitudine; tubuli 4–8 mm longi, in strato unico, sepiaceus.

Cutis hymeniodermiformis, elementis hyalinis, cylindraceis circa 15 μ longis, 4–5 μ crassis; hyphae hymeniodermati suppositae fuscae, conspicue septatae, circa 4 μ crassae. Pori circulares, 110–135–170 μ diam.; dissepimentis 30–60–90 μ crassis; axibus circa 195 μ distantibus. Basidiosporae sphaericae, luteae, 10–10.4–12 μ diam.

Basidioma pulvinate, with regular or irregular margin, long stipitate; upper surface dull, Blackish Brown (Ridgway), slightly bumpy and undulate in circles; margin incurved and encircling the tube layer; stipe long and thin, 110–380 mm long, 3–8 mm thick, concolorous with upper surface.

Section: cutis grayish, about 60 μ thick; context Pinkish-Buff (Ridgway), one quarter to one half of the thickness of the pileus; tubes 4–8 mm lomg, one-layered, Bister (Ridgway).

Cutis hymeniodermiform, its elements cylindrical, hyaline, about 15 μ long and 4–5 μ thick; hyphae under the hymenioderm anticlinal, fuscous, conspicuously septate, about 4 μ thick. Pores round, 110–135–170 μ in diam.; dissepiments 30–60–90 μ thick; distance between axes about 195 μ. Basidiospores spherical, very lightly yellowish, 10–10.4–12 μ in diam.

Magoderna vansteenisii has a cutis anatomy that cannot be distinguished from that of *M. infundibuliforme*. There is however a difference in pore size, which is smaller in the latter species. As to the habit the distinction is considerable. The pileus of *M. infundibuliforme* is funnel-shaped and relatively large whereas that of *M. vansteenisii* is pulvinate, horizontal, and small. The stipes are also distinctly different: in *M. infundibuliforme* they are short and thick whereas in the other species they are long and thin.

SPECIMENS EXAMINED.—INDONESIA: S u m a t r a, Atjeh, Gajolanden, Goenong Goh, Lemboeh, alt. 1000–1800 m, s. hosp., C. G. G. J. van Steenis 10,170 (BO 16,679), 18-II-1937, 66.L.61 (Holotype), 66.L.62.

SOLOMON ISLANDS, Vanikoro, on rotten branches on ground, C. J. Hadley (CSIRO-DFP. 5499), 7-VI-1955, 63. CSIRO-DFP. 22.

Addendum

Referring to K. Aoshima's paper on *Ganoderma* and *Amauroderma* (Bull. Tokyo Sci. Mus. **14**: 428—437. 1971) it should be noted that *G. lauterbachii* P. Henn. — if Aoshima's contention that this epithet is a synonym of *G. rivulosum* is correct—is still postdated to *Fomes weberianus* Bres. & P. Henn. (Saccardo, Syll. Fung. **9**: 174. 1891). *Ganoderma lauterbachii* P. Henn. should then be included in the synonymy of the latter. The type specimen that was in Berlin has unfortunately been destroyed. What has been said above of *G. subtornatum* Murrill should caution one when subsidiary types are examined. The specimen studied by the author under the name of *G. lauterbachii* (i. e. C. G. Lloyd collection no 23968, RLS. 69.BPI.3) does indeed point to *G. weberianum* Bres. & P. Henn. but it is a specimen where no gasterospore has been observed. The cutis elements are therefore tightly appressed one against another and are therefore long and thin. In other respects the basidioma agrees fully with those of *G. weberianum* where few or no gasterospores have been found; in particular the basidiospores are morphologically alike. It should be noticed that the specimen in Lloyd's collection was collected in Brazil and not in New Guinea.

Concerning *G. applanatum* (Pers. ex S. F. Gray) Pat. and *G. lucidum* (W. Curtis ex Fr.) Karst., the present author is of the opinion that the two species are not distributed in the Indonesian and New Guinea areas (see the comments regarding these two species). Amongst the many specimens examined from these regions none corresponds to either of the two species. The former is replaced by *G. tornatum* (Pers.) Bres. and the latter by several other species. Both are distributed only in temperate zones or at high altitudes in the tropical or subtropical regions.

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INDEX OF FUNGUS NAMES MENTIONED IN THE TEXT

New names are in **bold-face** type

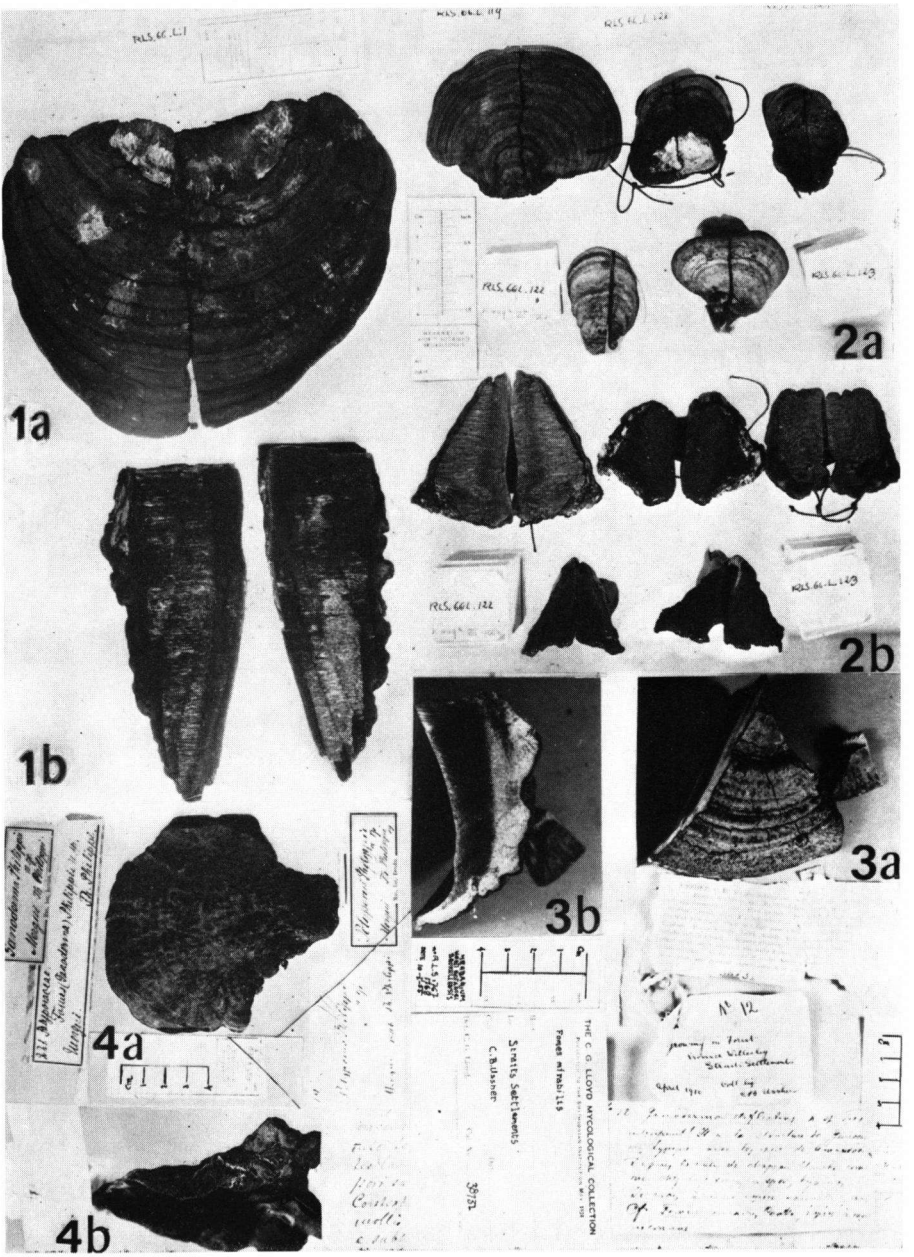


Fig. 1. *Ganoderma kosteri*, 66.L.1 (Holotype); a, upper surface; b, section. — Fig. 2. *G. vanheurnii*, 66.L.119 (Holotype): a, upper surface; b, section. — Fig. 3. *G. mirabile*, Lloyd Mycol Coll. 38,731, 55.BPI.10; a, upper surface; b, section. — Fig. 4. *G. philippii*, 70.B.4 (Holotype): a, upper surface; b, section.

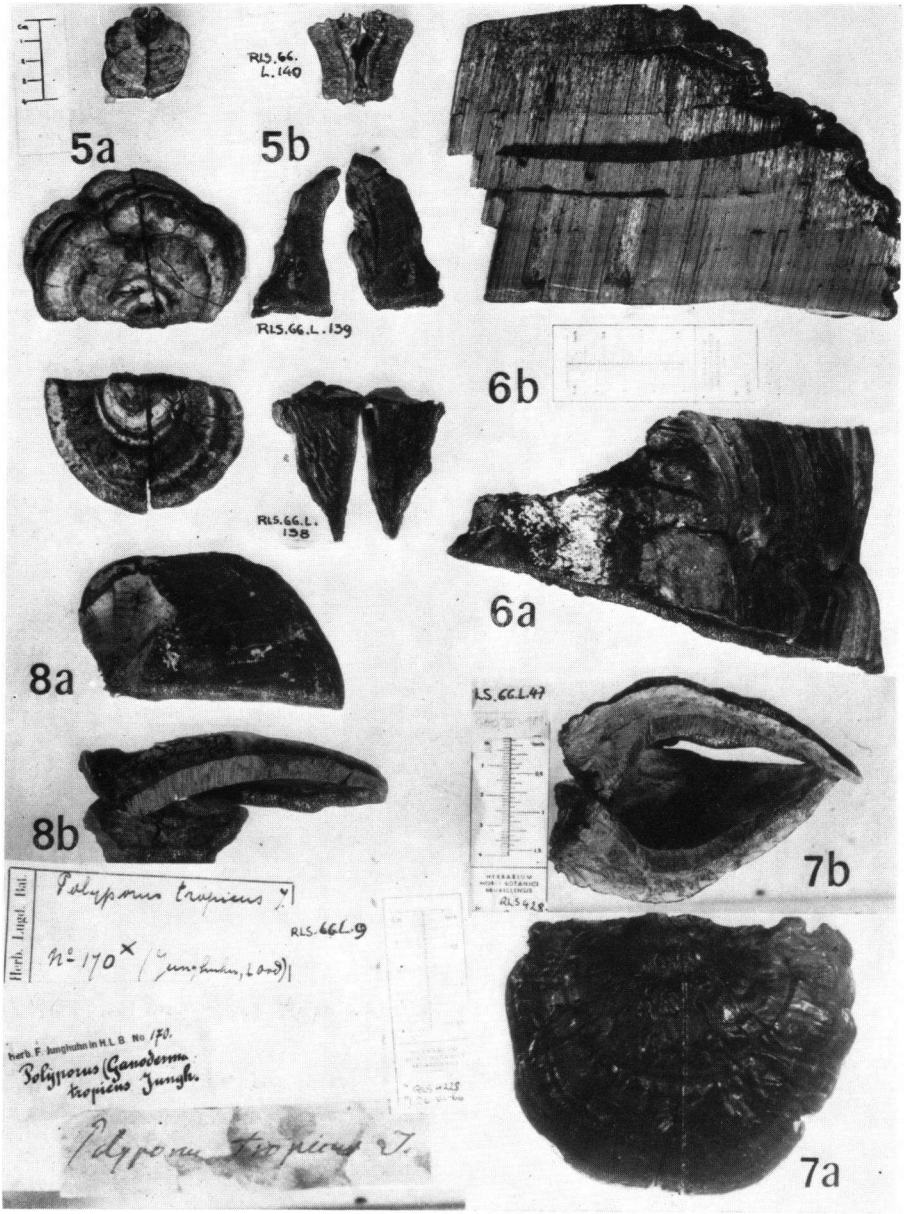


Fig. 5. *Ganoderma donkii*, 66.L.138 (Holotype), 66.L.139 & 140 (Isotypes); a, upper surface; b, section. — Fig. 6. *G. puglisii*, BR (Holotype); a, upper surface; b, section. — Fig. 7. *G. bruggemanii*, 66.L.47 (Holotype); a, upper surface: b, section. — Fig. 8. *G. tropicum*, 66.L.9 (Holotype); a, upper surface; b, section.

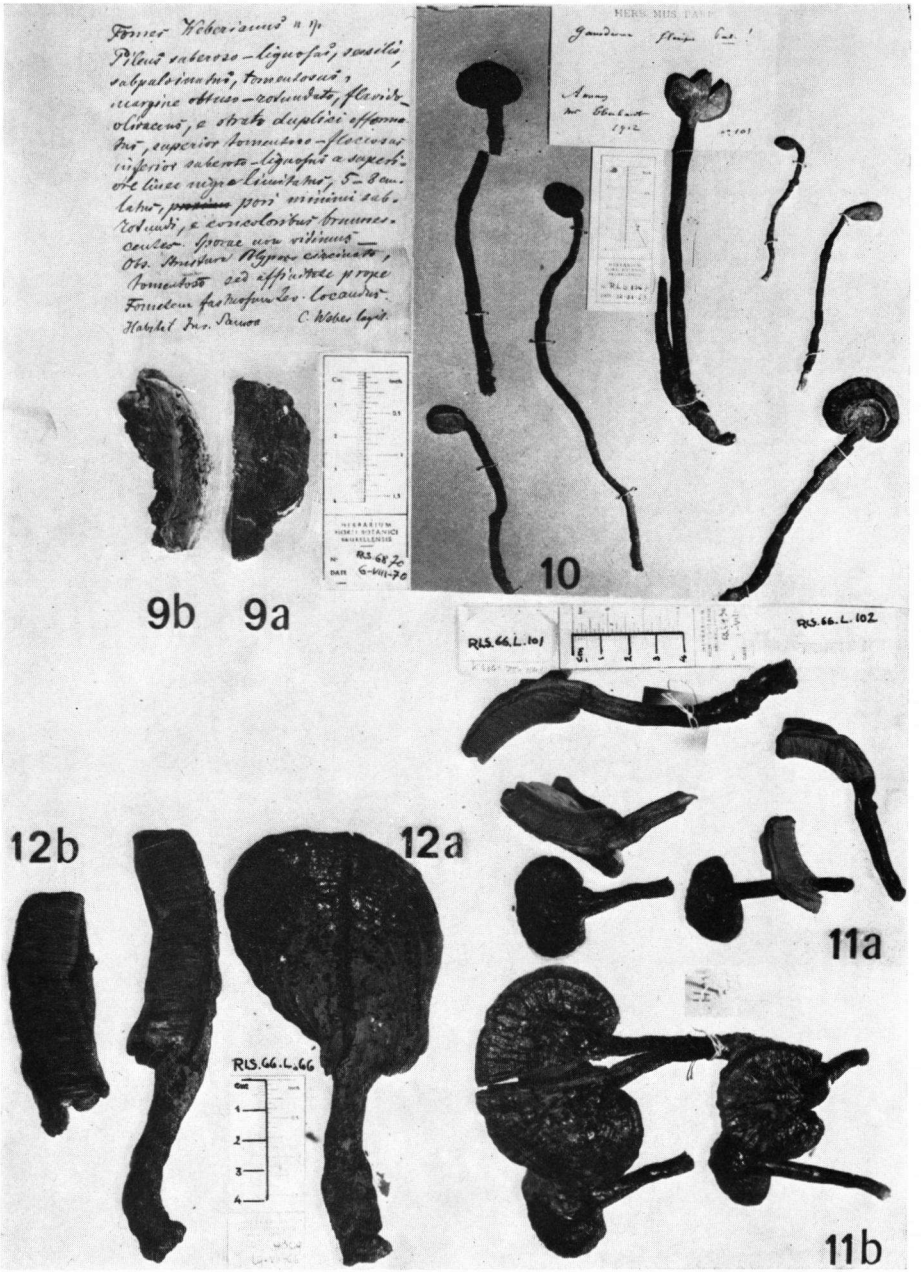


Fig. 9. *Ganoderma weberianum*, Weber, 70.B. 5; a, upper surface; b, section. — Fig. 10. *G. flexipes*, 53.PC.44 (Holotype). — Fig. 11. *G. trulla*, 66.L.101 (Holotype), 66.L.102 (Isotype): a, upper surface; b, section. — Fig. 12. *G. trulliforme*, 66.L.66 (Holotype); a, upper surface; b, section.

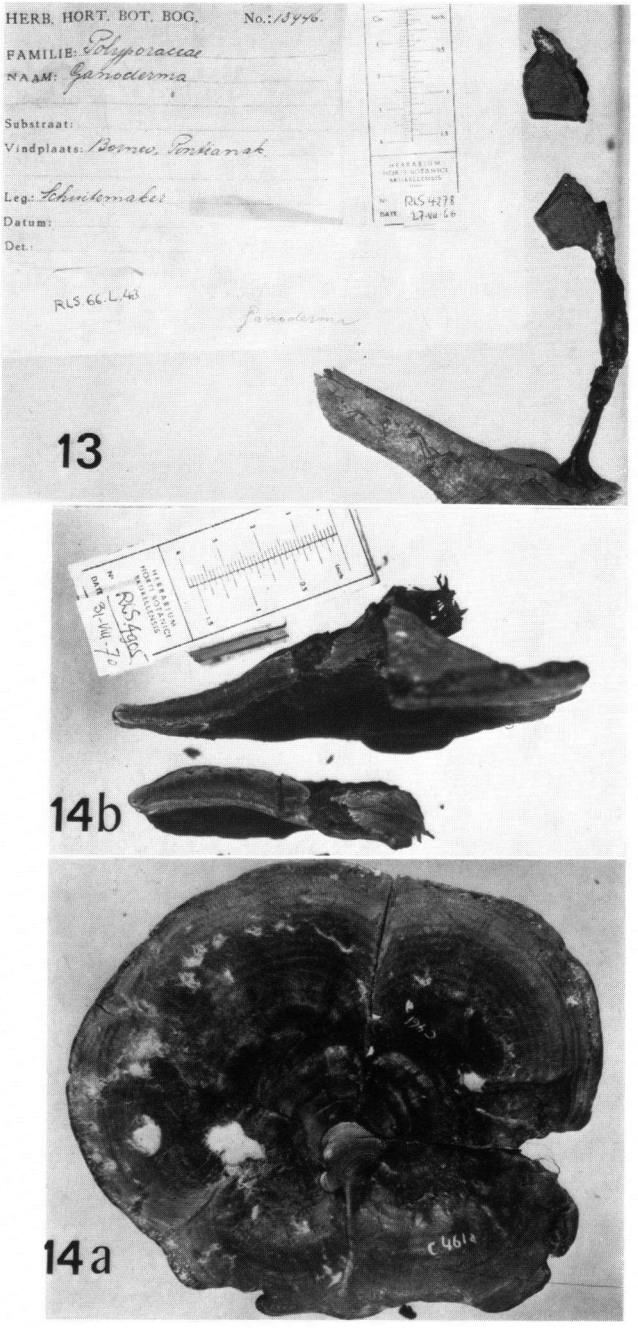
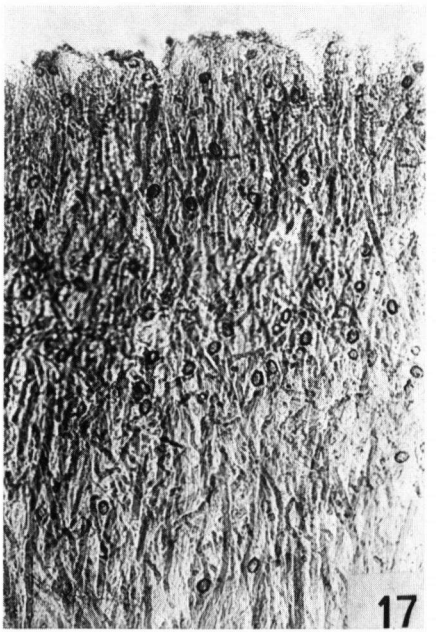
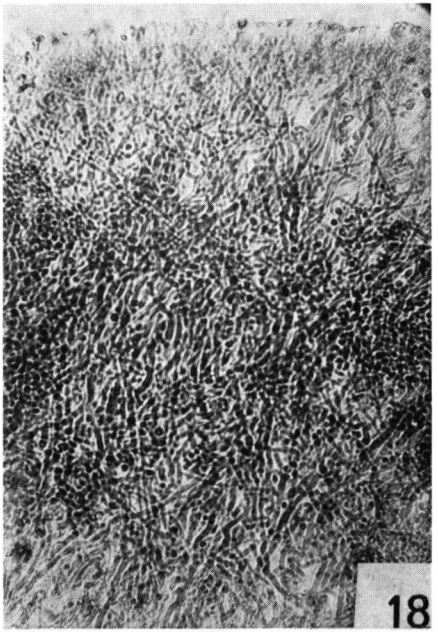
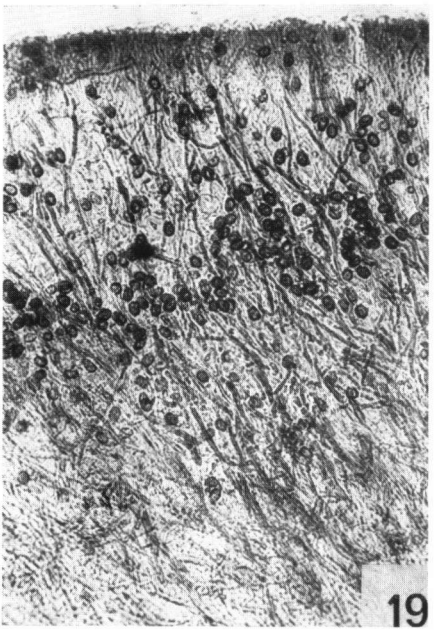


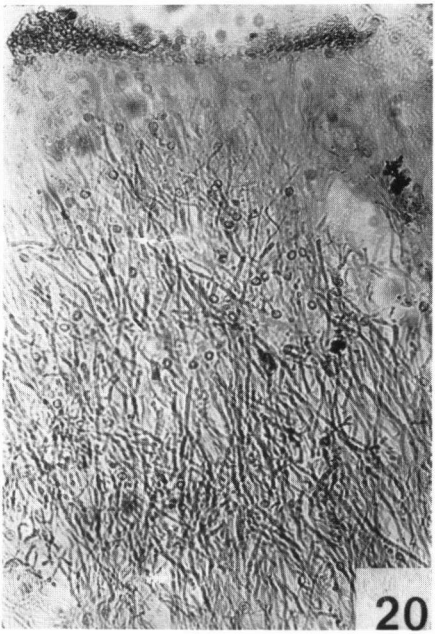
Fig. 13. *Ganoderma amboinense*, 66.L.43 (Neotype). — Fig. 14. *G. ahmadii*, 58.LAH.15 Holotype), 58.LAH.16 & 17 (Isotypes); a, upper surface; b. section.



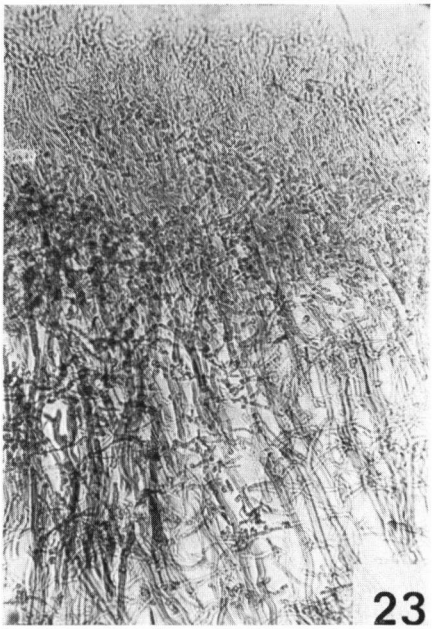


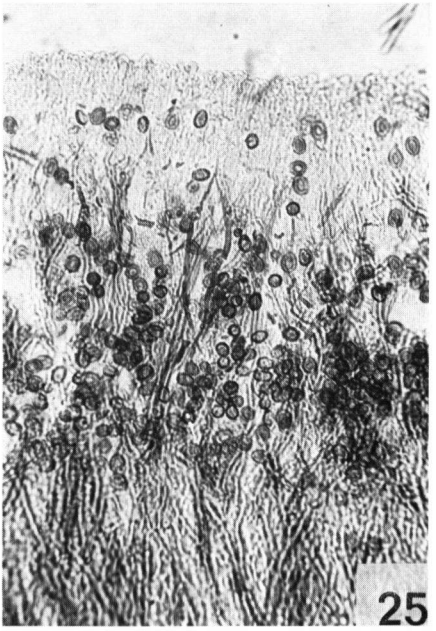
Figs. 15–18. Sections of the cutis, × 130. — 15. *Ganoderma brownii*, 69.NY.17 (Holotype). — 16. *G. donkii*, 66.L.138 (Holotype). — 17. *G. kosteri*, 66.L.1. — 18. *G. vanheurnii*, 66.L.119 (Holotype).



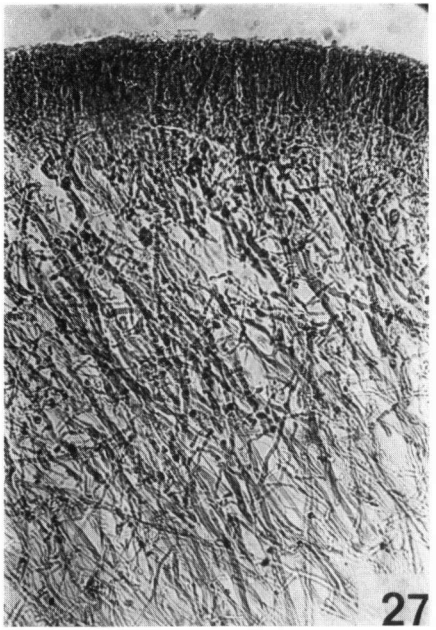


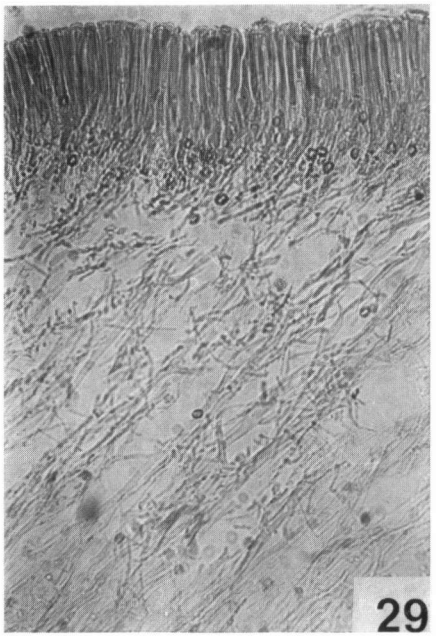
Figs. 19–22. Sections of the cutis, × 130. — 19. *Ganoderma manoutchehrii*, BR (Holotype). — 20. *G. mirabile*, 55.BPI.10 (Holotype), — 21. *G. philippii*, 70.B.4 (Holotype). — 22. *G. philippii*, 66.L.87.

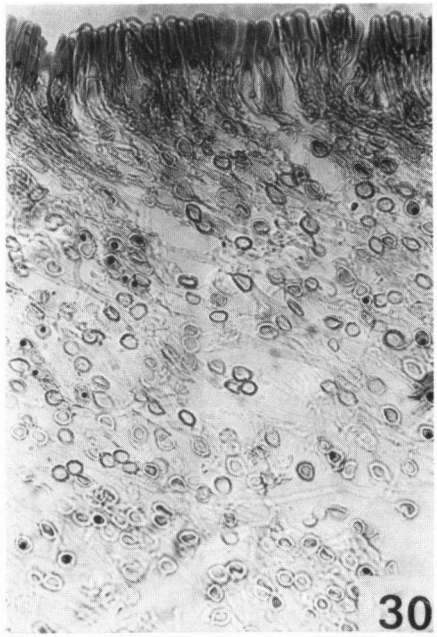




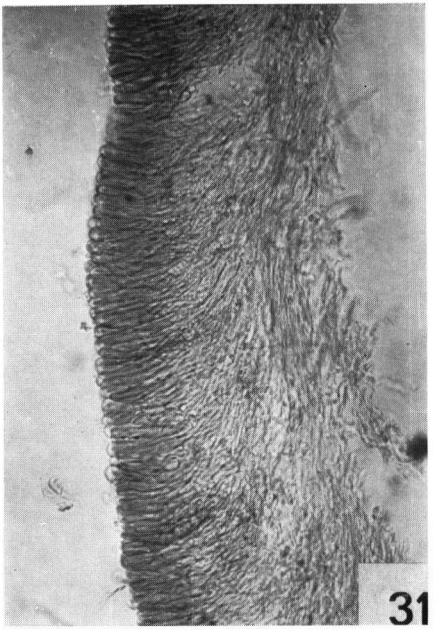
Figs. 23–26. Sections of the cutis, × 130. — 23, 24. *Ganoderma williamsianum*, 66.L.15; 24, wavy context hyphae. — 25. *G. puglisii*, BR (Holotype). — *G. bruggemanii*, BO (Holotype).

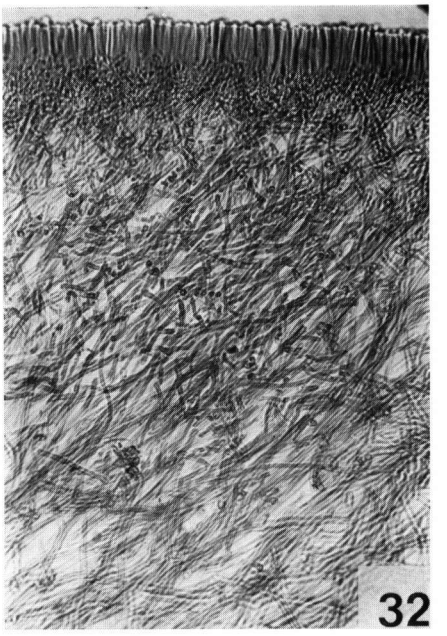


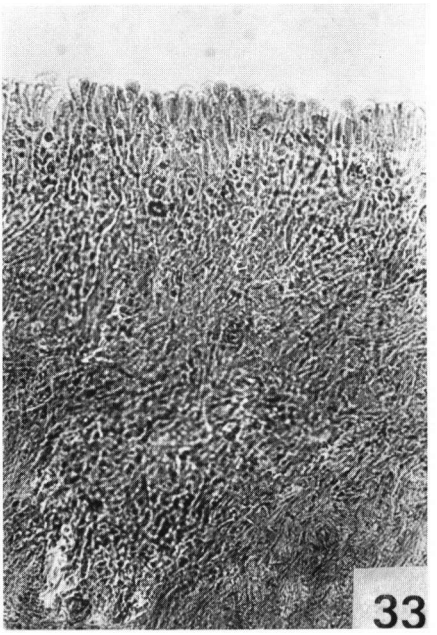




Figs. 27–30. Sections of the cutis, × 130. — 27, 28. *Ganoderma tropicum*, 66.L.9; 27, not lixiviated in KOH; 28, lixiviated in KOH. — 29. *G. weberianum* (Holotype), cutis when gasterospores are few or absent. — 30. *G. weberianum*, 66.L.71, cutis when gasterospores are abundant.

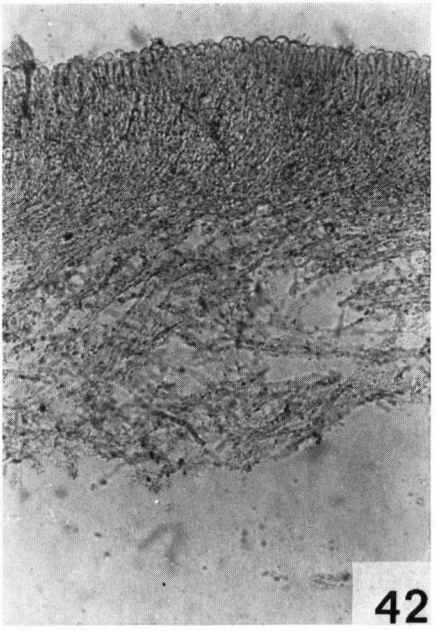




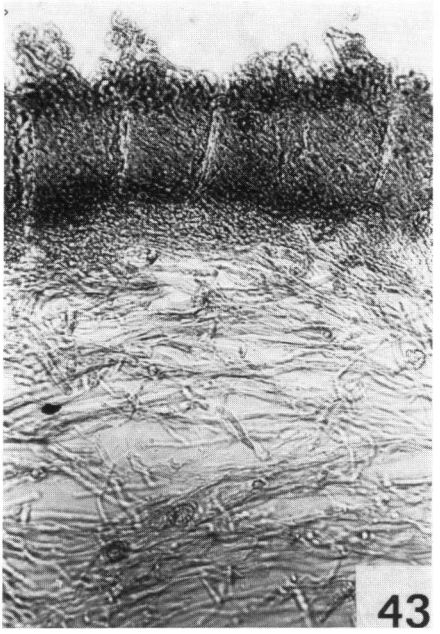


Figs. 31–34. Sections of the cutis, × 130. — 31. *Ganoderma flexipes* (Holotype). — 32. *G. trulla*, 66.L.102 (Holotype). — 33. *G. trulliforme*, 66.L.66. (Holotype). — 34. *G. petchii*, 69.K.87 (Holotype).

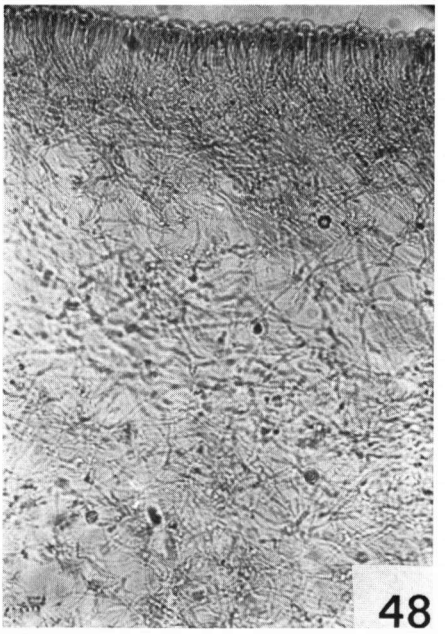
Figs. 35–38. Sections of the cutis, × 130. — 35. *Ganoderma amboinense*, 66.L.43 (Neotype). — 36. *G. subtornatum*, 59.NY.10 (Holotype). — 37. *G. lamaoense*, 69.NY.26. — 38. *G. leytense*, 62.K.48 (Holotype).

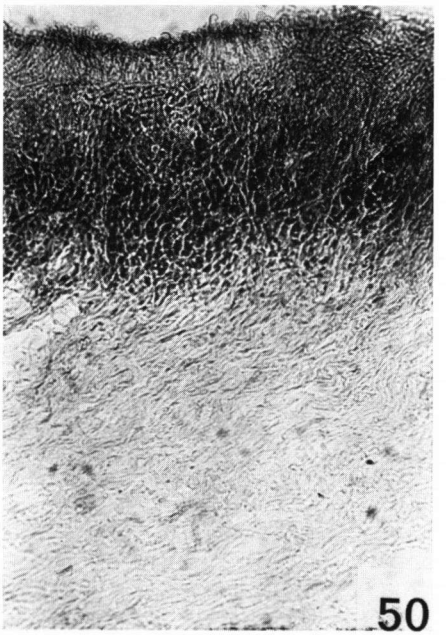


Figs. 39–42. Sections of the cutis, × 130. — 39. *Ganoderma leytense*, 66.L.30. — 40. *G. ahmadii*, 58.LAH.15 (Holotype). — 41. *G. resinaceum*, 66.L.22. — 42. *G. colossus*, 66.L.25.

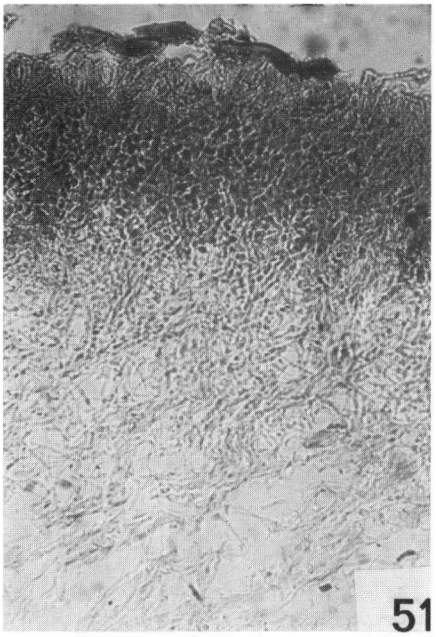


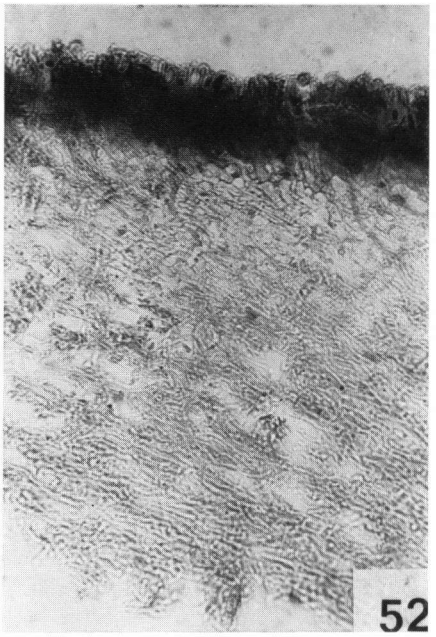
Figs. 43–46. Sections of the cutis, × 130. — 43. *Humphreya lloydii*, van Oosten 3B. — 44. *H. endertii*, 66.L.38 (Holotype). — 45. *H. coffeatum*, 66.L.23. — 46. *H. coffeatum*, 68.PR.10.



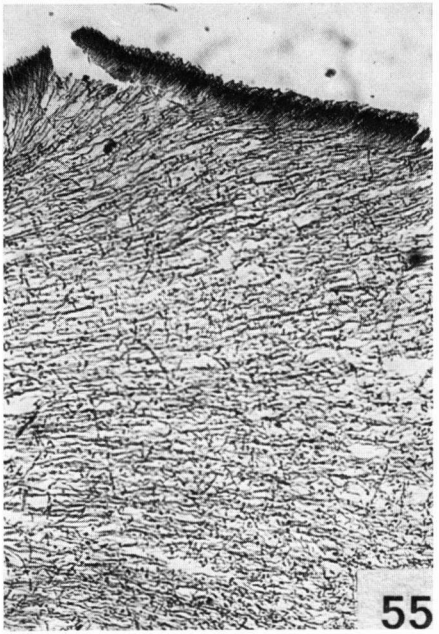


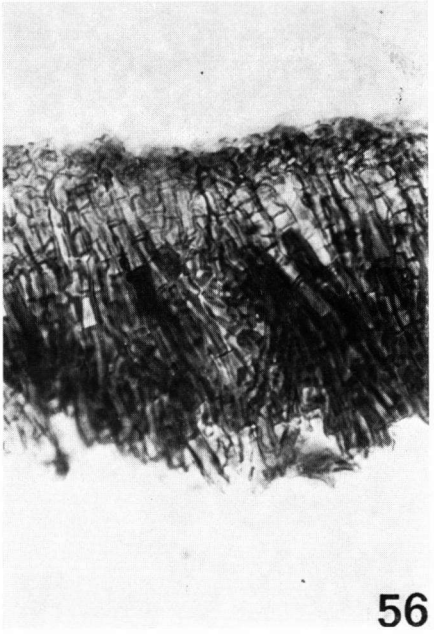
Figs. 47–50. Sections of the cutis, × 130. — 47. *Haddowia longipes*, 53.PC. 13 (Holotype). — 48. *H. aëtii*, 66.L.46 (Holotype). — 49. *Magoderna infundibuliforme*, 70.K.1 (Holotype). — 50. *M. subresinosum*, 70.NY.1 (Holotype).





Figs. 51–54. Sections of the cutis, × 130. — 51. *Magoderna subresinosum*, 66.L.42. — 52. *M. vansteenisii* (Holotype). — 53. *M. vansteenisii*, 63.CSIRO-DFP. 22. — 54. *Amauroderma rugosum*, 53.PC.45.





Figs. 55–57. Sections of the cutis. — 55. *Amauroderma preussii*, Fassi 556 (× 55); context hyphae pericline, cutis hyphae slanting upwards, in upper left corner (close to base of pileus) practically anticline. — 56. *A. preussii*, 56.BPI.2 (× 500); context hyphae passing into level of cutis and giving rise to fuliginous cells; beyond the cutis continuing as free hyphae, but soon broken and abraded. — 57. *Polyporus leptopus*, 53.PC.32 (× 130).