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PHYTOLOGIA

An international journal to expedite botanical and phytoecological publication

Vol. 58

November 1985

No. 5

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NEW YORK
BOTANICAL GARDEN

Published by Harold N. Moldenke and Alma L. Moldenke

590 Hemlock Avenue N.W.
Corvallis, Oregon 97330
U.S.A.

Price of this number \$3.00; for this volume \$15.00 in advance or \$16.00 after close of the volume; \$5.00 extra to all foreign addresses and domestic dealers; 512 pages constitute a complete volume; claims for numbers lost in the mails must be made immediately after receipt of the next following number for free replacement; back volume prices apply if payment is received after a volume is closed.

REFLECTIONS OF AN OLDTIMER ON THE FLORA OF LATVIA

Viktor Mühlenbach¹

A flora of Latvia (P. Galeniekš: Latvijas PSR Flora) was published in four volumes in the years 1953-1959. It will henceforth be cited as FL. It is of course much too late for a review of this flora, but as there are different omissions concerning my botanical activities in Riga before the Second World War, I decided to enumerate them, so that my discoveries of diverse rarities would not sink into oblivion. I published "The adventive flora of the railroad net in Riga" (Mühlenbach, 1932-1934), which was a shortened version of my thesis work for obtaining the magister (master) degree. I was able to find 128 species not native to Latvia in the years 1924 through 1932. I also cited previous records of synanthropic plants collected in Riga by others (59 species).

I compared my paper thoroughly with FL and found that from my 128 species 21 were missing, 14 of them being novelties. These plants are: Hordeum jubatum L., Commelina communis L., Silene multiflora (Waldst. & Kitt.) Pers., S. procumbens Murray, Dianthus campestris Bieb., Nigella sativa L., Ranunculus illyricus L., Rapistrum perenne (L.) All., Erysimum repandum L., E. diffusum Ehrh. (E. canescens Roth), Alyssum minus (L.) Rothm., (A. campestre auct.), Chorispora tenella (Pallas) DC., Melilotus wolgica Poiret in Lam., Vicia grandiflora Scop., V. lutea L., Lathyrus aphaca L., Thymus pannonicus All. (T. marschallianus Willd.), Sideritis montana L., Stachys recta L., Veronica spicata L. subsp. incana (L.) Walters (V. incana L.), and Valerianella eriocarpa Desv.

Some of the names I used were changed according to Flora Europaea (Tutin et al., 1964-1977). I did not think that it would be worthwhile to mention the localities, date of discovery and so on. These data can be obtained from my original paper if desired. Also among the second group mentioned in my paper - the synanthropes found in Riga by others - there are omissions, altogether 20 species. They are: Alopecurus pratensis L. x A. arundinaceus Poiret in Lam. (A. ventricosus Pers.), A. myosuroides Hudson, Deschampsia setacea Richter (in Tutin, D. setacea (Hudson) Hackel),

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Phalaris canariensis L., Hordeum secalinum Schreber, Chenopodium vulvaria L., Astragalus boeticus L., Ornithopus perpusillus L., Vicia pannonica Crantz, Androsace maxima L., Verbena officinalis L., Leonurus marrubiastrum L., Verbascum densiflorum Bertol. (V. thapsiforme Schrader), Veronica persica Poiret in Lam. (V. tournefortii Gmelin), Dipsacus sativus (L.) Honckeny (D. fullonum Miller), D. fullonum L. (D. sylvestris Hudson), Bidens pilosa L., Anthemis ruthenica Bieb., Carduus tenuiflorus Curtis, and C. acanthoides L. x C. nutans L.

It is true that several of these plants were published in the last century by some early writers whose reliability has been questioned subsequently. But many of these plants were discovered by the most reliable Latvian botanists, and some of the questionable reports were later verified.

For seven rare species found by myself and others and which were cited in my paper as well as in FL, the name Riga is missing among the localities cited in FL. They are: Beckmannia eruciformis (L.) Host, Poa bulbosa L. f. vivipara Koeler (form missing in Tutin), Bromus japonicus Thunb., Asparagus officinalis L., Luzula luzuloides (Lam.) Dandy & Willmott (L. nemorosa (Poll.) E. Mey., Medicago prostrata Jacq., and Lactuca tatarica (L.) C. A. Meyer. Centaurea calcitrapa L. represents an opposite case. FL lists one locality in Riga, while I found it in the Daugavpils II freight yard.

Although I have mentioned that a critique of FL would be irrelevant, I feel that a comment is in order regarding the paragraphs of bibliographical references and the synonyms that are appended to almost all species. One of the most frequent sources for references is Lehmann's "Flora von Polnisch-Livland" (1895, 1896), which was for a half of century the most important source on the Latvian flora. Polnisch-Livland is the historical German name for the eastern province of Latvia, now named Latgale. After the collapse of Poland, which ruled Latgale until 1795, the new rulers incorporated it with the Russian Guberniya (Province) Witebsk.

In his Flora von Polnisch-Livland, Lehmann envisaged two objectives: first, to publish the flora of Latgale, but at the same time to enumerate all plants of the 11 Russian guberniyas encircling Latgale. Therefore, he used a double numeration, so that it was evident to which of these two groups a plant belonged. Of course very many plants were labelled with both numbers, growing in Latgale as well as in some of the neighboring guberniyas. For some introduced plants no numbers were given, but it was always clear where the localities were situated.

Nevertheless, FL did not take account of this feature in Lehmann's system and sometimes cited plants far away from Latvia as growing there. For example, Lehmann gave the distribution of Rorippa austriaca (Crantz) Besser (as Nasturtium austriacum Crantz) as: "Lith. Minsk; Moh. (Lind.); bei Eichw. und Jundz. erst Podolien. Eingeschleppt oder verwildert" (translation: Lithuania, Minsk; Mohilew (Lindemann); by Eichwald and Jundzill only Podolia). All these places mentioned are far away from Latvia, yet FL cites it as native. The plant was later found in Latvia, but only in 1925 by me at Ķemerī railroad station.

The incorrect interpretation in FL of Lehmann's data about geographical distributions created a pitfall for subsequent authors, who often have taken every citation of Lehmann in FL for granted.

Numerous plants are missing from FL which were found and published by others too. For example, Kupffer (1934) published as a synanthropic novelty Achillea gerberi MB. genuina Schmalh., probably a polemochore from the WWI (polemochore = follower of war, coined by Mannerkorpi (1944-45)). It was discovered by A. Grosse on 25 June 1934, and rediscovered by me much later, toward the end of my abode in Riga. Because the taxonomy of this species is quite complicated, the name must be changed. Afanassiev (1959), who unravelled this question, gave priority to Achillea micrantha Willd.

FL also did not reveal the finders' names. An exception was sometimes made for newer publications, but there was no consistency. So, FL gives for Verbascum lychnitis L. and V. phoeniceum L. the primary source A. Petersone, K. Birkmane, Latv. PSSR augu not. (1958) Nos. 581 and 582. Yet both plants were mentioned by me (1932-1934) as found in Riga. Also, for each species there were two more older publications, which were also quoted by me. There are other similar cases.

These reflections on FL were written long ago. Subsequently, a moderate number of Latvian botanical works arrived one by one in the Missouri Botanical Garden's library, though some are missing. But only after concluding some more acute and extensive projects was I able to revert to the botanical problems of my country of descent.

After the conclusion of FL in 1959, Rasiņš (1960) published a paper on novelties and rarities of the flora of Latvia as well as on plants which had to be excluded from the flora. The paper is important, and shows how much time, effort and pain was needed to accomplish it. However, I would like to correct an assertion of Rasiņš that Kupffer (1899) in his essay on the

flora of the Latvian province Kurzeme erred in including the locality Palanga. The last, so Rasiņš writes, is situated in the Lithuanian SSR, not in Kurzeme. The truth is that Palanga was in 1819-1921 a component of Kurzeme, consequently of Latvia. Only in 1921 was Palanga ceded by arbitration to Lithuania to create an access to the Baltic Sea.

In 1974 a compendium or collective treatise of quite a few Latvian botanists appeared in Russian. It was edited by Tabaka (1974a) and dedicated to one of the eight geobotanical regions of Latvia, namely the Maritime Lowland, which was investigated by different approaches. This region is a strip of land along the Gulf of Riga and the Baltic Sea, and penetrates deeper into the country along the Daugava and Lielupe rivers. Riga, the capital of Latvia, is situated on the banks of the Daugava river 13.3 km from the Gulf of Riga. The range of my former research work in Latvia was confined particularly to this region.

The list of all plants was assembled by Birkmane and Jukna (1974), and contains 1212 species of vascular plants. They included: 1) native plants, 2) naturalized introduced plants, 3) unnaturalized introduced plants, 4) escapees from culture. In it all 21 specimens found by me in Riga and omitted in FL are also missing. In addition, three other species listed by me and by FL are not included in this list: Pimpinella anisum L., Bifora radians Bieb. and Coriandrum sativum L. Also absent are 18 of the 20 species that were published by others. The new list includes Phalaris canariensis L. and Veronica persica Poiret (in my paper V. tournefortii Gmel.). For the former species one of the references given is FL, but in the latter there is no reference mentioned. The list of plants in the Maritime Lowland region can be extended still more. These missing plants include Laserpitium prutenicum L., Scabiosa ochroleuca L., S. columbaria L. and Centaurea montana L. FL gives for the first species Tosmare lake as locality, and for the remaining Riga. Also omitted from the list are Beckmannia eruciformis (L.) Host, Luzula luzuloides (Lam.) Dandy & Wilmott, and for Bromus japonicus Thunb. localities in Riga are omitted. Feasibly there could be more species of this kind, but no special attempts were made to compare the compendium with publications at my disposal.

I will only mention one paper, because a quoted plant in it is of a special interest to me. Gautzsch (1939) quoted Sisymbrium supinum L. (in the Baltic literature called Braya supina (L.) Koch) as found by Miss Agnes v. Vegesack in Kēmeri in 1937. The same plant was located by me on the shore of Kāpiersis lake near the settlement Antīciems, 4-5 km from Kēmeri. I remember very well that it was in 1933, the death

year of my father. The shore is covered by chopped-up plates or flagstones of Devonian dolomite. A clear description is given by Doss (1898). The site reminded me vividly of the shore of a water basin on the Estonian island of Saaremaa, where the Estonian hosts presented this plant during a symposium of Fennobaltic botanists. Looking more carefully on the shore of Kapiemis lake, I discovered this plant in a similar surrounding. It is not possible to know if this was the same locality where v. Vegesack found it. FL mentioned that this species was found long ago between Valmiera and Tartu, but not found more recently. Flora Europaea does not cite the Estonian localities, although the occurrence there of Braya supina is well-documented.

In his paper, Gautzsch (1939) mentioned three more species that are missing in the compendium as well as in FL - Bromus briziformis Fischer & C. A. Meyer, Phleum arenarium L., and Mimulus luteus L. All are synanthropes, whilst Braya supina (L.) Koch seems to be a native plant. Numerous localities for other species listed by Gautzsch were not cited by FL or the compendium.

A confusing misprint also must be mentioned. FL gives for Orobanche pallidiflora Wimmer & Grab. as one locality "Liepupe", but the compendium for the same species (under the name Orobanche reticulata Wallr.) "Lielupe". Both are geographical names for two different places.

Finally, I would cite some rarer plants observed by me in the Maritime Lowland: Holcus lanatus L. at Olaine, Gladiolus imbricatus L. on Bullu Island, Corallorhiza trifida Chatel. at Vecāķi, Polemonium coeruleum L. at Ķemerī. I completely agree with Rasipš (1960) that Vicia lathyroides L. is an undeservedly forgotten plant (missing in FL); I found it in the naval base in Liepāja and later in the wartime in the same place. It is surely a native plant.

In 1976, A. Schultz published a paper which was of special interest for me, since he investigated the synanthropic flora of the railroad net in Riga. The research was done 1960-1975, covering quite a long time. This meets the postulate proclaimed by E. Lehmann in his "Flora von Polnisch-Livland", which had the subtitle "...dispersal of plants by railroads". Lehmann emphasized that it is imperative to continue the observation of the railroad floras for a long time. His flora was a vademecum for me during my work on the railroads in Riga, but I did not realize at the time the broader significance of his work. Only in St. Louis, where I began work in 1954, did I come across the inaugural dissertation by H. Matthies (University of Rostock, 1925), in which the author emphasized

that "strangely enough a comprehensive treatment of this problem (the introduction of plants by railroads) is in the professional literature given in reality by Lehmann". Lehmann was a native of Riga, therefore we who worked on the railroads in Riga heard these words of high esteem with satisfaction and never forgot them.

Schultz (1976) not only registered all synanthropic plants, but tried also to verify data given by me (1932-1943) at least in some cases. So he commented about Lactuca tatarica (L.) C. A. Mey.: "It is possible that the plants (found by Schultz) are descendents of the colony discovered by V. Muhlenbach already in 1932". I found Sisymbrium wolgensse Bieb. very frequently in the Mangali station during the whole observation time (1924-1932), and Schultz reports that Sisymbrium wolgensse Bieb. ex Fourn. was found in that very place in the first years of his study in great numbers. Many other plants recorded by me also were found by Schultz, but on the other hand, quite a number of plants that were found by me are missing in Schultz's paper. The estimated frequency of various plants differs in the two lists; quite a few plants are now more frequent, but some are now rare. Many plants are listed as unicates. There are also quite a few additions in Schultz's list of plants not seen by me. Twenty two novelties were discovered for the flora of Latvia. Schultz also stressed the fluctuation in numbers of specimens of different species from year to year. All of these features are very typical for a study of the plants on the railroads. I had the same problems in comparing my findings in Riga with those of my predecessors. I have obtained the same results in much more extended research on the railroads in St. Louis, Missouri (1954-1980; Mühlenbach, 1979, 1983). It is appropriate, then, to quote a line from a song by Hinze, which Lehmann (1895) himself cited in his "Flora von Polnisch-Livland": "Ein ewig Kommen, ein ewig Gehen" (a perpetual coming, a perpetual going). The poet described the changes in a university - the perpetual flow of students, coming and going. Only a few stay to achieve professorship. One speaks in the case of plants about naturalization, which is indeed an infrequent occurrence on the railroads.

Schultz commented that the surroundings of the freight car washing establishment in the large Šķīrotava freight and switching yard are especially rich in synthropes. Many species were found only there. This establishment did not exist during my studies in Riga. The railroads in St. Louis do not have such facilities, where instead the heavily soiled freight cars are cleansed manually on special tracks designated for this purpose. In spite of the different methods used, some similarities exist. The car cleanout tracks in St. Louis are also the most preferred sites for synthropes to settle down.

The methods applied in the car cleanout process are not as decisive in the increased dispersal of synanthropes as is the type of waste, refuse, dirt and so on that is removed from the cars.

I was able to study an ideal cleansing method for freight cars in Edmonton, Alberta. There the Canadian National Railways have in their huge Calder yard car cleaning facilities that are connected with the repair shop. Initially I had no intention of publishing my observations, but I found that the Canadian methods produce very different results compared to those in St. Louis and Riga. So I asked the Edmonton headquarters of Canadian National Railways to permit the publication. Mr. A. P. Rennie, Assistant Manager of Public Affairs, issued the permit to visit the facilities, and Mr. C. G. Pain, Engineering and Planning officer, provided the detailed description. I thank both gentlemen for their assistance. The waste product disposal system is as follows:

"The wash water flows via drainage trenches to a solids separator, then to an oil separator and then to the City of Edmonton's sewer system. The solids separated from the wash water are removed from the separator by a local contractor who takes it away for disposal at a dump site. Solid refuse removed from the car is normally thrown on the conveyor belt and transported to an incinerator. Material vacuumed from the car (winter operation) may or may not be deposited on the incinerator belt. Frequently, it is collected and removed to a dump by truck."

Apparently, the procedure works well: very few synanthropes were found in the vicinity of the facilities and those found were common in other parts of the yard. It demonstrates the very important role of the remnants left behind in the freight cars in the spreading of synanthropes by railroad traffic. The Canadian facilities operate very successfully from the standpoint of railroad management, but the results are at the same time disastrous for the railroad botany.

As a final minor comment about Schultz's (1976) list, I would note that a few of the plants listed as introduced seem to me to be native to the flora of Latvia, i.e., Lolium perenne L. and Potentilla norvegica L.

The second more detailed compendium edited by Tabaka (1977) concerned the Kurzeme geobotanical region in southwestern Latvia. Tabaka included two lists of plants: one containing all plants found in Kurzeme, put together by Birkmane et al.

(1977), and the second (by Tabaka et al. 1977) enumerating plants found in several restricted areas using the comparative floristic method. Tolmachev (1931) tried to use mathematical methods to solve floristic problems, and he introduced the concept of the "concrete" or elementary flora - a flora of a very limited area in which species are distributed only in conformity with purely local conditions. According to Tolmachev, the minimal area for a concrete flora would be 100 km², but he admitted deviation from this number. The concrete floras of many small areas are combined into a composite or collective flora. The concrete floras are important in the view of Tolmachev because they render comparisons with other concrete floras feasible.

In Tabaka et al. (1977), a double network of large and small squares was superimposed on the map of Kurzeme. In each large square there were 16 small squares with an area of 70 km². The surface of the large squares was 1120 km². The principal work in Kurzeme was carried out in two large squares. Both of them, including the towns of Kandava and Kuldīga, were chosen for the elaboration of the concrete floras. These concrete floras were studied by two persons (a scientist and a technician) for 7-10 days four times from May until September during three years.

The co-ordinates of this network are widely used in the Latvian botanical literature to pinpoint localities of plants. So the Šķīrotava freight yard mentioned above is found at 14/27, and the next frequently named Līgciems and Šķūtas farm at 13/16.

According to R. Beschel (1969), who worked in the U. S. S. R. as an exchange scholar, the concept of concrete floras was widely accepted in the U. S. S. R., but apparently unknown in western Europe and North America (at least at that time). Beschel used in his own work the concept "geon", which is a basic unit of flora, fauna, and landscape. It is closely related to Tolmachev's "concrete flora", but is not identical.

Prior to WWII, the territory of Latvia was divided into four administrative provinces (Vidzeme, Jurzeme, Zemgale, Latgale), 19 counties and 516 (1944) "townships". (It was difficult to find a name for those "minor civil divisions", to use the definition from Webster's dictionary. In Latvian the term is pagasts, in German Gemeinde, and I here use townships, although this name is used in various ways.) The townships enjoyed quite broad administrative functions. The farms in Latvia were either aggregated into villages (ciems, Dorf) or dispersed over the whole territory. The first type prevailed around Kandava. In using geographical names, the pre-war terminology was applied.

It happens that the domicile of my ancestors is situated in the township of Kandava. My clan originated in the Šķūtas farm in the Līģciems village. I know this neighborhood quite well, since many summers were spent here. Most of plants mentioned below were found in the meadows, fields, and groves of Šķūtas.

The compendium (Tabaka, 1977) counts in Kurzeme 1042 species of vascular plants, and for the Kandava and Kuldīga concrete floras the numbers are 665 and 574, respectively. What follows here are comments and discussion of some 27 species, all but two of them from Kandava township.

Bromus secalinus L.: This is mentioned in the compendium as comparatively rare and missing in the Kandava concrete flora. It was not by any means a rarity in Kandava township before WWI. A strange superstition among the farmers suggested that in years of bad harvest, part of the cereals sowed turned into "chess" (B. secalinus). In the description of the genus Bromus in the Latvian SSR, Fatore (1977) used an unfortunate translation of "Flora von Polnisch-Livland" into Russian, namely "Poland and Livland". I previously noted that Polnisch-Livland is the old German name for Latvia's eastern province Latgale.

Cyperus fuscus L.: This plant was known formerly from Kandava, on a woodland path from Šķūtas to the Strazde watermill.

Carex davalliana Sm.: Known from along a brook in the woods west of Līģciems.

Carex buxbaumii Wahlenb.: Missing in the Kandava concrete flora, but found in a meadow northeast of Šķūtas.

Carex capillaris L.: Missing in the Kandava concrete flora, but known from the meadow between Šķūtas Zirgaplōks grove and the path to Strazde.

Luzula luzuloides (Lam.) Dandy & Wilmott (L. nemorosa (Poll.) E. Mey.): This synanthropic plant was discovered in the park of the Strazde estate by me in 1921, and later found by others in several other localities. Strazde apparently was outside the Kandava concrete flora. The bibliographical notice (no. 81, page 159) given for this plant is incorrect: "K. Kupffer, 1087 Versammlung, 23 Febr. 1920--'Korr.-Bl. Naturf. Ver. Riga', 1924. Bd. 58, S. 39-42" should be "...Versammlung 1132 and 1134, 25 September 1922 and 6 November 1922, pages 56 and 59", where this discovery was discussed by Kupffer.

Iris sibirica L.: I recorded it in the meadow near the abandoned lime-kiln at the crossing of the railroad trunk line Kandava-Līgciems with the Tukums-Talsi highway.

Stellaria nemorum L.: This species is not listed in the Kandava concrete flora, but is not rare in Līgciems.

Sagina procumbens L.: This also is absent from the Kandava concrete flora, but is frequent in Šķūtas.

Silene dichotoma Ehrh.: Another species not listed in the Kandava concrete flora that I knew in Līgciems, on the railroad west of the Strazde mill-creek bridge.

Ranunculus nemorosus DC. (R. breyninus auct., not Crantz, according to Tutin, 1964-1977): Known from the eastern fringe of the Šķūtas Zirgaploks grove, and determined as a novelty for Latvia by Kupffer and published by K. Starcs (1936). Until 1973 this was the only locality in Latvia, when this species was found again in the valley of the Abava river at Kandava (Tabaka and Kļaviņa, 1981).

Corydalis intermedia (L.) Mérat.: Found in the woods northeast of Šķūtas; see remarks by Kupffer (1935) and Tabaka et al. (1981).

Cardaminopsis arenosa (L.) Hayek.: This species, not listed in Kandava concrete flora, was found in Līgciems, on the railroad west of the Strazde mill-creek bridge.

Camelina microcarpa Andr. ex DC.: The first report for Kandava was from Līgciems, on the railroad west of the Strazde mill-creek bridge; here surely it is synanthropic.

Aphanes arvensis L.: Found in the fields around the Kandava crown estate.

Rosa rubiginosa L.: First record for Kandava was on a forest aisle in the woods west of Līgciems. Maybe it is best to mention here a monograph of native roses in Latvia by Riekstiņš (1980), in which the distributions are illustrated by dotted maps. The Kandava square is blank for R. rubiginosa.

Oxytropis pilosa (L.) DC.: This has the same locality and status as Camelina microcarpa, but the path of introduction of this plant is very interesting. At the Tukums II railroad station, east of Kandava, the administration owned a huge sand-pit, from which it hauled sand for building purposes as well as ballast for reinforcement of the railroad tracks. In the close vicinity of this pit is a locality of the extremely

rare (in Latvia) Oxytropis pilosa, discovered first in 1849. Because of the exploitation of the sand-pit this plant was sharply decimated, and by 1927 only the last wretched specimens were seen (Kupffer, 1927). But in the same time this same plant began to appear in different places along the railroad tracks. In addition to Līgciems, I saw it in two freight yards in Riga in 1931 (1932-1934), also along some trunk lines elsewhere, but I cannot recall the exact localities. The spread of this plant is a very nice confirmation of Lehmann's thesis that the railroad operation contributes to the spread of plants on its premises. He could sometimes tell from which sand-pit the sand for ballasting has been taken.

Medicago sativa L. subsp. falcata (L.) Arcangeli (M. falcata L.): This species is missing in the Kandava concrete flora, but was frequent on the meadows in Šķūtas.

Coronilla varia L.: Tukums II railroad station on a siding, where it was surely a synanthrope.

Monotropa hypopitys L.: Also missing in the Kandava concrete flora, but not rare in the groves of Šķūtas.

Swertia perennis L.: Another species not listed in the Kandava concrete flora; along a brook in the woods west of Līgciems.

Asperugo procumbens L.: To the only locality of this species in Kurzeme, discovered by L. Vimba in Kazdanga in 1961, it is possible to add another one, in the southern vegetable garden and orchard of Šķūtas, not far from the granary; observed on a quite restricted site, but persisting for many years.

Pedicularis sceptrum-carolinum L.: It is already quoted for Kandava, but I can add another site, in meadows around the Kandava railroad station, located in the Cēre township, and also in the woods along the Šķūtas-Strazde path.

Pedicularis palustris L.: Missing in the Kandava concrete flora, but frequent on meadows of Šķūtas.

Orobanche elatior Sutton (O. major L. pro parte): Two additional localities can be added for this species: in a sand-pit near the Nēgas farm in Līgciems and along the Kandava-Pūre highway. It was not clear in which township (Kandava or Pūre) the last locality was situated. In both cases it occurred on Centaurea sp.

Galium rivale (Sibth. & Sm.) Griseb. (Asperula aparine Bieb.): Found on the meadows of Šķūtas along the Strazde mill-creek. By the way, this mill-creek gave me my surname. The Latvian peasants received their surnames only early in the last century, and in many places the surnames were derived from the German language (Mühlenbach = mill-creek).

Senecio sylvaticus L.: Another species missing in the Kandava concrete flora, but rare in woods around Līgciems.

It seems best to include here a review of one of the latest publications, because it treats partly the Kandava concrete flora. It is "The Valley of the Abava River" by Tabaka & Kļaviņa (1981). The stretch between the towns Kandava and Sabīle holds particular scenic beauty and is even called the Kurzeme (or Curonian) Switzerland. The flora of this valley is especially rich; of the 1042 species of Kurzeme, 826 species are found here. This is altogether a carefully composed book, yet I can add eight species more, two being synanthropes. Seven are from Līgciems, which is as the crow flies about 9 km from the river. Although there is some question whether it is correct to include plants from Līgciems in the Abava Valley flora, I do so because the authors included other plants from Līgciems (e.g., Corydalis intermedia). Moreover, the Strazde mill-creek which traverses Līgciems is a tributary of the Abava. These eight plants are Carex buxbaumii Wahlenb., Camelina microcarpa Andr. ex DC., Aphanes arvensis L., Rosa rubiginosa L., Oxytropis pilosa (L.) DC., Asperugo procumbens L., Digitalis grandiflora Miller and Pedicularis sceptrum-carolinum L.

One of the last compendia of Latvian plants at my disposal was issued in 1979 (Tabaka, 1979), and was devoted to the North Vidzeme geobotanical region. The list of plants for this region was prepared by Kļaviņa et al. (1977), and included 977 vascular plants. As I have botanized very little in this region, so I am not able to add anything new.

A series of compendia began to appear in 1978, titled "The Chorology of the Flora of the Latvian SSR". The second and third volumes were published in 1980 and 1981, respectively. The editor for all three issues was I. Fatare. The chorology series was devoted to rare species, many of which were on the protected list. There were altogether 110 species. For the overwhelming majority of these plants all known localities are given with the indication of sources, and also marked on grid maps with dots. My marginal notes on some species are as follows:

Coronilla varia L.: An additional locality, Tukums II railroad station, has already been mentioned.

Rosa tomentosa Sm. (in reality Rosa mollis Sm. after redetermination): The author objects to including two localities from the monograph of native roses by Riekstiņš. The first is Rucava township, which belonged to Latvia since medieval times, with interruptions, at least until 1944. The second is Kupffer's locality at "Palanga-Medze", a stretch of 64 km that is most probably located in Latvia too.

Jovibarba sobolifera (J. Sims) Opiz: Šķirotava railroad classification yard in Riga; observed for many years, always sterile.

Linnaea borealis L.: After a long list of localities of this species, for the last one the author states "The site RĪtupe is erroneously indicated for Latvia, as it is located in the Pskov district". The truth is that RĪtupe was joined to Latvia according to the peace treaty between Latvia and Russia on August 11, 1920, but was lost after WWII. The herbarium specimen in question was collected in 1926, when RĪtupe was undisputedly a part of Latvia. A more accurate statement would say that as a result of the transfer of RĪtupe and Palanga to the Russian SFSR and Lithuania respectively, localities of all plants found there must be excluded from the flora of Latvia. My countryman E. von Lindemann (1867) took this opinion when Alaska was sold by Russia to the U. S. A., and as a result had to remove 136 taxa from the flora of Russia.

The next publication to appear was The Flora of Latvian SSR by Pētersone and Birkmane (1980), written in Latvian. It was intended for use by specialists of biology and agriculture, but is also very appropriate to amateur botanists, students, and so on. What is especially important for a work of this kind is the comprehensive glossary of different morphological concepts that is included, as well as many sketches, depicting details of flowers, fruits, leaves, etc. Comparing this flora with FL, one finds that almost half of the plants described in my paper but omitted in FL are included in this new Flora (19 of 41). It is, of course, not clear whether they are my old records or new rediscoveries. The latter is possible because this new Flora includes quite a long list of synanthropes never found before in Latvia. One misses in many cases the indication of time and place of introduction of synanthropic plants. The user of this Flora has to perceive such plants as Anthoxanthum aristatum Boiss., Lupinus luteus L., Impatiens parviflora DC., Veronica filiformis Sm., and many more as native Latvian plants. But many others previously mentioned, including Galenīks in FL, have not considered in a rigorous fashion the question of whether a plant is native.

I would like to cite some rare plants which are not included in the Flora or are included with a question mark or from other localities. Plants considered earlier in this paper are not repeated here. Also, all plants were left out of consideration when I could not rely completely on my memory, and those plants are many. Geranium collinum and Tragopogon dubius are novelties for the synanthropic flora of Latvia.

Digitaria sanguinalis (L.) Scop.: Fishbreeding station Tome in the township of the same name, in a cold frame.

Chenopodium bonus-henricus L.: In the vicinity of the Tervete tuberculosis sanatorium in the township of the same name.

Geranium collinum Stephan ex Willd.: Torpakalns freight yard in Riga. A specimen was sent to the Botanischer Garten und Botanisches Museum Berlin-Dahlem, where it was determined and incorporated into the herbarium (B). It was destroyed during an aerial bombardment of Berlin by the Allies of the WWII.

Prunella grandiflora (L.) Scholler.: Koknese township.

Asperula tinctoria L.: Riverbank of the Daugava river, between Koknese and Pļavīpas.

Petasites hybridus (L.) P. Gaertner, B. Meyer, & Schreb.: Beside the J. Rozenšteins Pharmacy in the Ogresgals township.

Inula helenium L.: Koknese township.

Tragopogon dubius Scop.: On the railroad tracks in the vicinity of the military hospital in Riga.

Vimba (1981), in a paper on the problems of nature conservation, gave the latest statistics on the plant kingdom of Latvia: angiospermae 1350, gymnospermae 4, pteridophyta 43, mosses 420, lichenes 464, algae 2500, and fungi 2720, for a total of 7561 species.

In the same paper Riekstipš described a new taxon, Picea abies (L.) Karst. f. juniperiformis Riekstipš. The description and especially the attached photograph demonstrate a very strange looking shrub. Unfortunately, there is no Latin description, which would have validated this new taxon.

It is possible to cite additions to the botanical bibliography of Latvia (Tabaka, 1974b). The two most important papers are:

- 1) "Enumeratio plantarum phanerogamicum hucusque in Curonia, Livonia, Estoniaque observatarum auctore", Dr. J. Theoph. Fleischer. Bull. Soc. Imp. Naturalistes Moscow, 1829, 1: 74-102.
- 2) "Index plantarum quas in variis Rossiae provinciis hucusque invenit et observavit", Eduardus Lindemann. Bull. Soc. Imp. Naturalistes Moscow. 1860, 33(III): 77-190.

Both are quoted in *Florae Rossicae Fontes aperuit* (E. R. a Trautvetter, 1880). Von Trautvetter included in his paper a botanical bibliography of Russia, which comprised 1656 treatises, many of which concerned the Baltic region, where Latvia is located. Of course, the bibliography of Tabaka contains most of v. Trautvetter's numbers, but not all. Most of the treatises were published in *Korrespondenzblatt des Naturforscher-Vereins zu Riga*. Unluckily the older volumes of this journal are missing in our library. I could therefore rely only on the titles. But in the last century geographical names were used which now are ambiguous. So the often used "Baltic provinces" (*Ostseeprovinzen*) comprised Latvia as well as Estonia. Likewise, "Livland" or "Livonia" meant the northern province of Latvia (*Vidzeme*) as well as the southern part of Estonia. So I listed only those articles in which the title points beyond doubt to Latvian localities. In some cases, the two bibliographies differed in the years given or in the text of the titles. Without having the original articles, I can do nothing to settle these discrepancies. To save space I will not quote the full title and source, but only the numbers in v. Trautvetter's article: 90, 95, 130, 190, 293, 327, 597, 599, 674, 677, 680, 684, 942, 1192, 1220, 1277, 1293, 1407, 1594, 1651. Von Trautvetter cites one other bibliography, by F. Buhse et A. Buchholtz, *Uebersicht der naturhistorischen Literatur von Liv-, Kur- und Ehstland in Korrespondenzbl. Naturf.-Vereins Riga 7*, 1854.

I am aware of a serious shortcoming of this paper, which could be raised against it, namely partial want of vouchers. There is demand in some quarters that each published record should be supported by a vouchered specimen. Some of my early collections are preserved in Riga. Now and then they are quoted in the Latvian postwar literature. A recent citation was *Thymus marschallianus* Willd. (*T. pannonicus* All., according to Tutin, 1964-1977), mentioned in connection with the rediscovery of this plant, partly on railroads (Cepurīte, 1982). But there should be many other vouchered specimens in Riga, especially in Kupffer's herbarium (now in the possession of the University). He had determined all of my rare plants until his untimely death in 1935, and kept often some material of my collections. This assertion is confirmed in at least one

case. Fatare (1978) enumerates in her Chorology the known localities of the rare and protected Ajuga pyramidalis L., and lists among them "Līgciens G. RIG. (= Herbarium balticum K. R. Kupffer, Mühlenbach 1931." After his death, my plants with one exception (Geranium collinum) remained in my herbarium, which most probably was lost during the last war. I thought it would be worthwhile to quote all species, even if not unambiguously supported by vouchers so that their eventual rediscovery by other might be facilitated. Most of the species are natives and therefore could grow very well there. The synanthropes are another story, since according to my experiences most of these plants perish in a short time.

The second problem with my paper is that I was not able to use all Latvian postwar botanical works, because not all are present in our library. Therefore, it is possible that some of my remarks are superfluous, and are solved already by others.

Finally, I feel a duty to express my gratitude to the Director of the Missouri Botanical Garden, Prof. Dr. Peter H. Raven, who allowed me to plunge into a project far out of the scope of the present research activities at the Garden. In result, these, my reflections and reminiscences of the flora of Latvia, my old country of origin, were created.

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PSILOCLADA MAJOR (SCHUST.) ENGEL, COMB. NOV. (HEPATICAE)
FROM NEW ZEALAND

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I have seen several New Zealand collections of Psiloclada clandestina subsp. clandestina fo. major Schust. and compared them with other collections of the Psiloclada clandestina complex in New Zealand and find that fo. major deserves a higher rank:

Psiloclada major (Schust.) Engel, comb. nov.

Basionym: Psiloclada clandestina subsp. clandestina fo. major Schust., J. Hattori Bot. Lab. 48: 411. 1980. Type: New Zealand: South Island, Westland, Haast Pass, Schuster 59641.

The differences in lobe number cited in Schuster (1980) are constant, and P. major and P. clandestina differ also in vigor. The two taxa are surely distinct at the species level. The New Zealand taxa may be separated as follows:

Key to the New Zealand Species of Psiloclada

1. Leaves of main stems 5-7-lobed; underleaves 3-4-lobed; plants filamentous, threadlike in aspect. P. clandestina
1. Leaves on main stems 7-9(-10)-lobed; underleaves 5-6(-8)-lobed; plants vigorous, leafy in aspect. P. major

Selected specimens seen: NEW ZEALAND. SOUTH ISLAND. OTAGO: Trail between Gunn's Hut and Hidden Falls, ca. 30 m. SE of Lake McKerrow, Hatcher 584 (F, UWM); head of Lake McKerrow, Hatcher 1419 (F, UWM); N. of McKerrow River, Martin's Bay, Hatcher 1000 (F, UWM). WESTLAND: Westland Natl. Park, edge of Lake Wombat, Engel 6669A (MSC); Camp Creek, W. of Alexander Range, 630-1040 m., Reif C91H, C124K, C259D (F). NELSON: Paparoa Range, upper slopes of N. side of Tiropahi or Four Mile River between sea and Route 6, S. of Charlestown, 130-170 m., Engel 19243 (F).

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NOVITATES ANTILLANAE. XI

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In my studies on the floras both of Hispaniola and of Puerto Rico, I have met some taxonomic problems, some species new to science, a few changes in nomenclature and some new records. The following paper is the result of my studies.

The publication of the Flora of Hispaniola is now well under way; the third volume was published last March, and the fourth volume is at the printer's. As to the Flora of Puerto Rico, the first volume is still in press as this is written, and the second volume has been sent to the printer.

It is my hope that these publications will help the botanists to better understand the complex Flora of the West Indies. Particularly in Hispaniola, no systematic work having been published, with keys and descriptions of the species.

LEGUMINOSAE-MIMOSOIDEAE

Acacia dealbata Link - HISPANIOLA: HAITI: In forest, common, alt. 1800 m; Furcy, A. & P. Liogier 21418 (NY, SD, UPR).

This is obviously an introduction, the plant is native of Australia and Tasmania, and has been planted in tropical and subtropical regions. Some authors prefer to name it Acacia decurrens var. dealbata.

MYRTACEAE

Calypttranthes estremena Alain, *spec. nov.*

Arbor 10-15 m alta; rami hornotini compressi saepe bilineati, glanduloso-punctati glabri purpurascens, vetustiores teretes rubri vel grisei, cortice hic illic fisso et delabente; hypophylla non visa; folia petiolis 5-10 mm longis supra sulcatis suffulta, lamina elliptica vel late elliptica vel suborbiculata, 7-10 cm longa, 5.5-7 cm lata, apice rotundata, basi rotundata vel obtusissima, medio latissima, nervo medio supra ad basim sulcato, superne plano vel obsoleto, lateralibus utroque latere 10-12 sub angulo 70-80° abeuntibus, utrinque parum prominulis, margine plana vel subplana, utrinque subtus praesertim glanduloso-punctata, supra nitida olivacea, subtus pallidiora, chartacea; inflorescentiae ad apicem ramorum 2-4, pedunculo usque 6 cm longo, applanato pilis minimis dibrachiatis adpressis villosi, trichotomae; bracteae non visae; pedicelli primarii usque 12 mm longi; pedicelli termina-

les 6-10 mm longi, flores albi; alabastra non visa; calycis limbus supra ovarium fere 2.5 mm productus, calyptra membranacea glanduloso-punctata 3 mm diam.; petala non visa; stamina 5 mm longa, stylus 3 mm longus, apice capitatus; bacca non visa.

PUERTO RICO: Las Cuevas, Camuy, A. Liogier 35670, collected by William Estremera in flower, July 1985 (typus: UPR; isotypus: NY).

This species seems to be near to C. collina Urb. & Ekm., from Haiti; this last species has much smaller leaves, the peduncles much shorter; the flowers are unknown in this last species. Much collecting remains to be done in the island of Hispaniola, mainly in Haiti; many species were described by Urban and Ekman from sterile material.

Calyptranthes martorellii Alain, sp. nov.

Frutex usque 2.5 m altus; ramuli tereti dense ferrugineo-villosi; rami plerumque dichotomi vetustiores cortice brunneo striato, glabrescentes; hypophylla elliptica dense ferrugineo-villosa, usque 1.5 cm longa, 0.5 cm lata, glanduloso-punctata, apice rotundata vel obtusa, basi attenuata; folia chartacea obovata vel elliptica, 2-2.5 cm longa, 0.8-1.5 cm lata, apice rotundata vel late obtusa, basi attenuata acuta, nervo medio supra impresso, subtus prominulo, lateralibus nullis, margine plana vel leviter revoluta, utrinque glanduloso-punctata opaca, subtus pallidiora, petiolo nullo vel 1 mm longo, brunneo-villoso. Flores 1-3 in axillis superioribus sessiles, alabastra in bracteis binis inclusa; bractee basi ellipticae apice saepe falcata usque 7 mm longae, ferrugineo-tomentosae et glanduloso-punctatae, ad anthesim e basim cadentes; alabastra globulosa, 3.5 mm longa, 2 mm lata, dense ferrugineo-sericea, apice breviter vel longiuscule apiculata (apiculum usque 2 mm longum, interdum setaceum); calycis tubus supra ovarium 1 mm longe productus; petala non visa; antherae didymae, stylus ad apicem attenuatus; fructus globosus (non plane maturus?) 5 mm diam., ferrugineo-villosus.

PUERTO RICO: In wet forest, Cerro Maravilla area, 1100 m alt., March 2, 1983, A.H. Liogier, P. Liogier & L.F. Martorell 33970 (Typus: UPR, isotypi: NY, US, GH, P); id. May 23, 1984, A.H. Liogier & L.F. Martorell 35084 (UPR, NY, US, GH, etc.).

At first, this species might be taken as a small-leaved form of Calyptranthes krugii Kiaersk. Both species grow in the rain forest, above 1,000 m altitude, both have sessile flowers and fruits and both are ferruginous-tomentose.

C. krugii has usually larger leaves (up to 5 cm long and 3.5 cm broad), the lateral nerves are often visible beneath, the bracts are shorter than the buds and rounded; the bud is long-apiculate; the calyx-tube is very little produced beyond the ovary, forming a very shallow depression.

I name this species after Dr. Luis F. Martorell, who has contributed

so much to the collecting in Puerto Rico and some adjacent islands, and whose studies and publications have added to our knowledge of the Flora of our region.

Calyptranthes peduncularis Alain was originally collected in the Maricao State Forest, on serpentine; it is distinguished by its 1-flowered peduncles, its apiculate calyptra; C. dumetorum Alain, also collected on serpentine, at Susua, seemed different at first; although there were no flowers nor fruits, the emnants of the hypsophylls were mistakenly taken for old flowers. Upon examining the type specimens of both species and also further collections, I have come to the conclusion that both taxa are identical and therefore C. dumetorum has to be considered as a synonym to C. peduncularis.

Eugenia laevis Berg.

PUERTO RICO: West of Bayamón, June 9, 1959, R. Woodbury s.n. (UPR 2401); Aguadilla, June 17, 1959, R. Woodbury s.n. (UPR 2400); Guajataca Tunnel, Nov. 1961, R. Woodbury s.n. (UPR 2398); Guajataca Gorge, April 1964, R. Woodbury s.n. (UPR 2399); Ranchos Guayama, Salinas, Oct. 15, 1970, R. Woodbury s.n. (UPR 2397); Quebradillas Gorge, June 1974, R. Woodbury s.n. (UPR 5440).

First record in Puerto Rico; Hispaniola, Central America.

Myrcia maricaensis Alain, sp. nov.

Arbor 10 m alta, truncus 13 cm diam.; ramuli, petioli et paniculae adpresse brunneo-pubescentes; folia coriacea, elliptica vel obovata, 5-6.5 cm longa, 2-4 cm lata, apice obtusa vel subacuta, basi acuta in petiolum 3-5 mm longum attenuata, nervo medio supra basim versus paullo impresso, subtus ad basim prominente, lateralibus supra obsolete, subtus numerosis vix prominulis, interse nervo marginali 1-2 mm e margine remoto anastomosantibus, saepe obsolete; folia supra glabra atrovirentia, subtus pallidiora adpresse pubescentia, non glanduloso-punctata; inflorescentiae multiflorae, 5-8 mm longae, brunneo-pubescentes, pedunculi 3-4 cm longi; flores subsessili vel pedicelli usque 1 cm longi; bracteae lineares 1-2 mm longae; alabastra obovoidea, 2-3 mm longa; hypanthium intus glaber, cupulatum, supra ovarium productum; calycis lobi 5, subaequales, extus tomentosi, rotundati, intus glabri, 1.2-1.5 mm longi, post anthesim reflexi; discus 2 mm latus, stylus 2.5-3 mm longus apice dilatatus; petala oblonga, 2-3 mm longa; stamina circa 50; fructus non visus.

PUERTO RICO: In montane forest, Maricao State Forest, 300-800 m alt., Cain road, near Buenavista, July 16, 1950, Elbert L. Little 13421 (NY, holotypus, US); id., Rock House area, July 18, 1966, R. Woodbury s.n. (UPR 2307); id., June 20, 1970, R. Woodbury 20480 (NY, UPR); id., July 18, 1971, R. Woodbury s.n. (UPR 3273).

This species belongs to section Aulomyrcia, as of the treatment by R. McVaugh (Taxon 17: 377-381. 1968). It seems to be related to Myrcia

tomentosa (Aubl.) DC., from Trinidad and Guiana. This last species has larger leaves (5-9.5 cm long, 2-5 cm broad), puberulous above, transparent-dotted, the nerves rather prominent beneath.

Myrcia margarettae (Alain) Alain, comb. nov.

Eugenia margarettae Alain, Bull. Torrey Bot. Club 90: 190. 1963.

This plant known from the type specimen only (Alain Liogier 9400, NY) belongs to sect. Myrcia in the McVaugh paper; its rather large and conspicuous flowers, its elliptic rounded to emarginate leaves, distinguish it from M. deflexa (Poir.) DC. Obviously, and according to McVaugh's revision of the American genera (Taxon 17: 354-418. 1968), this plant with 5-merous flowers belongs in Myrcia, not in Eugenia.

ARALIACEAE

Following recent authors (cf. Mem. N. Y. Bot. Gard. 38: 51. 1984), I here reduce the species of Didymopanax to Schefflera:

Schefflera gleasonii (Britton & Wilson) Alain, comb. nov.

Didymopanax gleasonii Britton & Wilson, Sci. Surv. P. Rico & V. Isl. 6: 365. 1926.

This plant is endemic to the high mountains in the central cordillera in Puerto Rico, and much rarer in the Luquillo mountains to the East.

Schaefflera tremula (Krug & Urban) Alain, comb. nov.

Didymopanax tremulus Krug & Urban, Symb. Ant. 1: 206. 1899.

Endemic to the island of Hispaniola, where it is abundant in the mountains, mostly in the Haitian part of the island; in the Dominican Republic, it has been collected in the Cordillera Central, the northern Cordillera and the mountains South of Barahona.

SAPOTACEAE

While studying this family for the Flora of Puerto Rico, I have met a species that years ago was considered by A. Cronquist as a synonym to Mastichodendron (Sideroxylon) foetidissimum (Jacq.) Cronquist (Lloydia 9: 247. 1946). This species, named by Urban Sideroxylon portoricense is clearly different from M. foetidissimum: its leaves are acute to acuminate at apex, usually longer, the fruit is smaller than in M. foetidissimum.

Mastichodendron portoricense (Urban) Alain, comb. nov.

Sideroxylon portoricense Urban, Symb. Ant. 5: 134. 1904.

This species, endemic to Puerto Rico is found in forests at lower altitudes, in the northern hills and in the western region of the island of Puerto Rico.

NOTES ON THE GENUS *CLERODENDRUM* (VERBENACEAE). IX

Harold N. Moldenke

CLERODENDRUM Burm.

Additional synonymy: *Aterodendron* Vahl, in herb. *Cleorodendron* Meijer, in herb.

Additional & emended bibliography: C. Muell. in Walp., Ann. Bot. Syst. 5: 710--711. 1860; Ettingsh. & Gardn., Proc. Roy. Soc. Lond. 30: 233. 1880; Becc., Malesia 3: 35, 47--51, 211, 291, 314, & 340. 1884; Schimp., Wechselbez. Zwisch. Pfl. Ameisen. 1888; Heim, Ann. Rep. Smithson. Inst. 1896: 432, pl. 18. 1898; Woodrow, Journ. Bomb. Nat. Hist. Soc. 5: 12. 1899; Hiern, Cat. Afr. Pl. Coll. Welw. 1: 839--847. 1900; Gürke, Engl. Bot. Jahrb. 30: 391. 1901; DeWild., Ann. Mus. Congo Bot., ser. 4, 1: 117--120, pl. 37 & 38. 1903; Ridl., Journ. Roy. Asiat. Soc. Straits 53: 102--103. 1909; Mehe, Abhandl. Sachs. Ges. Wiss. Math.-phys. 32: 312--361. 1911; Wernham, Journ. Bot. Brit. 52: 32--33. 1914; Backer, Tropische Natuur 5: 87, 92, & 93. 1916; Wangerin, Justs Bot. Jahresber. 52 (1): 392--393 & 462. 1924; Burkill & Haniff, Gard. Bull. Straits 6: 234. 1930; Mildbt., Notizbl. Bot. Gart. Berlin 11: 677--680. 1932; Fedde & Schust., Justs Bot. Jahresber. 54 (2): 747. 1934; Chillon, Rev. Bot. Appliq. 19: 441. 1939; Uphof, Bot. Rev. 8: 574. 1942; E. D. Merr., Pl. Life Pacif. World 97, 98, & 273, fig. 90. 1945; W. Robyns, Fl. Sperm. Parc Nat. Albert 2: 140--147. 1947; Wild, Vict. Falls Handb. 158. 1953; J. K. Jacks., Journ. Ecol. 44: 350 & 363. 1956; Anon., Amer. Midl. Nat. 60: 388. 1958; Gilliland & Jabil, Proc. Sympos. Humid Trop. Veg. 64. 1958; Anon., Etud. Tax. Fl. Afr. Trop. Ind. 1959: 53. 1960; Seaforth, West Afr. Journ. Biol. Appl. Chem. 7: 29 & 31. 1963; Hocking, Excerpt. Bot. A.7: 454. 1964; Wild, Kirkia 5: 4. 1965; Burkill, Dict. Econ. Prod. Malay Penins. 1: 589--596. 1966; Glover, Gloss. Bot. Kipsig. Names Kenya 158. 1967; Ashton, Biol. Journ. Linn. Soc. 1/2: 193. 1969; Glover, Stewart, Fumerton, Marindany, & Anderson, Gloss. Botan. Kipsig. Names 232 & 259. 1969; J. K. Jacks. in Eyre, World Veget. Types 94. 1971; Hyland, U. S. Dept. Agr. Pl. Invent. 178: 209 & 277. 1972; Janzen, Biotropica 6: 253. 1974; Isaacson, Flow. Pl. Ind. 1: 335--337. 1979; Judd, Phytologia 58: 233 & 239. 1985; Mold., Phytologia 58: 279--303. 1985.

Additional excluded taxa: *Clerodendron cyaneum* Zipp. ex Miq., Ann. Mus. Bot. Lugd.-Bat. 2: 99 in syn. 1865 = *Caryopteris chosenensis* Mold. *Clerodendron fissicalyx* Scheff. ex Mold., Phytol. Mem. 2: 385 in syn. 1980 = *Faradaya papuana* Scheff.

CLERODENDRUM ALATUM Gürke

Emended synonymy: *Clerodendron fleuryi* A. Chev., Bull. Soc. Bot. France 58, Mem. 8: 191. 1912. *Clerodendron fleuryi* A. Chev. apud B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 47, 83, & 93. 1936. *Clerodendron lelyi* Hutch. apud B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 83 & 93 in syn. 1936.

Additional & emended bibliography: A. Chev., Bull. Soc. Bot. France

58 Mem. 8: 191. 1912; Fedde & Schust., Justs Bot. Jahresber. 39 (2): 319. 1913; A. Chev., Expl. Bot. Afr. Occ. Franç. 1: 508. 1920; Prain, Ind. Kew. Suppl. 5, imp. 1, 61. 1921; Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 1, 2: 272 & 273. 1931; Chillou, Rev. Bot. Appliq. 19: 441. 1939; Mold., Alph. List Inv. Names 17--19 & 21. 1942; H. N. & A. L. Mold., Pl. Life 2: 59. 1948; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 109--114, 180, & 181. 1949; Prain, Ind. Kew. Suppl. 5, imp. 2, 61. 1960; Mold., Phytologia 57: 469--472. 1985.

Clerodendron fleuryi is based on *Chevalier 22160* from Ivory Coast. Hutchinson & Dalziel (1931) cite for it *Chevalier 22160*, *Dalziel 205*, *Dent Young 205*, and *Lely 384* from Ivory Coast and Northern Nigeria.

CLERODENDRUM ANGOLENSE Gürke

Additional synonymy: *Clerodendron capitatum* var. *butayi* DeWild., Ann. Mus. Congo Bot., ser. 5, 3: 131 in syn. 1909.

Additional bibliography: Mildbr., Notizbl. Bot. Gart. Berlin 11: 680. 1932; Mold., Phytologia 58: 180 & 303. 1985.

Mildbraed (1932) asserts that his *C. euryphyllum* is very closely related to *C. angolense*, but differs in its distinctive leaf-shape, coarsely dentate leaf-blades, matted pubescence on the younger parts of the branches, and the few-flowered inflorescences.

DeWildeman (1909) cites *Flamigni s.n.*, *Huyghe s.n.*, *Laurent 663 & 882*, *Pynaert 521*, and *Seret 698* from Zaire.

CLERODENDRUM BETHUNIANUM Low

Emended synonymy: *Clerodendron bethuneana* Low, Sarawak 378 nom. nud. 1848.

Additional bibliography: Mold., Phytologia 58: 192--199. 1985.

Low's Original (1848) so-called description of this species consists merely of the statement that "We had passed...two large shrubs of the magnificent *Clerodendron Bethuneana* which were in full flower".

CLERODENDRUM BUCHNERI Gürke

Additional bibliography: Mold., Phytologia 58: 300--303. 1985.

Additional citations: ZAIRE: *Quarré 6235* (Br); *Ringoet 375* (Br, Br), *s.n.* [7/3/12] (Br), *s.n.* [1920] (Br); *W. Robyns 2069* (Br); RR P. *Salesiens S.640* (Br), *S.688* (Br), *S.704* (Br). BURUNDI: *Lewalle 1164* (Ld). TANZANIA: Tanganyika: *Hoffmann s.n.* [Peter 16293; O.IV.41] (B); *Peter 35646* [V.137] (B), *35739* [V.137] (B), *37428* [V.160] (B), *37434* [V.163] (B), *37568* [V.164] (B). ANGOLA: Bié-Cuando-Cubango: *E. J. Mendes 2220* (Ld, U1). Huila: *Barbosa & Correia 8927* (U1); *E. J. Mendes 1831* (U1, U1), *2038* (U1). Lunda: *Sanjinje s.n.* [VI.54.114] (U1). Moxico: *Barros Machado 142* (U1), *262* (U1), *286* (U1), *308* (U1), *322* (U1), *358e* (U1). Province undetermined: *Pocock 216* [Lukona-Kassassa] (Af). ZAMBIA: *Bredo 3802* (Br, N); *Ferrar s.n.* [Govt. Herb. Salisb. 4802] (N); *Herb. Queen Victoria Memorial 8192* (Rh); *E. Milne-Redhead 510* (Br, K), *2558* (Br, K, N); *J. G. Read 11* (Af). ZIMBABWE: *C. E. F. Allen 463* (Rh). NAMIBIA: *Baum 533* (Br, Mu--3915, N, S). CULTIVATED: Tanzania: *M. S. 556* (Mu).

CLERODENDRUM BUKOBENSE Gürke, Engl. Bot. Jahrb. 18: 182--183 [as "*Clero-*"]

dendron"]. 1893; B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 45, 81, & 92. 1936.

Synonymy: *Clerodendron bukobense* Gürke, Engl. Bot. Jahrb. 18: 182--183. 1893. *Clerodendron variifolium* DeWild., Bull. Jard. Bot. Brux. 7: 179. 1920. *Clerodendrum variifolium* DeWild. apud B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 81 in syn. 1936.

Bibliography: Gürke, Engl. Bot. Jahrb. 18: 182--183. 1893; Gürke in Engl., Pflanzenw. Ost-Afr. C: 341. 1895; J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 295 & 311--312. 1900; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 101. 1901; DeWild., Bull. Jard. Bot. Brux. 7: 179. 1920; DeWild., Pl. Bequaert. 2: 268--270. 1922; Fedde & Schust., Justs Bot. Jahresber. 48 (1): 496 (1927) and 53 (1): 1072. 1932; B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 9, 25, 30, 45, 81, & 92. 1936; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 101. 1941; Mold., Alph. List Inv. Names 21. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 48, 49, & 89 (1942) and ed. 2, 115, 116, & 180. 1949; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 101. 1959; Mold., Résumé 141, 143, 261, 271, & 448. 1959; Mold., Fifth Summ. 1: 228, 235, 440, & 459 (1971) and 2: 863. 1971; Mold., Phytol. Mem. 2: 218, 224, & 534. 1980.

A shrub, subshrub, or suffrutescent herb, sometimes climbing; branches and branchlets glabrous or the youngest short-pubescent; leaves decussate-opposite; petioles short, alate, and basally articulate, or obsolete; leaf-blades papery, oval or ovate to elliptic, 10--12.5 cm. long, 4--5 cm. wide, apically acuminate, glabrous or very sparsely pilose on both surfaces, often with the venation more or less densely velutinous beneath, the lower ones apically coarsely serrate and basally narrowed into the short petiole, the upper ones marginally entire, basally more or less deeply cordate, and sessile, the uppermost gradually merging into the foliaceous bracts; inflorescence axillary, borne at the tips of the stems and branches, dichotomous; cymes long-pedunculate, few-flowered, lax; peduncles to 4 cm. long, downwardly arched or reflexed; rachis and inflorescence-branches short-pubescent; basal bracts foliaceous, oval, diminishing in size from the base to the apex of the inflorescence; bracteoles 2, minute, linear or filiform, pubescent, ciliate; flowers pedicellate, the pedicels 3--5 mm. long; calyx more or less campanulate, 3.5--7 mm. long, externally glabrous or sparsely puberulent, 5-lobed almost to the middle, the lobes rotundate-orbicular, 2--3 mm. long, apically obtuse or rounded; corolla short-tubular, externally glabrous, green or greenish to white, the anterior (lower) lobe blue or lilac to violet, the tube curvate, 7--12 mm. long, mostly about twice the length of the calyx, apically ampliate, the limb 5-parted, the lobes ovate, apically obtuse; stamens long-exserted; filaments basally tomentose; style long-exserted; fruiting-calyx about 10 mm. wide; immature fruit black.

This species is based on *Stuhlmann* 3657, 3834, and 4054 from Bukoba in the Karagwe area of Tanganyika, Tanzania, collected in anthesis, respectively, on March 25, April 5, and April 16, 1892, and deposited in the Berlin herbarium, now unfortunately destroyed. Baker (1900) cites only the first two of these cotype collections.

Gürke (1893) -- his work sometimes mis-cited as "1894", the volume titlepage date -- comments that "Dieser zur Sektion *Cyclonema* gehörende Art ist besonders auffallend durch die Form der Blätter: die unteren

sind am Grunde verschmälert, die oberer tief herzförmig; auch die zurückgekrümmten Inflorescenzstiele sind sehr charakteristisch".

DeWildeman's *C. variifolium* is based on *Bequaert 6121* from the gallery forest along the sides of a river at Rutshuru, Zaire, collected on October 30, 1914, and deposited in the Brussels herbarium. The type locality is misspelled "Rutohuru" by Fedde & Schuster (1927).

DeWildeman (1922) provides interesting morphologic details: "plante volubile....pétiole articulé à la base, à articulation peu visibles sur les jeunes rameaux; limbe des feuilles des rameaux principaux elliptiques ou ovales, assez brusquement rétréci, à pétiole ailé, atteignant avec ce dernier 24 cm. de long et de 11,5 de large, cuneiforme à la base, plus ou moins longuement acuminé au sommet, à bords plus ou moins profondément et irrégulièrement dentés, à dents aiguës, nervures principales latérales au nombre de 6--8 de chaque côté de la nervure médiane; feuilles des rameaux latéraux à pétiole à peine ailé, n'atteignant souvent que 3 mm. de diam." He also comments that "Cette plante rappelle fortement celle que nous avons décrit en 1914 (*Fedde Repertorium XIII*, p. 143) sous le nom *C. myricoides* var. *attenuatum*. Elle se rapproche du *C. myricoides*, tel que nous l'avons compris ci-dessus par les dimensions et la forme du calice, et se distingue des lors de la plante du Katanga, des récoltes de M. Homblé, qui possède, comme les types de notre herbier, du *C. myricoides* var. *camporum* Guerke et var. *laxum* Guerke, un calice très réduit rappelant le *C. ugandense* Prain (*Bot. Magazine pl.* 8235). Dans les échantillons du Katanga dont nous avons parlé ailleurs, le pétiole ailé n'atteint pas, d'après les exemplaires en notre possession, le diamètre de celui de la plante galeries forestières du Rutshuru."

Clerodendrum bukobense has been found growing in gallery forests along streams, in flower from March to May and in November. The corollas are described as "greenish with the back petal lilac" on *Lebrun 8423* and "petals white and blue" on *Kahurananga & al. 2699*.

Thomas (1936) has designated *Stuhlmann 3657* as the type, citing in addition *Stuhlmann 3834 & 4054* and *Bequaert 6121*.

The *Peter 33718*, distributed as *C. bukobense*, actually is *C. discolor* var. *oppositifolium* Thomas.

Citations: ZAIRE: *Bequaert 6121* (Br, Ld--photo, N, N--photo); *Lebrun 8423* (Br, N). TANZANIA: Tanganyika: *Kahurananga, Kibwaa, & Mungai 2699* (Mu).

CLERODENDRUM BUNGEI Steud., *Nom. Bot. Phan.*, ed. 2, 1: 82. 1840.

Synonymy: *Clerodendron foetidum* Bunge, *Enum. Pl. Chin. Bor.* 52. 1833 [not *C. foetidum* D. Don, 1825, nor Hort., 1853]. *Clerodendron foetidum* Bunge apud Steud., *Nom. Bot. Phan.*, ed. 2, 1: 382 in syn. 1840.

Clerodendron foliosum Bunge ex D. Dietr., *Syn. Pl.* 3: 615. 1843.

Clerodendron bungei Steud. apud Schau. in A. DC., *Prodr.* 11: 672 in syn. 1847. *Clerodendron roseum* Hort. ex Carr., *Rev. Hort.* 47: 80. 1876.

Volkameria bungei Hort. ex Lavallee, *Arb. Segrez.* 179. 1877. *Ovieda foetida* Baill., *Hist. Pl.* 11: 87, fig. 100. 1891. *Clerodendron*

bungeanum Steud. apud Bretschn., *Hist. Europ. Bot. Discov. China* 338. 1898. *Clerodendron bungei* Hort. ex Koord. & Valet., *Meded. Lands*

Plant. 42 [*Beijdr. Booms. Java* 7]: 164. 1900. *Clerodendron foetidum*

roseum Hort. ex Schelle in Beissner, Schelle, & Zabel, *Handb. Laubh.*

425 nom. nud. 1903. *Clerodendron esquirolii* Lévl., Feddes Repert. Spec. Nov. 11: 298. 1912 [not *C. esquirolii* Lévl., Feddes Repert. Nov. 11: 302. 1912]. *Pavetta esquirolii* Lévl., Feddes Repert. Spec. Nov. 13: 178. 1914. *Clerodendron oetidum* Bunge apud Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 88 sphalm. 1921. *Clerodendron fragrans* var. *foetida* (Bunge) Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 89. 1921. *Clerodendron yatschuense* H. Winkler, Feddes Repert. Spec. Nov. Beih. 12: 474. 1922. *Clerodendron bungei* Standl. apud Rehd., Man. Cult. Trees Shrubs, ed. 2, imp. 1, 806 in syn. 1940. *Clerodendron bungei* Standl. ex Bravo Hollis & Ramírez Cantú, Anal. Inst. Biol. Mex. 22: 421 sphalm. 1951. *Clerodendron bungei* Standl. apud Rennó, Levant. Herb. Inst. Agron. Minas 149 sphalm. 1960. *Clerodendron foetidum* (Burm.) Bunge, in herb. *Clerodendron foetidum* (L.) Bunge, in herb. *Clerodendron yatschouense* H. Winkler, in herb. *Clerodendron faetium* Bunge, in herb. *Clerodendron bungeana* Ledín, in herb. *Clerodendron bungei* Standl., in herb. *Clerodendron bungei* Standl., in herb.

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Exkursionsfl. 3: 139. 1912; Diels, Notes Roy. Bot. Gard. Edinb. 7: 332 & 349. 1913; "A. O.", Garden Lond. 77: 560. 1913; Pardé, Bull. Soc. Dendr. France 12: 104 & 131. 1913; J. K. Small, Fl. Southeast. U. S., ed. 2, 1363. 1913; J. K. Small, Shrubs Fla. 117. 1913; Léveillé, Feddes Repert. Spec. Nov. 13: 178. 1914; Léveillé, Fl. Kouy-Tchéou 371. 1914; P. C. Standl., Torreyia 15: 9. 1915; Hadden, Garden Lond. 80: 440--441. 1916; Rehd. in Sarg., Pl. Wils. 3: 375. 1916; Léveillé, Cat. Pl. Yun-Nan 277. 1917; "G. J.", Garden Lond. 83: 506. 1919; Cowley, Garden Lond. 84: 524. 1920; Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 88, 89, 108, & viii. 1921; H. Winkler, Feddes Repert. Spec. Nov. Beih. 12: 474. 1922; Fedde, Justs Bot. Jahresber. 42: 848. 1923; L. H. Bailey, Man. Cult. Pl., ed. 1, imp. 1, 633, 634, & 808 (1924) and ed. 1, imp. 2, 633, 634, & 808. 1925; Arnold, Gard. Chron., ser. 3, 82: 149. 1927; "A. G. F.", Gard. Chron., ser. 3, 82: 505. 1927; Hegi, Illust. Fl. Mitteleur. 5 (3): 2237. 1927; Rehd., Man. Cult. Trees Shrubs, ed. 1, imp. 1, 778. 1927; Dop, Bull. Soc. Hist. Nat. Toulouse 57: 167--169. 1928; "N. K. G.", Gard. Chron., ser. 3, 84: 207, fig. 94. 1928; Hottes, Book Shrubs, ed. 1, 162. 1928; Wisley, Gard. Chron., ser. 3, 34: 207, fig. 94. 1928; Fedde, Justs Bot. Jahresber. 47 (2): 300. 1929; A. W. Hill, Ind. Kew. Suppl. 7: 253. 1929; Stapf, Ind. Lond. 2: 238. 1930; Hottes, Book Shrubs, ed. 2, 188. 1931; Fedde & Schust., Justs Bot. Jahresber. 53 (1): 1073. 1932; P'ei, Mem. Sci. Soc. China 1 (3): 124, 125, & 138--140. 1932; P'ei, Sinensia 2: 74. 1932; Rehnault, Pareys Blumengärt., ed. 1, 282. 1932; Wilder, Frag. Path 208, 263, & 386. 1932; Beauverd, Bull. Soc. Bot. Genève., ser. 2, 24: 253. 1933; Dop & Pindat, Bull. Soc. Hist. Nat. Toulouse 65: 367--368. 1933; J. K. Small, Man. Southeast. Fl. 1143--1144. 1933; Becherer, Bericht. Schweitz. Bot. Gesell. 43 (1): 67. 1934; Bremekamp, Feddes Repert. Spec. Nov. 37: 191. 1934; Junell, Symb. Bot. Upsal. 1 (4): 101, 104, 180, & 181, fig. 165. 1934; Rehd., Journ. Arnold Arb. 15: 324. 1934; Rehd., Man. Cult. Trees Shrubs, ed. 1, imp. 2, 778. 1934; L. H. Bailey, Florists Handl. Verbenac. [mss.]. 1935; Dop in Lecomte, Fl. Gén. Indo-chin. 4: 850 & 858--859. 1935; Rehd., Man. Cult. Trees Shrubs, ed. 1, imp. 3, 778. 1935; Wangerin, Justs Bot. Jahresber. 55 (1): 834. 1935; Makins, Ident. Trees Shrubs 74 & 259, fig. 62D. 1936; Wangerin, Justs Bot. Jahresber. 56 (1): 669. 1936; Troncoso, Darwiniana 3: 57. 1937; L. H. Bailey, Man. Cult. Pl., ed. 1, imp. 3, 633, 634, & 808. 1938; Mold., Alph. List Comm. Vern. Names 7. 1939; Mold., Lilloa 4: 331. 1939; Mold., Prelim. Alph. List Inv. Names 19, 22, & 33. 1940; Rehd., Man. Cult. Trees Shrubs, ed. 2, imp. 1, 806 & 937. 1940; L. H. Bailey, Man. Cult. Pl., ed. 1, imp. 4, 633, 634, & 808. 1941; L. H. & E. Z. Bailey, Hortus Second, imp. 1, 188. 1941; Calderon & Standl., Fl. Salvad., ed. 2, 236. 1941; Mold., Lilloa 6: 319--320. 1941; Worsdell, Ind. Lond. Suppl. 1: 238. 1941; Hottes, Book Shrubs, ed. 4, 188. 1942; Mold., Alph. List Inv. Names 17, 21, & 34. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 5, 6, 10, 12, 16, 27, 31, 36, 43, 54, 56, 71, & 89. 1942; Mold. in Lundell, Fl. Tex. 3 (1): 83--85. 1942; Herter, Revist. Sudam. Bot. 7: 224. 1943; L. H. Bailey, Man. Cult. Pl., ed. 1, imp. 5, 633, 634, & 808. 1944; E. L. D. Seymour, New Gard. Encycl., ed. 3, 288. 1944; Bowden, Amer. Journ. Bot. 32: 195, 198, & 199, fig. 204. 1945; Mold., Phytologia 2: 98. 1945; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 560 & 561. 1946; Mold., Alph. List Cit.

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Illustrations: Lindl., *Edwards Bot. Reg.* 24: pl. 41 [in color, as "*Clerodendron fragrans*"]. 1838; Planch., *Fl. Serres Jard.*, ser. 1, 9: 17 [in color]. 1853; Sweet, *Ornament. Fl. Gard.* 3: pl. 157 [in color, as "*Clerodendron fragrans*"]. 1854; W. Hook., *Curtis Bot. Mag.* 81 [ser. 3, 11]: pl. 4880 [in color]. 1855; Carr., *Rev. Hort.* 37: 470/471 [in color]. 1866; Baill., *Hist. Pl.* 11: 87, fig. 100. 1891; Voss in *Vilm.*, *Blumengärt.* 1: pl. 95. 1895; C. K. Schneid., *Illust. Handb. Laubholz.* 2: 592, fig. 384 h & i. 1911; "A. O.", *Garden Lond.* 77: 560. 1913; Hadden, *Garden Lond.* 80: 441. 1916; "G. J.", *Garden Lond.* 83: 506. 1919; Cowley, *Garden Lond.* 84: 524. 1920; Hegi, *Illust. Fl. Mitteleur.* 5 (3): 2237. 1927; Dop, *Bull. Soc. Hist. Nat. Toulouse* 57: 167--169. 1928; "N. K. G.", *Gard. Chron.*, ser. 3, 84: 207, fig. 94. 1928; Wisley, *Gard. Chron.*, ser. 3, 34: 207, fig. 94. 1928; Junell, *Symb. Bot. Upsal.* 1 (4): 104, fig. 165. 1934; Makins, *Ident. Trees Shrubs* 74, fig. 62D. 1936; Bowden, *Amer. Journ. Bot.* 32: 198, fig. 204. 1945; Preston, *Gard. Chron.*, ser. 3, 123: 132, fig. 65. 1948; Eisenstaedt, *Life* 30 (8): 66 [in color]. 1951; Graf, *Exotica* 3: 1481. 1963; Everett, *Reader's Digest Compl. Book Gard.* 416. 1966; Hellyer, *Shrubs Colour* [31] [in color]. 1966; Hay & Syngé, *Color Dict. Fls. Plants* 190, pl. 1517 [in color]. 1969; Graf, *Exot. Pl. Man.*, ed. 1, 492. 1970; Morley, *Wild Fls. World* pl. 104f [in color]. 1970; F. Perry, *Compl. Pls. Fls.* pl. 76 [in color]. 1974; Gault, *Color Dict. Shrubs* pl. 100 [in color]. 1976; Raj, *Palaeobot. Palyn.* 39: 416, pl. 14, fig. 2 & 5. 1983; Duke & Ayensu, *Med. Pl. China* 2: 636. 1985.

A small woody or semi-woody shrub, 0.5--3 m. tall, freely suckering, late-flowering; stems erect, dark-green, brittle, basally woody; branchlets and twigs, when produced, rather stoutish, brown, rather shiny, sparsely pilose-puberulent or purple-pubescent when young, soon becoming glabrous, marked with numerous, whitish, slightly raised lenticels; nodes not annulate; principal internodes 1.5--12 cm. long; leaves decussate-opposite, with an unpleasant or even repulsively nauseous-aromatic odor when broken or crushed; petioles rather stout, 2--16.5 cm. long, striate, often somewhat raised-lenticellate, minutely puberulent or glabrate, usually collapsing basally in drying; leaf-blades membranous or subchartaceous, dark-green above, lighter beneath, deltoid-ovate or broadly cordate, 6.5--23 cm. long, 4.5--23 cm. wide, usually about as long as wide, apically acute or short-acuminate, marginally uniformly and coarsely serrate with broadly triangular apically apiculate teeth, basally subtruncate or cordate, often centrally slightly subcuneate into the petiole, more or less pulverulent and marked with scattered, often reddish or purple, very short, often glandular, strigillose hairs on both surfaces but especially beneath, becoming subglabrate, usually with some discoid glands at the base beneath; midrib slender, very slightly prominent and usually puberulent above, prominent beneath; secondaries slender, about 4 on each side, the lowest pair issuing with the midrib at the base of the blade, all ascending and slightly arcuate, often very slightly prominent above and more distinctly so beneath; vein and veinlet reticulation abundant, rather distant; inflorescence usually terminal, very rarely also supra-axillary, corymbose-paniculate in subcapitate fashion, 6--11 cm. long, 2--21 cm. wide, densely many-flowered, very showy, puberulent throughout; peduncles continuous with

and similar to the stems or else flattened and yellowish, varying from obsolete to 10 cm. long; pedicels slender, 1--4 mm. long, densely puberulent; bracts large and foliaceous or absent; bractlets and prophylla linear-setaceous, 1--3 mm. long, puberulent; flower-buds dark magenta-purple; flowers usually fragrant, heavy-scented, about 3 cm. long; calyx campanulate or more or less cylindrical, reddish, 3--6 mm. long, externally rather sparsely puberulent and granular-lepidote or pubescent, the rim 5-toothed, the teeth ovate, about 1.5 mm. long, shorter than the tube, apically obtuse or acute to long-acuminate; corolla cyathiform, usually red or rose to rose-purple, purplish, or purple-pink, not "doubled", rarely white, the tube very slender, 2--2.5 cm. long, 1--1.5 mm. wide, usually about 5 times as long as the calyx, glabrous, the limb [4-? or] 5-lobed, 1--1.5 cm. wide, the lobes oblong-ovate, 3--5 mm. long; stamens violet-blue, long-exserted to about 8 mm. beyond the throat of the corolla-tube; filaments slender; style as long as or longer than the stamens; stigma very shortly bilobed; fruit drupaceous, globose, about 1 cm. long and wide, from red to blue-black, purple, or finally black, shiny; chromosome number: $2n = 108$.

The species is based on *Bunge 296* from gardens in Peking, China. Bunge's original (1833) description is: "Cl. suffruticosum; foliis petiolatis lato-cordatis acutis scabriusculis repando acute dentatis subtus ad nervorum axillas glandulosis, corymbis densis capitatis terminalibus, tubo corollae longissimo calycem quintuplo excedente, limbo quadripartito. Colitur: floret Junio, Julio. 5 Odore gravi narcotico; flores purpurei, genitalia exserta." This description was repeated verbatim by Dietrich (1843) in his description of his *C. foliosum* "Bunge" except for his corolla "limbo 5-partito" in place of Bunge's "quadripartito". He cites only the type collection.

Clerodendrum bungei is native from China to northern India, but is widely cultivated in many parts of the world and has escaped and/or become naturalized in the southern United States, Puerto Rico, Mexico, parts of South America, Guam, and even Switzerland. It is a member of Section *Densiflora* Schau. *Clerodendron yatschuense* H. Winkler is based on *Limpricht 629*, but his *no. 6570* is also marked as "original" on a photograph in the Britton Herbarium.

It should be noted that the *C. foetidum* of D. Don and of "Hort.", referred to in the synonymy given above, actually belong, respectively, in the synonymy of *Caryopteris foetida* (D. Don) Thellung and *Clerodendrum lindleyi* Decaisne, while the *C. foetidum* ♀ & var. *integri-folium* of Hasskarl are *C. colebrookianum* Walp. and *C. foetidum* fl. pl. Jack is *C. philippinum* f. *multiplex* (Sweet) Mold.; *Volkammeria foetida* Buch.-Ham. and *C. foetida* Hamilt. are synonyms of *Caryopteris foetida* (D. Don) Thellung.

Collectors have found *Clerodendrum bungei* growing in clay or rocky soil, in abandoned ground, waste places and fields, open woods, old yards, often in light shade in damp shaded places, rocky places in bamboo groves, along roadsides and streamsides, in the drainage areas from cow barns, at the open edges of mixed woods, in damp and tropical forests, shady places under isolated trees, moist pastures, and woodlands along rivers, on shaded rocky slopes and the slopes of small

volcanic cones, often on oak-covered slopes, in river barrancas, valleys, and secondary vegetation, near water, and on roadside banks in limestone mountains, at altitudes of 150--3300 meters, in flower in January, March to October, and December, and in fruit in August. Simpson reports that in South Africa it flowers in late summer and autumn; Pitschman and his associates (1965) say that in the southern Alps of Switzerland it flowers in August and September and this is also the season quoted by most northern hemisphere horticulturists. Wilson & Bell (1967) assert that it is "fragrant in autumn".

Bowden (1945) determined the chromosome number of $2n = 108$ on the basis of his no. 6722-39. Baillon (1891) illustrates a cross-section of the ovary. The leaf glands are described by Dop (1928, 1933), while Pitard (1901) describes a composite and interrupted ring of sclerenchyma in the pericycle. Ventura calls the flower fragrance "agreeable", but Curtiss refers to the flowers as "weedy scented" and several other collectors describe it as "unpleasant".

A notation on the Guthrie 284 collection, cited below, avers that this specimen, presumably while alive, was "painted for Addisonia", but I have failed to find it represented in that journal.

Tsang found *C. bungei* "fairly common but scattered" in Kwangsi. Maximowicz (1886) lists it as cultivated ("omnes") in Peking and notes: "*C. foetidum* Don, Prodr. Nepal. 103, quod *Cl. Buchanani* Walp. Repert. IV, 108, DC. Prodr. XI, 672" as a synonym (?), adding "Bungeano nomine quidem vetustius, Schauero mihique incognitum est. Planta quam *P. integrifolium* dixit Hasskarl in Retzia I, 60, e Singapur in hortum bogoriensem introducta, diversissima species videtur, sed a me non visa". Mueller (1860) says of the latter: "Forsan haec varietas speciei novae typum praebet, quam *Clerodendrum ixoraeflori* nomine salutarem." This actually is a synonym of *C. colebrokianum* Walp.

Ewan reports *C. bungei* "thoroughly naturalized" in Orleans Parish, Louisiana; R. D. Thomas lists it as escaped in Orlean, Ouachita, Rapides, and Terrebonne Parishes in that state -- "native or self-reproducing" in Iberia Parish. Standley (1967) also reports it escaped in Louisiana. R. M. Harper, in a letter to me dated October 12, 1943, records it as cultivated in Alabama and as escaped at Montgomery and University, Alabama, and at Tallahassee, Florida. Duncan & Kortes (1981) report it cultivated in Georgia. Wurzlów found it "thoroughly naturalized on abandoned ground" at Houma, Louisiana, flowering there in July. Gimale L. reports it very abundant in Hidalgo, Mexico, while Ventura calls it "abundant on roadsides" in Veracruz. Molina R. (1975) lists it as cultivated in Honduras and Calderón & Standley (1941) found it in gardens in El Salvador. Small (1913) reports it from "fields and thickets" in northern Florida, introduced from China.

López-Palacios (1976) asserts that, though reported, he does not personally know of its occurrence in Colombia; Angely (1971) lists it from Minas Gerais, Rio de Janeiro, and São Paulo, Brazil, while Herter (1943) found it in cultivation in Uruguay. Troncoso (1937) reports it cultivated in Argentina and Venturi found it escaped along the edges of highways in Catamarca. Liogier (1982) lists it as planted and escaped in Puerto Rico, while Fosberg and his associates (1979) found it growing on Guam. The Andersons found it "in shade of trees, not common but locally abundant on roadside banks in limestone moun-

tains" in Hidalgo, Mexico. Beauverd (1933) and Becherer (1931) report it introduced in the vicinity of Locarno, Switzerland. Wunderlin (1982) found it "rare in disturbed sites" in Palm Beach County, Florida, apparently escaped from cultivation.

Encke (1960) gives the assumed natural distribution as Sikkim, China, and the Ryu-Kyu Islands. Boom (1966) asserts that it "grows well in Europe, but only as a shrub". Synge (1956) and Hyams (1967) tell us that it was introduced into cultivation, presumably in England, from China in 1844, while Stucchi (1968) claims that it did not appear in Italian gardens until 1862. Bailey (1935) lists it as offered to the American horticultural trade by Kayo, Knap Hill, Sanford, and Jungle Gardens (on Avery Island, Louisiana) nurseries, but Mattoon (1953) lists only 2 sources at that time, apparently indicating a drop in popularity among gardeners.

The color of the corollas of *Clerodendrum bungei* is variously described by collectors and authors -- as "rose" on Pételot 1381, Saucedo 65, and Ventura A. 2377, as "rosadas con hormigas" on Gimale L. 576, as "rose-red" by the Baileys (1911) and Lord (1978) and on Frye & Frye 2643 and Hitchcock & Stanford 2643, as "rosy-red" by Fletcher (1972) and Graf (1963) and on Ewan 17680, as "purpurrodenrot" by Encke (1940), as "rose-pink" by Simpson (1964), as "red" on Breedlove 6837, Henry 10299, Steward & Cheo 606, Tsiang 10042, and Tsui 810, as "reddish-purple" on Steward 2305, as "red-purple" by Hallyer (1982) and on Rzedowski 20023, as "pink" on Anderson & Anderson 4668, Mexia 1914, Steward 1239, Sykes 99/68, and Tsang 27891, as "pinkish" on Chiao 885, Rock 11550, and Steward & al. 145, as "deep-pink" on Chute M.208, as "rose-purple, open petals lighter" on Howard 16658, as "Rosein Purple acc. R.H.S. Colour Chart 1938-42" on Bracelin 1592, as "purple" on Breedlove 10440, as "purplish-red" on Tsiang 5442 and by Makins (1936) and Synge (1956), as "purplish-red or pinkish" on Keng 594, as "purple-red" by Bean (1970), as "pink, purplish or red" by Walker (1976), as "carmine" by Van Houtte (1853), as "lilac-rose" by Hottes (1942), as "lilac to rose-purple" on Hardin & Duncan 13803, as "lavender" on Gillis 11034, as "violet" on Mello Barreto 4387 and Venturi 7209, as "crimson" on Brown s.n., and as "white" on McClure 2649.

Common and vernacular names listed for *C. bungei* are "ai-tung-chih", "amor de Pedro", "ban-bana-kusagi", "bocamelia", "brocamelia", "camelia americana", "chau shi mut li", "ch'ou mao tan ts'ao", "ch'ou m' d'än", "flor de la rosa muerte", "fragrant clerodendron", "glorybower", "glory tree", "Kashmir bouquet", "hortensia", "mu-tan-hua", "ngai-t'ou-tau", "reddish-flowered clerodendrum", "rose glorybower", "sa sha ping", "starkduftender Losbaum", "stinkender Loosbaum", and "colcana". In the horticultural trade (American) "rose glorybower" is the recommended standardized common name.

Gibbs (1974) has found leucoanthocyanin present in the leaves. P'ei reports the species as a drug source in Sikang and Szechuan, China. McClure reports the roots used as a drug in Kwangtung -- *Herb. Canton Chr. Coll. 165* was purchased on the drug market in Canton by E. H. Groff, who reports that the roots are dried and sold for 50--60 cents per catty Canton silver; they are boiled for 4 or 5 hours and the extract is then taken internally in the treatment of weak muscles of the ankles and legs. Cheo reports the roots cut into small pieces, soaked

in wine, and used as an aromatic. Duke & Ayensu (1985) describe the uses as follows: "Leaf: Decocted and applied externally as anodyne and anti-inflammatory; also used for ancylostomiasis, arthritis, headache, hypertension, hives, filariasis, infections, rheumatism, and toothache. Used for lung weakness and gastritis. Plant: Decocted for cough, debility and weakness. Root: Soaked in wine to treat mechanical injury."

Lindley (1838), misidentifying the species as "*Clerodendron fragrans*", says of it: "Few plants are more deserving cultivation than this, which in the gardens of China is one of the handsomest of their Flora; as is attested by a beautiful Chinese drawing preserved in the library of the Horticultural Society.....It is a conservatory plant of the easiest cultivation, and if planted in the open border in a warm place during summer, it will remain healthy and flower abundantly. But it is killed by the first frost. It grows with great luxuriance, and the chief thing to be attended to in its cultivation is a sufficient quantity of room. A damp stove seems to suit it very well. If it be in a healthy condition, the pot in which it is grown will soon be completely filled with its roots; in this state it is necessary to give it plenty of water, and syringe it freely over-head. The syringing is more particularly necessary, because, it is very liable to be infested by insects, (coccus) which, if allowed to get into the dense head of flowers, are not easily eradicated. The best soil is a rich loam, mixed with leaf-mould and sand. It is propagated freely by cuttings taken from the half-ripened wood, inserted in silver sand in the usual manner, and plunged in a hot-bed."

Hellyer (1966) avers that *C. bungei* should be "planted where it can be seen but not touched because the foliage gives off a repulsive odor when bruised". It is usually cut back to the ground by frost. Rooted suckers can be removed in autumn to start new plants. Frazzi (1953) warns us that a "damping-off" fungus attacks this plant in Argentina causing necrotic lesions to appear in the leaves. Lord (1978) agrees that the plant must be shielded from frost.

Graf (1963) describes the leaves as "quilted" and gives the period of anthesis as June to September (in the northern hemisphere). Cowley (1920) quotes Nix who describes *Clerodendrum bungei* as growing luxuriously in an English garden -- "the flowers smell deliciously sweet in the sun, but the leaves, when bruised, have a most disagreeable smell.. The plant burrows under the paths and comes up in unexpected places."

Hellyer (1982) affirms that *C. bungei* and *C. trichotomum* Thunb. are the only two species in the genus that are hardy enough to be planted outdoors in the British Isles, but that it is "usually killed to the ground level each winter but shoots up again from the roots in spring. ...Both need warm and sunny places and fairly fertile well-drained soil. They can be grown from seed, root cuttings and also from suckers dug up with roots in spring or autumn.....[and] which may need to be dug out to prevent the plant spreading too far."

The Baileys (1941) inform us that in the United States *C. bungei* is adapted to be grown only in southern parts like Florida, the Gulf Coast, and southern California. In their 1976 work they assert that it is hardy in life-zone 9.

Bean (1970) comments that "In the open air this species can scarcely be regarded as a shrub. It is killed back to the ground most winters [in England], but sends up vigorous, erect, woody shoots during the summer 3 to 6 ft. high.....In August and September come the terminal rounded corymbs, each 4 to 5 in. across, densely packed with purple-red flowers.....Native of China; introduced by Fortune in 1844. It has lived for many years at the foot of a greenhouse wall at Kew, spreading rapidly by its suckers, and forming in summer a dense thicket of stems. It has proved hardy in an open position in the R.H.S. Garden, Wisley.....Easily increased by divisions in spring."

A key to distinguish this species from other cultivated species is given by Syngé (1956), for which see these present notes under *C. beth-unianum* Low. To distinguish it from the taxon with which it is most frequently confused, the following may serve:

1. Corolla mostly "doubled", its tube only slightly surpassing the calyx; calyx-lobes as long as the tube or longer; leaf-blades coarsely and irregularly toothed....*C. philippinum* f. *multiplex*.
- 1a. Corolla not "doubled", its tube several times longer than the calyx; calyx-lobes shorter than the tube; leaf-blades regularly serrate or serrate-dentate.....*C. bungei*.

Voss (1895) gives the following horticultural directions: "*C. foetidum* Bnge. ist eine jener alten, wertvollen und schönblühenden Pflanzen, die man nicht gern verschwinden sieht; ausserdem ist es, wenn gut kultiviert oder im freien Lande wachsend, auch durch seine Tracht und wegen der grossen, ansehnlichen Blätter als Gruppenpflanze empfehlenswert. Als Topfpflanze behandelt, blüht dieser Art bis tief in den Winter hinein. Kultur in jedem kräftigen, genügend durchlässigen Gartenboden; im Sommer aber bis zur Blütezeit mit dem Begriessen nicht nachlässig sein, gegentlich auch Dungwasser (Mistjauche oder aufgelösten tierischen Dung, welchem entweder aufgelöstes phosphorsaures Kali oder aufgelöstes Thomasschlackenmehl beizufügen ist, beides natürlich sehr stark verdünnt). Am besten gedeiht die Pflanze, wenn man sie an einen warmen aber freien, lustigen Standort ins Freie pflanzt, zu Anfang des Herbstes mit genügendem Erdballen aushebt und sie (nachdem man die Ausläufer entfernt hat) in ausreichende aber knapp angepasste Töpfe pflanzt, die Erde tüchtig durchfeuchtet und die Pflanze, damit die Blätter nicht leiden, einige Tage in einem geeigneten Raume geschlossen und schattig hält. Haben die Wurzeln wieder Boden gefasst, die Pflanzen sich also erholt, so kommen sie in ein Kalt- oder Lauwarmhaus. Je wärmer der vorausgegangene Sommer gewesen, je besser also die Stengel ausreifen konnten, desto früher wird die Blütezeit eintreten. Stellt man nach und nach einzelne Pflanzen wärmer, so kann man die Blütezeit bis tief in den Winter hinein verlängern. Nach der Blüte allmählich Ruhezeit eintreten lassen und die Pflanze möglich trocken, auch kühl halten, etwa wie Fuchsien und Hortensien. Topfpflanzen kann man in ziemlich geräumigen Töpfen im Sommer im Freien, im lustigen Kalt- oder hellen, lustigen Zimmer aufstellen. Kräftige Erde, viel Wasser und namentlich auch Düngung sind dann unentbehrlich. Zwar hält dieser Halbstrauch in Deutschland unter guter Laubdecke, und nachdem man zuvor die Stengel etwa 20 cm hoch über dem Boden abgeschnitten hat, auch im Freien aus, die nächstjährigen, bis 1 m. und

drüber hohen Stengel kommen dann aber meist so spät im Herbst zum Blühen, dass der Frost die Blüten gewöhnlich vorher zerstört. Ratsamer ist also Überwinterung in Töpfen. Vermehrung durch Grundsprosse, auch durch Teilung leicht, ebenso durch Stecklinge und 'Wurzelschnittlinge'. Anzucht aus Samen. Aussaat in Töpfe und warm halten. -- Keimkraft der Samen meist nur 1 Jahr; Keimung in 4--6 Wochen."

Planchon (1853) reviews the tangled history of *Clerodendrum bungei*: "Trois arbustes bien distincts ont reçu le nom de *Clerodendron foetidum*, D'abord, l'espèce primitive à laquelle ce nom doit rester, et dont, nous transcrivons en note la diagnose, comme objet de comparaison. C'est une plante du Népal, à feuilles elliptiques, à calice plus long que le tube de la corolle: elle n'existe pas, que nous sachions, dans nos jardins. La seconde espèce, signalée dans la Revue Horticole, en 1851, d'après des exemplaires que l'on cultivé à Paris depuis une douzaine d'années, nous paraît presque identique avec une prétendue forme à fleurs simples du *Clerodendron fragrans*, forme déjà publiée dans le Botanical Register, en Août 1838, mais sans indication d'origine [C'est évidemment cette plante du Botanical Register que M. Schauer, dans le Prodromus de De Candolle (Tom. XI, p. 666). signale, après Lindley, comme le type à fleurs simples du *Clerodendron fragrans*, et dont il indique l'introduction comme récent à la date de 1847. Voici pourtant sur quelles raisons se fonde notre savant collaborateur, M. Decaisne, pour considérer cette plante comme espèce à part, sous le nom manuscrit de *Clerodendron Lindleyi*. 1^o Le type à fleurs simples du *Clerodendron fragrans* figuré par Ventenat (Malmais. t. 70), et qui fleurit en France, dans le jardin de Cels, vers le commencement du siècle, a des corolles à limbe bien plus large que le *Cl. Lindleyi*. 2^o Le *Clerodendron fragrans* est une plante délicate, qu'on ne cultive jamais en pleine terre à Paris, et dont les racines ne tracent pas l'autre espèce est, au contraire, rustique et ses racines traçantes. Ce que nous disons ici, du reste, se rapporte spécialement à la plante cultivée au Museum de Paris, sous le nom de *Clerodendron foetidum*, plante qui diffère un peu de celle du Botanical Register en ce que ses fleurs sont inodores (et non presque aussiodorantes que celles du *C. fragrans*) et que ses jeunes pousses surtout sont convertes d'un velouté de couleur violette. Y aurait-il encore là deux espèces confondues? Qui étudiera jugera. Reste la troisième espèce que nous appellerons avec Steudel *Clerodendron Bungei*, et dont le portrait dessiné sur le vivant dans l'établissement Van Houtte, n'existe dans aucune publication horticole.

"C'est encore à la patrie du *Camellia*, des Pivoines Moutan, des Chrysanthèmes et des Reines Marguerites, c'est encore aux inestimables travaux de M. Fortune, que nous devons cette précieuse addition à nos arbustes d'ornement. Bunge avait observé celle belle espèce dans les jardins de Pékin; nous ignorons où Fortune en a pris les exemplaires qu'il a récemment introduits; mais, bien que ces derniers n'aient fleuri chez M. Van Houtte qu'en serre froide, il est probable que sous le climat de la Belgique, l'arbuste pourra, comme le *Clerodendron foetidum* du jardin botanique de Paris (*Cl. Lindleyi* Dne. Mss.) végéter en pleine terre, en perdant l'hiver ses pousses aériennes et se conservant par les drageons souterrains.

"Très rapprochée par le feuillage des *Clerodendron fragrans* et

Lindleyi, Dne Mss., notre plante s'en distingue aisément par l'absence presque totale de longues bractées glandulifères entre les fleurs du corymbe et surtout par ses calices à dents ovales et courtes, au lieu d'être longues et subulées. Les feuilles rappellent celle des *Catalpa* et du *Paulownia imperialis*; les corymbes effacent pour la grandeur et l'éclat ceux du *Fuchsia arborescens* (*syringaeiflora*) qu'une certaine ressemblance générale en fait rapprocher au premier abord."

Van Houtte (1853) adds: "M. Standish me témoignait le regret de ce qu'une aussi belle plante dût porter le nom de *foetidum*. Elle est munie, en effet, d'un ample feuillage, surmonté de gros bouquets de fleurs du plus beau carmin, et ce nom fort ingrat paraissait lui porter malheur. Mais les vœux de M. Standish sont accomplis: D. Don, en nommant antérieurement *C. foetidum* une espèce de l'Inde orientale, a par cela même infirmé le nom de celle qui nous occupe, originaire de la Chine septentrionale. Steudel l'a dédiée, suivant l'usage, au botaniste qui venait, lui aussi, déshériter ce beau genre. C'était assez d'un *foetidum*, d'un *calamitosum*, d'un *depauperatum*, d'un *infortunatum*! Cruel ostracisme immérité!

"Depuis que j'ai écrit ces lignes, dans mon catalogue (adit 1855), j'ai acquis la certitude que cette plante est parfaitement rustique. [Le lecteur voudra bien remplacer dans l'inscription les mots serre froide par: pleine terre.] Dès le printemps 1853, nous en avons livré quelques pieds à la pleine terre de ce jardin. Ces plantes ont luxueusement végété, et leurs drageons souterrains se rencontrant maintenant à 75 centimètres de profondeur, il est hors de doute que la plante est acquise à nos jardins. Elle se prête, du reste, à tous les genres de cultures: loin d'exiger la serre chaude, elle se contente d'une orangerie, voire même de l'humble fenêtre de l'artisan; -- on peut la tenir en pot, dès l'automne, en serre chaude, pour l'avoir en fleurs pendant l'hiver; -- où, enfin, la cultiver en pleine terre, pour en jouir pendant l'été dans nos massifs, où elle rappellera une fois de plus à la reconnaissance de l'horticulture le nom de son illustre introducteur."

Diels (1900) cites *Rosthorn 207, 259, & 2365* from central China; in his 1913 work he cites *Forrest 366, 1023, & 3001*. Winkler (1922) cites *Limpricht 1570 & 1629* from Szechuan. Walker (1976) cites *Naito s.n.* and *SIRI 5833* from Okinawa. Bravo Hollis & Ramirez (1951) cite their no. 370 from Mexico.

The *Trin. Bot. Gard. Herb. 1360* collection cited by me as *C. bungei* in 1939 is anomalous in having entire-margined leaf-blades. It somewhat resembles *C. colebrokianum* Walp. in this and other respects, but the presence of glandulose foliaceous bracts in the inflorescence, glandulose acuminate calyx-teeth, etc., seem to point more directly to *C. bungei*. The calyx-teeth are not nearly long enough, nor the bracts dense enough, for *C. lindleyi* Decaisne. Possibly it may represent a hybrid, but for the time being I am placing it in *C. colebrokianum*; *Trin. Bot. Gard. Herb. s.n.*, on the other hand, is quite ordinary and normal *C. bungei*, with typical serrate leaf-blade margins.

Numerous errors, in addition to the above-mentioned ones, occur in the literature of *C. bungei*. Some authors refer to the species as a "tree" or to the flowers as "drooping" and "ill-smelling" -- statements which seem to be incorrect. Darlington & Wylie (1956) refer to the

species as native both to China and tropical America -- actually it is only introduced in the New World. Pitschman and his associates (1965) describe the leaves as entire or indistinctly serrate beyond the middle and the inflorescence as "seitenständig" -- all incorrect statements.

Lindley (1838) considered that taxon to be the single-flowered form of "*Clerodendron fragrans*", which it obviously is not, and his beautiful colored illustration is thus mis-labelled. Similarly, the illustration in Dean's work (1968) inscribed as *Clerodendron foetidum* actually represents *Clerodendron philippinum* f. *multiplax* (Sweet) Mold. The *Clerodendron foetidum* ♂ *integrifolium* of Hasskarl is *C. colebrokianum* Walp.

The Index Kewensis reduces *Volkameria buchanani* Roxb. to *Clerodendron foetidum*, but it is actually the name-bringing synonym of *Clerodendron buchanani* (Roxb.) Walp.; *Volkameria foetida* Buch.-Ham. is also sometimes regarded as synonymous with *Clerodendron bungei*, but actually is a synonym of *Caryopteris foetida* (D. Don) Thellung.

The Baillon (1891) reference in the bibliography of *Clerodendron bungei* is often cited as "1892", the titlepage date; the Angely (1971) work is sometimes mis-cited as "1970", again the titlepage date. The Bunge (1832) reference is sometimes cited as "1831" for some reason as yet unknown to me.

Material of *C. bungei* has been abundantly misidentified and distributed in herbaria as *C. fragrans* Vent., *C. intermedium* Cham., *C. pleiosciadium* Gürke, *C. trichotomum* Thunb., *C. urticifolium* Willd., and even as *Acanthaceae*. On the other hand, the Ferris 12092, distributed as *C. bungei*, actually is *C. canescens* Wall. while Ching 1994, En 2021, Fong 19, Maxwell 184, and Pittier 13538 are *C. lindleyi* Decaisne, Blum & Kimmel 2281, Ebinger 40, and Tyson 4207 are *C. paniculatum* L., Herb. Univ. Nanking 656 is *C. trichotomum* Thunb., Schoch 150 is the type collection of *C. yunnanense* Hu, Collector undetermined s.n. [20th March 1803] is *Caryopteris foetida* (D. Don) Thellung, and Smith 1173 is not verbenaceous.

Citations: SOUTH CAROLINA: Greenville Co.: Mrs. Taylor s.n. [Greenville, Nov. 18, 1931] (H--5425). GEORGIA: St. Simons Island [Glynn Co.]: Hardin & Duncan 13803 (Hi--57562, It, Mi, W--21755446, We); Thorne, Ford, & Goodwin 2229 (It). FLORIDA: Alachua Co.: Hueber s.n. [near Gainesville, 6.14.'28] (N); G. F. Weber s.n. [Gainesville, June 14, 1928] (N, N), s.n. [Gainesville, 1928] (F1--20952, F1--20953). Dade Co.: Ledin s.n. [Miami, Oct. 14, 1950] (Ft, Ws). Duval Co.: Curtiss s.n. [Jacksonville] (N). ALABAMA: Mobile Co.: E. W. Graves 949 (E--975615, W--98447!). MISSISSIPPI: Adams Co.: Compton 6 (A); F. Cook s.n. [Natchez, June 26, 1925] (W--1325924). Claiborne Co.: Guthrie 284 (N). LOUISIANA: East Baton Rouge Par.: T. Brown s.n. [May 6, 1975] (Lv). Iberia Par.: Thomas & McCoy 84459 (Ld). Orleans Par.: Ewan 17680 (Ba, Tl); Penfound s.n. [Nov. 20, 1936] (Tl). Ouachita Par.: C. Smith 1327 (Ne--1825). Pointe Coupee Par.: M. Chaney 200 (Lv). Rapides Par.: Thomas & Pias 61836 & 3999 (Ne--150053). Tangipahoa Par.: H. R. Wilson 236 (Lv). Terrebonne Par.: Wurzlów s.n. [July 8, 1914] (W--694319, W--694320), s.n. [July 15, 1914] (Lv, N). TEXAS: Harris Co.: Thurow 13 (W--1244747). MEXICO: Chiapas: Breedlove 6055 (Ac), 6837 (Ac), 10440 (Ld, Mi). Distrito Federal: Paray 550 (Ip).

Hidalgo: Anderson & Anderson 4668 (Mi, N); Chute M. 208 (Mi); O. M. Clark 7001 (N); Frye & Frye 2643 (Du--285407, En, Hp, N, Or--43426, Pl--110832, Rs--25585, Se--65852, W--1791027); Gimete L. 576 (Mi, N, Tu--186517); Hitchcock & Stanford 2643 (Po--260128), 7290 (Du--361324, Pl--130338, Po--266816, Se--59860, W--1806864); Kenoyer 432 (F--915113); H. E. Moore 2998 (N); Sharp 441781 (N). México: Hinton 3879 (K). Morelos: J. M. Hill 45 (Au--169067). Nuevo León: Abbón 42 [Ar-sène 6226] (A, E--845036, Ld, N, P, Ur, W--1002521), s.n. [1911] (B). Puebla: Davila s.n. [28-VII-1963] (Ip); Fagoaga s.n. [Necaxa] (Au); M. Martínez s.n. [Nov. 1943] (N); J. Rzedowski 20023 (Au--249491, Ip, Ip, Mi, Mi). San Luis Potosí: M. T. Edwards 449 (F--918331); Rowell, Webster, & Barkley 17M349 (Au--142506, Me--167870). Veracruz: Dodds 75 (Ln--19927, Mi, N); G. L. Fisher 35509 (E--1097165, F--782579, I, N); García Saucedo 65 (Ld, Mi, Tu--181549, Ws); F. W. Johnson s.n. [Cordoba, 9-26-06] (N); M. Martínez s.n. [Banderilla, Sept. 1942] (Du--316228); Matuda 947 (Mh, Mi, Mi); Smyth 159 (W--1209012); Ventura A. 2377 (Au--303157, Mi, N). CUBA: Havana: C. F. Baker s.n. [Sept. 1, '07] (Po--64689). PUERTO RICO: Barrett s.n. [June 1925] (N). COLOMBIA: Cundinamarca: Antonio s.n. [Apolinar-Maria 96] (F--1007419). BRAZIL: Minas Gerais: F. C. Hoehne s.n. [Herb. Inst. Biol. 20236] (N, Sp). Rio de Janeiro: Melo Barreto 4387 (Ja--32257). São Paulo: Decker & [Herb. Inst. Biol. 33189] (Sp); C. Duarte 240 [Herb. Inst. Biol. 15155] (N, Sp); Hatschbach 2805 (Sm, W--2059470); Heiner s.n. (S). ARGENTINA: Catamarca: Venturi 7209 (Gg--160638). Tucumán: Schreiter 972 [Herb. Osten 15070] (Ug); Venturi 14 (A, N, W--1591208). SWITZERLAND: Usteri 17405 (Mu). INDIA: Sikkim: G. King s.n. [1879] (X). CHINA: Anhwei: Herb. Univ. Nanking 657 (Ca--230443); E. D. Merrill 11260 (Ca--992160, N); A. N. Steward 1239 [Herb. Univ. Nanking 5479] (Ca--248796), 2305 (Ph). Chekiang: Barchet 565 (W--596128); Chiao 885 [Herb. Univ. Nanking 14185] (Ca--325115, Go, W--1426667); Faber 353/87 (K); Hu 134 (Ca--232280); Keng 594 (Ca--361627). Honan: Skatschkow s.n. [Pekin] (Br). Hunan: Dahlström 287 (S); Fan & Li 142 (Bz--18925), 560 (Bz--18924). Hupeh: H. C. Cheo 18222 (Gg--234259, N); Chow 833 (N); W. Y. Chun 3888 (It); Chun & Chien 5051 [Herb. Univ. Nanking 8033] (Ca--261517); A. Henry 189 (W--800030); E. H. Wilson 2224 (Gg--32018, W--777406). Kiangsi: L. H. Bailey s.n. [July 9, 1917] (Ba, Ba); Tsiang 10042 (N). Kiangsu: Chiao 12969 (Bz--19270). Kwangsi: Steward & Cheo 606 (S); W. T. Tsang 27891 (Ca--1286200, W--1757310). Kwangtung: Mc Clure 2649 [Herb. Canton Chr. Coll. 9207] (Oa); Tsui 543 (N, W--1754721), 810 (N, W--1754875). Kweichow: Steward, Chiao, & Cheo 145 (N); Tsiang 5442 (N, S, W--1554962). Szechuan: T. Y. Cheo 13 (Ca--10398); Fang 5979 (Du--333837), 9278 (Du--333625); Farges s.n. (W--2497100); Limpricht 1570 (N--photo), 1629 (N, N--photo). Yunnan: W. C. Cheng 1991 (W--1671702); Forrest 8403 (S); A. Henry 10299 (N); J. F. Rock 11550 (W--1511097). Province undetermined: Faber 42 [Yangtze-Kiang] (K); Hers 2454 (Br). CHINESE COASTAL ISLANDS: Hainan: W. Y. Chun 6580 (Ca--261517). VIETNAM: Pételot 1381 (Ca--234426), 1397 (Ca--234350). RYU-KYU ISLANDS ARCHIPELAGO: Okinawa: Naito s.n. [3/X/1945] (Ks); Walker, Tawada, & Amano 5833 (N). CULTIVATED: Alabama: Koepfer, Justics, & Isely s.n. [Montgomery, Oct. 3, 1943] (Dp--38402). Arizona: M. E. Caldwell J.5 (Tu--172580). Austria: Beck s.n. [Hort. Eisgrub.

1895] (V); *Herb. Hort. Bot. Vindob. s.n.* (V, V, Vu); *Herb. Von Bergler s.n.* (V). Belgium: *Bowden 6722-39* (Ba); *Herb. Hort. Brux. s.n.* [H. B. Lov. 1857] (Br), *s.n.* [14 Sept. 1889] (Br); *Herb. Martius s.n.* [H. B.] (Br); *Herb. Thenensis ser. II.909* (Br, Br); *Lange s.n.* [Sept. 9, 1896] (Cp); *Martens s.n.* [H. B. Francos 1857] (Br). Brazil: *Glaziou 17163* (B, Br, Cp, P); *Luederwaldt s.n.* [Herb. Mus. Paulista 2139; Herb. Inst. Biol. 15736] (N, Sp); *Mello Barreto 4387* (F--909821); *D. I. Stehle 994* (N, Sp). California: *Bracelin 1592* (Ba, Gg--339903, Go); *Bradbury 712* (Ba); *Epling s.n.* (E--946571); *E. Goodman s.n.* [San Francisco, Aug. 1920] (Gg--32017); *Herb. Univ. Calif. Los Angeles s.n.* [September 7, 1943] (La); *K. D. Jones 1757* (N); *Lenington s.n.* [Summer 1930] (It); *E. C. Marquand s.n.* [July 30, 1935] (N); *McKee s.n.* [Oct. 21, 1916] (Ca--197696); *R. Moran s.n.* [March 1949] (Ba); *Walther s.n.* [Santa Barbara, Sep. 1919] (Gg--32041), *s.n.* [Piedmont, Oct. 18, 1922] (Gg--32016), *s.n.* [Golden Gate Park, Aug. 1926] (Gg--142672), *s.n.* [Golden Gate Park, July 1931] (Gg--189231), *s.n.* [Golden Gate Park] (A); *Wells, Lammeris, & McClintock s.n.* [July 25, 1944] (Gg--361160). China: *Bretschneider 573* (K); *Herb. Canton Chr. Coll. 165* (Oa). Cuba: *Anias s.n.* [Herb. Cub. Estac. 6944] (Es); *C. F. Baker 800* (B, Ca--145517, Po--63797, Po--64693), *s.n.* [Santiago de las Vegas, Sept. 1, '07] (B, Ca--147939), *s.n.* [Santiago de las Vegas, Dec. 12, '08] (B); *Herb. Cub. Estac. 2001* (Es); *Lima 415* (Ha). District of Columbia: "A. L. S." *s.n.* [Bot. Gard., Sept. 25, 1886] (W--147606); *Tidestrom 614* (Ar--19844). Egypt: *Din s.n.* [13/9/1971] (Gz). El Salvador: *Calderón 731* (G, N, W--1151689). England: *Baltje s.n.* [Aug. 23] (K); *Gamble 30089* (K); *Herb. Hort. Ware s.n.* [10/79] (K); *Herb. Roy. Hort. Soc. Gard. Wisley s.n.* [August 1933] (Ba); *Stearn s.n.* [Cambridge Bot. Gard., 16. X.1932] (Ba); *Winchester s.n.* [Sept. 1885] (K). Florida: *Beadel s.n.* [22 August 1945] (Ba); *Gillis 11034* (Ld); *Hume s.n.* [Orlando, July 21, 1930] (Ba, Ba); *Ledin s.n.* [Miami, Oct. 14, 1950] (Ft); *Rhoads s.n.* [Gainesville, 4 June 1937] (Fl--26960); *Spence s.n.* [St. Petersburg, 20 Sept. 1933] (Fl--20956); *Tidestrom 4210* (Ar--19843). France: *Gadeceau s.n.* [1890] (Bm); *Pitard s.n.* [J. Bot. Bordeaux] (N). Georgia: *H. E. Moore s.n.* [23 August 1957] (Ba). Germany: *Bornmüller s.n.* [Teigel, VIII.1882] (B); *Collector undetermined s.n.* [Oktober 1975] (Mu); *Herb. Hort. Bot. Monac. s.n.* [24.X.1890] (Mu--3847), *s.n.* [4.7.1891] (Mu--4044). Hawaiian Islands: *C. Potter s.n.* [Foster Gardens, 8/25/59] (Bi). Louisiana: *Arsène 11018* (W--1032624); *L. H. Bailey s.n.* [July 11, 1918] (Ba); *C. Smith 1591* [Palynolog. Lab. L.S.U. pollen slide 472] (Ne--1312). Maryland: *P. G. Russell s.n.* [S.P.I. 76930] (Ar--3253). Mexico: *Mexia 1914* (Gg--157090); *Rosas R. 429* (Ld). Mississippi: *Van Winkle s.n.* [Winona] (Ur). Missouri: *Herb. Jesup s.n.* (Dt). Netherlands: *Schouten s.n.* [13 Oct. 1924, Middelburg] (Ut). New Zealand: *W. R. Sykes 99/68* [Herb. Bot. Div. D.S.I.R. 181463] (Ld). North Carolina: *J. M. Matthews s.n.* [Sept. 4, 1935] (Hi--59419). Puerto Rico: *R. A. Howard 16658* (Ba); *Prey s.n.* [1901] (G). Russia: *Regel s.n.* [Herb. Bot. Petrop. 57.8] (L). South Africa: *Nat. Herb. Pretoria "A"* (Br). South Carolina: *McMaster s.n.* [Aug. 29, 1933] (Ba). Switzerland: *Herb. Bernet s.n.* [Sept. 1867] (X); *Herb. Hort. Basil. s.n.* [14 Sept. 1864] (M); *Herb. Hort. Genève. s.n.* [Oct. 1884] (Cb); *Herb. Jard. Bot. Genève. s.n.* [25 Sept. 1935] (Cb, Cb, Cb); *Herb. Jard. Valley*

res s.n. [Aôut 1862] (X), *s.n.* (X); *Herb. Serres Rivage Genève s.n.* [7 Sept. '74] (X), *s.n.* [9 Oct. '75] (X); *Reuter s.n.* [Hort. Genève., 14 Aôut 1862] (X). Texas: *Her. Univ. Texas s.n.* (Au). Trinidad: *Trin. Bot. Gard. Herb. s.n.* ["b"] (R). MOUNTED CLIPPINGS & ILLUSTRATIONS: Eisenstaedt, *Life* 30 (8): 66. 1951 (Ld); "N. K. G.", *Gard. Chron.*, ser. 3, 84: 207, fig. 94. 1928 (Ba); Lindl., *Edwards Bot. Reg.* 24: pl. 41. 1838 (Ld, N); H. N. Moldenke color slide 477 (Ld); Planch., *Fl. Serres*, ser. 1, 9: 16/17. 1853 (Ld); Preston, *Gard. Chron.*, ser. 3, 123: 132, fig. 65. 1948 (Ba); E. H. Walker, *Fl. Okin. South. Ryuk.* 890--891. 1976 (W).

CLERODENDRUM BURUANUM Miq., *Ann. Mus. Bot. Lugd.-Bat.* 3: 252--253 [as "*Clerodendron*"]. 1867; H. Hallier, *Meded. Rijks Herb. Leid.* 37: 68 [as "*buruano*"]. 1918.

Synonymy: *Clerodendron buruanum* Miq., *Ann. Mus. Bot. Lugd.-Bat.* 3: 252--253. 1867. *Clerodendron buruanum* f. *typicum* Bakh. in Bakh. & Lam, *Nova Guinea* 14, *Bot.* 1: 171. 1924. *Clerodendron rubuanum* Miq., in herb.

Bibliography: Miq., *Ann. Mus. Bot. Lugd.-Bat.* 3: 252--253. 1867; Jacks. in Hook. f. & Jacks, *Ind. Kew.*, imp. 1, 1: 560. 1893; H. Hallier, *Meded. Rijks Herb. Leid.* 37: 67 & 72. 1918; H. J. Lam, *Verbenac. Malay. Arch.* 274 & 363. 1919; Bakh. in Lam & Bakh., *Bull. Jard. Bot. Buitenz.*, ser. 3, 3: 76, 90--91, 108, & viii. 1921; Bakh. in Bakh. & Lam, *Nova Guinea* 14, *Bot.* 1: 171. 1924; Bakh., *Journ. Arnold Arb.* 10: 73. 1929; Bakh. in White, *Journ. Arnold Arb.* 10: 264. 1929; Fedde & Schust., *Justs Bot. Jahresber.* 53 (1): 1072. 1932; Bakh., *Journ. Arnold Arb.* 16: 71. 1935; Beer & Lam, *Blumea* 2: 224. 1936; Mold., *Known Geogr. Distrib. Verbenac.*, ed. 1, 63, 66--68, & 89. 1942; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 2, 1: 560. 1946; Mold., *Known Geogr. Distrib. Verbenac.*, ed. 2, 142, 148--150, & 180. 1949; Mold., *Résumé* 187, 193, 197, 198, 200, 215, & 448. 1959; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 3, 1: 560. 1960; Mold., *Résumé Suppl.* 6: 9 (1963) and 12: 8. 1965; Mold., *Fifth Summ.* 1: 322, 329, 331, 335, 338--340, 441, 449, & 459 (1971) and 2: 863. 1971; Mold., *Phytol. Mem.* 2: 312, 320, 322, 325, 328--330, 348, & 534. 1980; Mold., *Phytologia* 57: 468 (1985) and 58: 208 & 281. 1985.

A tall shrub or small tree, 3--8 m. tall; branchlets obtusely tetragonal; leaves decussate-opposite; petioles 2.5--10 cm. long, grayish-pubescent; leaf-blades oblong or elliptic, 13--21 cm. long, 5--12.5 cm. wide, dark-green above, pale beneath, apically acuminate, marginally entire, basally truncate or subcordate, sometimes centrally cuneate and somewhat decurrent into the petiole, subglabrous above (except for the pubescent venation), sparsely pubescent beneath, the pubescence denser on the venation, the venation impressed above; secondaries 6--8 pairs; inflorescence paniculate, lax, few-flowered, 5--10 cm. long, grayish-pubescent; peduncles green; bracts foliaceous, green; bracteoles subulate; pedicels shorter or longer than the calyx; calyx green or light-green, sometimes reddish or only basally lilac, about 5 mm. long, externally gray-pubescent except on the tips of the segments, the teeth deltoid, apically acute, about half as long as the tube; corolla white or cream-color, often somewhat lilac in the throat,

1.5--2 cm. long, externally gray-pubescent, the tube apically lilac, the lobes 4--10 mm. long, apically rounded, less pubescent than the tube; stamens exserted; filaments white; anthers grayish-yellow to dark-brown; style white; stigma shortly bifid, lilac; ovary externally glabrous; fruiting-calyx pink or rose-color; fruit dull greenish-black.

This species is based on *Teijsmann H.B.1874* from Kageli and *H.B. 5250* from Oki, Buru island, in the Molucca Islands. Collectors have encountered the plant at the foot of hills and in rainforests (where Beer & Lam report it "common"), at 60--1450 m. altitude, in flower in April, May, July, and September, and in fruit in September.

Vernacular names reported for the species are "loeboe aloeng", "pangel pangel riembo", "pangi pangi riembo", and "pangil poetib".

Bakhuizen (1921) describes his var. *typicum* as "Folia sparse pubescentia vel nervis exceptis subglabra; corollae tubae elongatus, calycem duplo-triploque superans, 1.2--2 cm. longus" and bases it on *Lam 669, 1183, and 1218* from West Irian. He includes in the synonymy of what he regards as *C. buruanum* the following taxa: *C. lindavianum* Lauterb., *C. versteegi* Pulle, *C. vanoverberghii* Merr., *C. catalpifolium* H. Hallier, *C. brunfelsiiflorum* H. Hallier, and *C. albiflos* H. J. Lam, citing *Teijsmann 1874* from Buru, *Teijsmann s.n.* from Amboina, and *Schlechter 14455* and *Versteeg 1396* from New Guinea. I regard the Lauterbach and Pulle taxa as *C. buruanum* f. *lindavianum* (Lauterb.) Bakh., the Merrill and Lam taxa as valid species, and *C. brunfelsiiflorum* also as valid with *C. catalpifolium* as a synonym.

Lam (1919) cites for *C. buruanum* only *H. Bog. 5250* from Buru and *1160* from Sumatra. He comments "cf. *C. condensatum*", but fails to mention anything relevant in his discussion of the latter taxon. Beer & Lam (1936) cite nos. *3970* and *5448*, giving the species' overall distribution as the Philippines, Moluccas, and New Guinea.

It should be noted that, according to its accompanying label, the *Herb. Hort. Bot. Bogor. XI.B.XIX.120*, cultivated in the Buitenzorg garden, originated in Borneo.

Material of *C. buruanum* has been misidentified and distributed in some herbaria as *C. infortunatum* L. On the other hand, the *Carr 15156*, distributed as *C. buruanum*, actually is *C. brachyanthum* Schau.

Citations: GREATER SUNDA ISLANDS: Borneo: *Endert 1463* (Bz--72719), *2618* (Bz--72725). Sumatra: *Buwalda 6867* (Bz--72580); *Teijsmann H.B. 1160* (Ut--53399). LESSER SUNDA ISLANDS: Flores: *Voogd 1791* (Bz--19702, N). MOLUCCA ISLANDS: Amboina: *Pijl 715* (Bz--19703, Bz--19704); *Teijsmann s.n.* [Hila] (Bz--18926, Bz--18927, Bz--18928). Buru: *Binendyk s.n.* (Bz--18932); *Teijsmann H.B.1874* (Bz--18929--cotype, Bz--18930--cotype, Bz--18931--cotype, Ld--photo of cotype, N--photo of cotype, Ut--11568--cotype), *H.B.5250* (Ut--11567--cotype). NEW GUINEA: West Irian: *Aet 85* (Bz--72583); *Docters van Leeuwen 9015* (Bz--72665), *11301* (Bz--72657, Bz--72658); *Herb. Hort. Bogor. 18955*(Bz); *Kanehira & Hatusima 12326* (Bz--18934); *Lam 669* (Bz--18937), *1183* (Bz--18954, N), *1218* (Bz--18935, Bz--18936, N). NEW GUINEAN ISLANDS: Japen: *Aet & Idjan 532* [Van Dijk 532] (Bz--72977, Bz--72978). CULTIVATED: Java: *Herb. Hort. Bot. Bogor. VI.B.XIX.120* (Bz--25519, Bz--25812, Bz--25813, Bz, Bz, N), *VI.B.XIX.121* (Bz--25814, Bz--25815, N), *XII.B.III.38* (Bz--19700, Bz--19701, N).

CLERODENDRUM BURUANUM f. *LINDAVIANUM* (Lauterb.) Bakh. in Bakh. & Lam, Nova Guinea 14, Bot. 1: 171 [as "*Clerodendron buruanum* f. *lindavianum*"]. 1924; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 67, 68, & 89. 1942.

Synonymy: *Clerodendron lindavianum* Lauterb. in K. Schum. & Lauterb., Nachtr. Fl. Deutsch. Schutzgeb. Südsee 372--373. 1905. *Clerodendron versteegi* Pulle in Lorentz, Nova Guinea 8 (2): 403. 1910. *Clerodendrum lindavianum* Lauterb. ex H. Hallier, Meded. Rijks Herb. Leid. 37: 68 [as "*lindaviano*"]. 1918. *Clerodendrum versteegi* Pulle apud H. Hallier, Meded. Rijks Herb. Leid. 37: 67. 1918. *Clerodendron buruanum* f. *lindavianum* (Laut.) Bakh. in Bakh. & Lam, Nova Guinea 14, Bot. 1: 171. 1924. *Clerodendron lindavianum* Laut. apud Bakh. in Bakh. & Lam, Nova Guinea 14, Bot. 1: 171 in syn. 1924. *Clerodendron versteegii* Pulle apud Bakh. in Bakh. & Lam, Nova Guinea 14, Bot. 1: 171 in syn. 1924. *Clerodendron buruanum* var. *versteegii* (Pulle) Bakh., in herb.

Bibliography: Lauterb. in K. Schum. & Lauterb., Nachtr. Fl. Deutsch. Schutzgeb. Südsee 372--373. 1905; Prain, Ind. Kew. Suppl. 3, imp. 1, 44. 1908; Pulle in Lorentz, Nova Guinea 8: 403 (1910) and 8: 687. 1912; Prain, Ind. Kew. Suppl. 4, imp. 1, 50. 1913; Wernh. in Ridl., Trans. Linn. Soc. Lond., ser. 2 Bot. 9: 137. 1916; H. Hallier, Meded. Rijks Herb. Leid. 37: 67, 68, & 72. 1918; H. J. Lam, Verbenac. Malay. Arch. 288, 292, & 364. 1919; Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 90, 109, & ix. 1921; H. J. Lam in Lauterb., Engl. Bot. Jahrb. 59: 96--97. 1924; Bakh. in Bakh. & Lam, Nova Guinea 14, Bot. 1: 171. 1924; Bakh., Journ. Arnold Arb. 10: 73. 1929; Bakh. in White, Journ. Arnold Arb. 10: 264. 1929; Fedde & Schust., Justs Bot. Jahresber. 53 (1): 1072 (1932) and 60 (2): 572. 1941; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 67, 68, & 89 (1942) and ed. 2, 149, 150, & 180. 1949; Prain, Ind. Kew. Suppl. 3, imp. 2, 44 (1958) and 4, imp. 2, 50. 1958; Mold., Résumé 192, 194, 200, 204, 261, 266, 271, & 448. 1959; Mold., Résumé Suppl. 12: 8. 1965; Mold., Fifth Summ. 1: 322, 335, 339, 340, 441, & 459 (1971) and 2: 863. 1971; Mold., Phytol. Mem. 2: 312, 325, 329, 330, & 534. 1980; Mold., Phytologia 57: 468 & 473. 1985.

A small, erect, often compact tree or treelet, to 15 m. tall, shrub, 1--5 m. tall, or even herbaceous and 1 m. tall [the mountain form at 2070 m. altitude]; trunk to 12.5 cm. in diameter and 20 cm. girth, the bole often to 2 m. long; branches slender, terete, often wide-spreading, fulvous-tomentose; branchlets terete; twigs green, pilose with pale-brown hairs; bark thin, smooth and slightly flaky, green or gray-green to pale-gray or gray, sometimes pale-brown mottled with light-gray; inner bark white, 2.5 mm. thick; wood white or straw-color, odorless, without exudate; lenticels mostly brown; leaves decussate-opposite, anisophyllous; petioles 4--11.5 cm. long, appressed tawny- or fulvous-tomentose; leaf-blades membranous or thin-chartaceous, ovate or subcordate-ovate, 13--22 cm. long, 7--16.5 cm. wide (at the lower quarter), mostly dark-green and shiny above and pale beneath (in drying dark brown-green above and paler beneath), apically acute or short-acuminate (the acumen acute or obtuse), marginally entire, basally obtuse or rounded to subcordate, softly and rather densely appressed pilose-pubescent on both surfaces but especially above and on the venation beneath with pale-brown hairs, glandulose beneath; venation yellowish-green and prominent beneath, impressed above; secondaries 7--9 per side,

strong, obliquely ascending; inflorescence terminal, paniculate-subcorymbose, pyramidal, compact, 10--21 cm. long, 7--16 cm. wide; peduncles green, 3--7.5 cm. long, thinly silvery-pilose; bracts foliaceous; bracteoles linear-lanceolate, about 5 mm. long; pedicels 3--5 mm. long; flower-buds green or light-green, pilosulous; cymes di- or trichotomous; flowers pedicellate, fragrant or odorless [depending on time of day?]; calyx infundibular, 5--7 mm. long, green or greenish-white to pink, violet, lilac, or red, externally with white or pale-brown pilose pubescence and often also with peltate scales, internally glabrous, the tube to 7 mm. long, sometimes brown, the 5 teeth or lobes triangular, 2--3 mm. long, apically white and acuminate; corolla hypocrateriform, white, sometimes pink or lilac, externally glabrous, the throat usually pink, the tube mostly very short, only 6--10 mm. long, scarcely surpassing the calyx, mostly pink, glabrous or nearly so, glandulose, the lobes oblong, 4--7 mm. long, apically rounded, mostly white, often wrinkled, pubescent and glandulose along the mid-vein; stamens 4, exserted 1.5--2 cm. beyond the corolla-mouth, inserted in its tube; filaments about 2 cm. long, white; anthers dorsifixed, about 1.5 mm. long, white or light-yellow to dark-brown or green, subcaudate; style white, long-exserted, about 2 cm. long, often somewhat shorter than the stamens; stigmas lilac, about 2 mm. long, bifid, the lobes slender; ovary obconic, about 1.5 mm. long, externally glabrous; fruiting-calyx accrescent, pink or light-pink to pink-purplish, reddish, red-violet, or blood-red, 5-lobed, sometimes greenish outside and reddish inside, the lobes eventually spreading or reflexed; fruit drupaceous, globose, at first green or dark-green, 6 mm. long and 5 mm. wide, turning purple-green or blue, eventually dark-purple or black, splitting into 4 nutlets.

This form is based on *Schlechter 14455* from 1000 m. altitude in the Torricelli Mountains in the Territory on New Guinea, Papua New Guinea, collected in April, 1902. It is a member of the Subsection *Paniculata* of Section *Microcalyx*. It differs from the typical form of *C. buruanum* chiefly in its leaf-blades being conspicuously soft-pubescent on both surfaces, especially above, and the corolla-tube only scarcely exceeding the calyx in length. Lauterbach (1905) notes that "Die Art ist mit *C. ingratum* Laut. et K. Sch. verwandt, jedoch durch die starke Behaarung, Kelch- und Blütenform abweichend."

Frodin avers that the "lvs. [are] grayish-green above, perianth persistent, fruit dark-gray", but his collection must have been unusual to possess these characters.

Pulle's *C. versteegi* is based on *Versteeg 1396* from West Irian.

Clerodendrum buruanum f. *Lindawianum* has been encountered by collectors in and at the borders of rainforests, in the sandy soil of primary and secondary forests on ridge crests, along open trailsides, in jungles among bamboo, grasses, and ferns, in mountain forests and rainforest regrowth, in old garden areas, lowland *Dipterocarpus* forests, and rather shady and damp *Nothofagus*-dominated forests, on steep banks and limestone hillsides, in logging areas of woodland, and in riverbeds and scree, from sealevel to 2070 m. altitude, in flower from December to February and April to October, and in fruit from March to May, July to September, December, and January -- apparently it blooms and fruits throughout the year.

The corollas are mostly described as "white" (as on Aet 339, Brass 2919 & 3403, Clemens & Clemens 596, Darbyshire 224, Floyd 6654, Gjellerup 95, Kajewski 2341 & 2502, Kanehira & Hatusima 11437, K ie & Olsen 1388, Lam 503, Ledermann 8219 & 10457a, Mamit s.n., Nyman 831, Peekel 160, Sawyer 218, Stevens & Lelean LAE.58312, and Womersley 3851), but as "snow-white" on Kajewski 1978, "white with pink throat" on Lam 401 & 1401, "pink" on Schlechter 14455, "lilac" on Bloembergen 4022, and "tube pink or rose" on Schlechter 14455.

The plant was found growing "on a small coral island 2 km. off shore" by K ie & Olsen. Womersley describes it as "usually in secondary bush" in New Guinea; Brass found it "common in rainforest regrowth" in Papua; and Kajewski reports it common in rainforests on Bougainville.

It is worth noting that the calyx is noticeably shorter than usual on Brass 2919 and Kajewski 1978, 2341, & 2502.

Bakhuizen (1929) comments that "This variety is only known from New Guinea up to the present and also from the Dutch division of it: it differs from the type, which chiefly occurs in the Moluccas, in having the leaves softly hairy at the upper side and the corolla tube very short, scarcely exceeding the calyx. The leaves, however, are very variable in size, now rather large, thin and with a long petiole, now smaller, chartaceous and with a rather short petiole. The species is also closely related to *Clerodendrum infortunatum* L."

Vernacular names reported for *C. buruanum* f. *lindavianum* are "a melmalu palpalana", "ambus-gor-le-le", "anbus-gor-le-le", "a melmalu palpalana", "e-ya-papor", "fuho", "jamu-jamu", "kaiye", "koru-kopu", "namovar", "nengkello", and "pepargil".

Wernham (1916) regarded the form as "endemic in New Guinea", citing Kloss s.n. from West Irian; Hallier (1918) cites Versteeg 1396 and Zippelius 167b as *C. versteegi* and notes: "Deutlich anisophyll! Von einer sehr nahe verwandten Art [referring to *C. curranii* Elmer?] liegt nur ein mangelhaftes, zu einer Beschreibung nicht ausreichendes Exemplar vor (Molukken? Zippelius 167b, mit blutrothen Fruchtkelchen)."

Lam (1919) cites from the Territory of New Guinea: Ledermann 6615, 8219, 10457a, & 11889, Nyman 831, and Schlechter 14455; from West Irian: R mer 61 & 222; and from New Ireland: Peekel 160. In his 1924 work he cites the same collections.

Bakhuizen (1924, 1929) cites Brass 924 & 1412 as well as Lam 401, 503, & 1401 and Versteeg 1396, giving the overall distribution, as regarded by him, as the Moluccas, Philippines, and New Guinea. Fedde & Schuster (1932) cite Versteeg 503, 1396, & 1401 from West Irian, but this is an error in transcription -- the first and third numbers apply to Lam collections.

Kajewski tells us that the leaves of this plant are placed in water with bamboo, allowed to rot, and then rubbed on children's bodies to treat skin diseases; also that bark is stripped off and the "sappy part" is applied by natives to places on the body that are sore; the leaves boiled in water are applied to sore legs.

Stevens & Lelean refer to the fruits as "berries", but they are drupes.

The so-called *C. lindavianum* var. *glabrior* Gibbs is now known as *C. albiflos* var. *glabrior* (Gibbs) H. J. Lam.

Material of *Clerodendrum buruanum* f. *lindawianum* has been misidentified and distributed in some herbaria as *C. adenophysum* Wall., *C. confusum* H. Hallier, *C. infortunatum* L., *C. rubuanum* Miq., and *C. villosum* Blume.

Citations: GREATER SUNDA ISLANDS: Celebes: *Boembergen* 4022 (Bz--20957); *Kjellberg* 1544 (Bz--18941, S). Sarawak: *Ismawi & Kudi* s.n. [Herb. Sarawak For. Dept. S.32078] (Ld); *Mamit* s.n. [Herb. Sarawak For. Dept. S.33408] (Kh, Tu); *Native collector* 526 (Bz--19693), 1828 (Bz--19694). NEW GUINEA: Papua: *Brass* 924 (Bz--18945), 1412 (Bz--18943), 3970 (Bz--20186); *Chalmers* s.n. [1885] (Mb); *Forbes* s.n. [1887] (Mb); *MacGregor* s.n. [Mt. Musgrove, 25/ 6/ 89] (Mb), s.n. [Port Moresby 1889] (Mb). Territory of New Guinea: *Clemens & Clemens* 596 (B), 5198 (B, N); *Darbyshire* 224 (Ba); *Darbyshire & Hoogland* 8107 (Ba); *Schlechter* 14455 (Br--isotype, Bz--18942--isotype, Ld--photo of isotype, N--isotype, N--photo of isotype); *Womersley* 3851 (Ng--6483). West Irian: *Aet* 6 (Bz--72582), 119a (Bz--72581), 339 (Bz--72951, Ng--16931); *Feuilletau de Bruyn* 381 (Bz--18779); *Gjellerup* 95 (Bz--18952); *Kanehira & Hatusima* 11437 (Bz--18933); *Lam* 401 (Bz--18947), 503 (Bz--18944, Bz--18946), 1061 (Bz--18938, Bz--18939, Bz--18940, Ut--63841), 1401 (Bz--18948, Bz--18949); *Meyer Drees* 520 [Boomproefst. bb.25730] (Bz--20956); *Römer* 222 (Bz--18953, Bz--25548, N); *Sawyer* 218 (Ca--1288320); *Versteeg* 1396 (Bz--18950, Bz--19851, Bz--25950, Ld--photo, N--photo, Ut--13808). BISMARCK ARCHIPELAGO: Dyaul: *Köie* 1847 (Cp). Mussau: *Köie & Olsen* 1200 (Cp), 1340 (Ac, Cp), 1388 (Cp, Ld), 1404 (Cp), 1623 (Cp), 1697 (Ac, Cp). New Britain: *Floyd* 6654 (Ng--16842, Ng, W--2603233, W--2603249); *Frodin* NGF.26684 (N); *Stevens & Lelean* LAE.58312 (Mu, W--2956533). SOLOMON ISLANDS: Bougainville: *Kajewski* 1925 (Bi, Bz--19088, Bz--19089, Bz--19099), 1978 (Bi, Bz--19095, Bz--19097). Guadalcanal: *Kajewski* 2502 (Bi, Bz--19086, Bz--19091, N). Malaita: *Kajewski* 2341 (Bi, Bz--19090, Bz--19092). San Cristoval: *Brass* 2919 (Bi, Bz--19093, Bz--19096). Ysabel: *Brass* 3403 (Bi, Bz--19094, Bz--19098).

CLERODENDRUM BUETTNERI Gürke, Engl. Bot. Jahrb. 18: 174--175 [as "*Clerodendron*"]. 1893; B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. *Clerod.*] 14 & 92. 1936.

Synonymy: *Clerodendron buettneri* Gürke, Engl. Bot. Jahrb. 18: 174. 1893. *Clerodendron buettneri* Gürke apud J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 293 & 302. 1900. *Clerodendron buettneri* Gürke apud B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. *Clerod.*] 61. 1936.

Bibliography: Gürke, Engl. Bot. Jahrb. 18: 174--175. 1893; J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 293 & 302. 1900; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 101. 1901; DeWild., Bull. Jard. Bot. Brux. 7: 165. 1920; DeWild., Pl. Bequaert. 2: 258. 1922; Good & Exell, Journ. Bot. Brit. 68: Suppl. 2: 141. 1930; B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. *Clerod.*] 10, 14, 35, 61, & 92. 1936; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 101. 1941; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 47, 48, & 89. 1942; Mold., Alph. List Cit. 2: 504. 1948; H. N. & A. L. Mold., Pl. Life 2: 52. 1948; Mold., Alph. List Cit. 3: 963 (1949) and 4: 1153 & 1159. 1949; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 113, 114, & 180. 1949; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 101. 1959; Mold., Résumé 139--141 & 448. 1959;

H. Huber in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 2: 439 & 442. 1963; Mold., Résumé Suppl. 15: 17 & 18. 1967; Mold., Fifth Summ. 1: 221, 223, 225, 226, 228, & 461 (1971) and 2: 863. 1971; Mold., Phytol. Mem. 2: 212, 213, 215, 216, 218, & 534. 1980.

A climbing shrub or small liana; branches, branchlets, and twigs densely brown-hispid with long, wine-red, articulated hairs; leaves decussate-opposite, short-petiolate; petioles 1--2 cm. long, densely long-villous; leaf-blades herbaceous, oblong or elliptic-oblong, 7--10 cm. long, 2.5--4 cm. wide, apically acuminate, marginally entire, basally more or less unequally cordate or subcordate, dull medium-green above, paler beneath, brown-hispid or -villous to subvillous-pubescent principally along the venation beneath; secondaries 4 or 5, arcuate-ascending; inflorescence terminal; peduncles about 1 cm. long, very densely long-villous; cymes corymbiform, few-flowered; pedicels elongate; bracts minute, filiform to subulate-filiform; calyx very pale-green, the tube about 5 mm. long, 5-parted nearly to the base, the lobes ovate-lanceolate, 1--3 mm. long, apically acute, 3-veined, pilose; corolla tubular, white or yellowish-white with a red center, sometimes pale-pink, about 1.6 cm. long, basally pale-green, the tube pilose, slightly surpassing the calyx, the throat rose-tinted; stamens very long-exserted; anthers dark-brown; style very long-exserted, pale-green.

This species is based on *Bluttner* 426 from along the road to Sibange, Munda, in the Gabonese Republic, collected in September, 1884, and deposited in the Berlin herbarium, now probably destroyed.

Collectors have encountered the plant in shady forests, including virgin and secondary forests, and on abandoned native plantations, in flower in January, May, and September, at 650 m. altitude. Gossweiler refers to it as "not frequent".

Gürke (1893), in commenting on his *C. dinklagei*, notes that this taxon "Steht den *C. Bluttneri* sehr nahe, ist aber durch schwächere und kürzere Behaarung unterschieden; auch sind hier die Haare rückwärts gerichtet, bei *C. Bluttneri* absteheend. Die Blätter sind am Grunde abgerundet und nicht herzförmig wie bei *C. Bluttneri*, auch etwas länger zugespitzt. Die Kelchzipfel sind länger, schmaler und mehr zugespitzt als bei jener Art."

DeWildeman (1922) cites for *C. bluttneri* only *Bequaert* 6755; Good & Exell (1930) cite *Gossweiler* 6904, 7681, & 7898 from Portuguese Congo [Longo, Angola], giving the overall distribution of the species as Nigeria, Cameroons, Gabon, and Congo.

Thomas (1936) cites *Bluttner* 526 and *Gossweiler* 7998 from Gabon, *Tessmann* B.13 & 22 from the Republic of Equatorial Guinea, and *Leder-mann* 712, *Mildbraed* 5769, *Staudt* 347, *Tessmann* 868, *Zenker* 687, 1256, & 2702, and *Zenker & Staudt* 418 from the Cameroons.

Huber (1963) cites only *Latilo* FHI.31813 from Southern Nigeria, noting "Also in Cameroons, Rio Muni and Gabon".

DeWildeman (1922) cites Baker's (1900) work to p. "362" instead of to page 302. Gürke's work (1893) is sometimes erroneously cited as "1894", the titlepage date.

Citations: CAMEROONS: *Breteler* 1739 (Mu); *Gocker* 45 (W--1051329); *Staudt* 347 (L, S); *Zenker* 687 (N), 1256 (L, Mu--3708), 2702 (Br, Mu--4004, N), s.n. (Br); *Zenker & Staudt* 418 (Ca--617121, S). ZAIRE: Be-

quaert 6755 (Br); *Cabra 7* (Br); *Germain 5114* (E--2168592); *Lebrun 985* (Br).

CLERODENDRUM CABRAE DeWild., Ann. Mus. Congo, ser. 5, 3: 131 [as "*Clerodendron*"]. 1909; B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. *Clerod.*] 81. 1936.

Synonymy: *Clerodendron cabrae* DeWild., Ann. Mus. Congo, ser. 5, 3: 131. 1909.

Bibliography: DeWild., Ann. Mus. Congo, ser. 5, 3: 131. 1909; Prain, Ind. Kew. Suppl. 4, imp. 1, 50. 1913; B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. *Clerod.*] 16, 25, 44, 81, & 92. 1936; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 48 & 89. 1942; Mold., Alph. List Inv. Names Suppl. 1: 6. 1947; H. N. & A. L. Mold., Pl. Life 2: 52. 1948; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 115 & 180. 1949; Prain, Ind. Kew. Suppl. 4, imp. 2, 50. 1958; Mold., Résumé 141, 148, 261, & 448. 1959; Mold., Fifth Summ. 1: 228, 245, & 441 (1971) and 2: 863. 1971; Mold., Phytol. Mem. 2: 218, 235, & 534. 1980.

A large tree, branched shrub, or much-branched sun-loving liana, short-pubescent on the young parts; branches short-pubescent; bark gray; leaves decussate-opposite, subsessile or short-petiolate; petioles to about 12 mm. long; leaf-blades ovate or ovate-rotund, about 7 cm. long and 4.5 cm. wide, apically subtund or cuneately acute, marginally entire or sparsely dentate and ciliate, basally cuneate or rounded to subcordate, sparsely pilose; cymes axillary, opposite, paniculate, dichotomous, about 5-flowered, the rachis 5--6 cm. long; flowers pedicellate, zygomorphic, odorless; pedicels basally bracteolate, reflexed; calyx campanulate, 5--6 mm. long, strongly zygomorphic, red, sparsely tomentose, the lobes overlapping in opposite pairs, broadly ovate, apically rounded, erect, appressed to the corolla-tube; corolla bicolored, plainly irregular, the tube about 1 cm. long, basally inflated, the lobes about 1.5 cm. long and 8 mm. wide, glabrous, 4 green or light-green and the 5th (lowermost) blue or mauve, or the upper ones gentian-violet (*Seguy 647*) and the ventral surface of the lower ones mauve with the dorsal surface bronze-green like the tube; stamens only slightly exerted from the corolla-mouth; filaments green; anthers yellow; style about 4 cm. long, far surpassing the stamens; ovary green, to 2.5 cm. long; ripe fruit brilliant red-brown or red.

The species is based on *Cabra-Michel 44* from along the river between Tumba Mani and Kwango, Zaire, collected on September 1, 1902, and deposited in the Brussels herbarium. It is a member of the Section *Chaunocymosa* of Subgenus *Cyclonema*. A key to distinguish the taxa in this Section is given by Thomas (1936), on pages 44 to 48.

Collectors have found *Clerodendrum cabrae* growing in forests and along riversides, at 470--1800 m. altitude, in flower in February, July, and December.

Vernacular names reported for this plant are "dillko", "ifonge", "inaolo a mbambake", "inaolo a wangange", "mambake", "mbambake", "mbambake boliki" [=the liana mbambake], "mbambake e boliki", and "mbondó éâ ngonda".

Thomas (1936) cites only the type collection. DeWildeman (1909) comments that "Cette espèce semble devoir se rapprocher surtout du *C. sansibarense* Gürke.....Elle se différencie par ses feuilles opposées

et plutôt courtement pétiolées, parfois même sessiles. La disposition opposée des feuilles différencie le *C. Cabrae* du *C. ternatum* Schinz qui a avec *C. sansibarense* certaines analogies."

Germain 309 is a mixture of *C. cabrae* and *C. germaini* Mold. Material of *C. cabrae* has been misidentified and distributed in some herbaria as *C. sansibarense* Gürke and *C. scheffleri* Gürke.

Citations: ZAIRE: *Achten 561b* (Br, Br), *566b* (Br, Br, N); *Bredo 2718* (Br); *Cabra-Michel 44* (Br--type, Ld--photo of type, N--photo of type); *Claessens 513* (Br); *Descamps s.n.* [Katanga] (Br); *Dewulf 826* (Br, N); *Dubois 135* (Br, Br); *Germain 294* (Br, Br), *309a* (Br, Br, Br, N), *417* (Br); *Gillardin 387* (Br, Br, Br); *Goossens 2437* (Br); *Hulstaert 311* (Br), *1356* (Br), *1439* (Br); *Lebrun 1446* (Br, Br), *2578* (Br, Br), *6259* (Br, Br); *J. Leonard 619* (Br, N); *J. Louis 869* (Br, N, S), *1389* (Br), *7155* (Br, N), *7274* (Br), *8685* (Br, Ca--962231, Vi), *8943* (Br, W--2091037), *9144* (B, Br), *10109* (Br), *10926* (Br), *12513* (Br), *14728* (Br), *15905* (Br); *Quarré 7062* (Br, Br); *Renier 49* (Br, N); *Vanderyst 10746* (Br), *10947* (Br, Br), *11124* (Br), *12290* (Br, N), *12347* (Br, N), *16724* (Br), *24388* (Br, Br, N), *24389* (Br), *24390* (Br, Br), *24391* (Br), *31634* (Br, Br). ZAMBIA: *Burt 6380* (Br).

CLERODENDRUM CAERULEUM N. E. Br., Kew Bull. Misc. Inf. 1895: 115--116 [as "*Clerodendron*"]. 1895; B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 80. 1936.

Synonymy: *Clerodendron caeruleum* N. E. Br., Kew Bull. Misc. Inf. 1895: 115. 1895.

Bibliography: N. E. Br., Kew Bull. Misc. Inf. 1895: 115--116. 1895; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 101. 1901; H. H. W. Pearson in Theselt.-Dyer, Fl. Cap. 5 (1): 218 & 222--223. 1901; B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 44, 80, & 92. 1936; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 101. 1941; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 52 & 89 (1942) and ed. 2, 121 & 180. 1949; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 101. 1959; Mold., Résumé 153 & 448. 1959; Mold., Fifth Summ. 1: 255 (1971) and 2: 863. 1971; Bayer, Flow. Paint. Saunders 264 & [265], pl. 75 [sin.]. 1979; Mold., Phytol. Mem. 2: 244 & 534. 1980.

Illustrations: Bayer, Flow. Paint. Saunders 264 & [265], pl. 75 [sin.] (in color). 1979.

A perennial woody herb or low much-branched shrub, to 1 m. tall; stems dark-reddish; young branches dark-brown, tetragonal, puberulent in 2 opposite lines, later glabrous; bark grayish, glabrous, more or less tuberculate, wrinkled; leaves decussate-opposite, petiolate, not malodorous; petioles 2--12 mm. long, puberulent; leaf-blades membranous, yellow-green, ovate or ovate-lanceolate to almost oblong, sometimes distinctly hastate, 0.8--6 cm. long, 0.4--2.5 cm. wide, apically acute, marginally coarsely and acutely 3- or 4-dentate or -serrate, rarely entire, basally cuneate, sparsely puberulent above and on the venation beneath, marginally ciliate; secondaries 3--5 per side, prominent beneath; inflorescence axillary, cymose; cymes 1--3-flowered, solitary, pedunculate; peduncles slender, 2--3.5 cm. long, 2-bracteate near the summit, puberulent along the posterior line, otherwise glabrous; flowers showy, pedicellate; pedicels 2--4 mm. long; bracts subulate, 2--3 mm. long, completely glabrous or marginally ciliate;

calyx campanulate, 2--5 mm. long, strongly 5-veined, externally glabrous or minutely puberulent, the rim 5-toothed, the teeth distant, narrowly deltoid, apically acutely long-acuminate, equaling the tube, marginally obscurely ciliolate; corolla blue or purple, irregular, the tube curvate, 7 mm. long or about twice as long as the calyx, glabrous except for the villous throat, the limb 1.4--1.6 cm. wide, the 4 upper lobes elliptic, subequal, apically obtuse, the lower lobe cuneate-obovate, apically subtruncate; stamens 1.6 cm. long, incurved, long-exserted; style long-exserted; fruit drupaceous, 4-lobed, 2-seeded, externally glabrous.

This species is based on *Gerrard & Mcken 1252* from the Mooi River valley, at 2000--3000 feet altitude, Natal, South Africa, deposited in the Kew herbarium. Thomas (1936) has designated this collection (which he cites as *Gerrard 1252*) as the type from among the three collections originally cited by Brown -- *Gerrard & Mcken 1252* and *Sutherland s.n.* from Natal and *Mrs. K. Saunders s.n.* from Swaziland.

Brown (1895) notes that the species is "Allied to *C. myricoides*, R. Br., but easily recognized by its much narrower and very acute calyx-teeth".

The corollas are described as "blue" on *Repton 1184* and *Wells 2211*, as well as by Gerrard, and as "purple" on *Galpin 14776*. They are depicted by Saunders (1979) as deep purple-blue. The *Wells 2211* collection exhibits decidedly hastate leaf-blades.

Collectors have encountered this plant on grassy banks, among bushes on steep hillsides, in thorn veld, and "flat on the soil surface among rocks", often cropped short by goats, at altitudes of 660--1000 m., in flower in January, February, and November. Pentz refers to it as "a common shrub in thorn veld". Thomas (1936) cites only the type collection and *Sutherland s.n.*

Material of *Clerodendrum caeruleum* has been misidentified and distributed in some herbaria as *C. lanceolatum* N. E. Br., *C. myricoides* (Hochst.) R. Br., and *C. myricoides* var. *camporum* Gürke.

Citations: SOUTH AFRICA: Natal: *Galpin 14776* (Af); *Pentz 541* (Af, Ld); *Repton 1184* (Af); *Wells 2211* (Mu). Transvaal: *Van der Schijff 2319* (Af).

CLERODENDRUM CAESIUM Gürke, Engl. Bot. Jahrb. 28: 300--301 & 466 [as "*Clerodendron*"]. 1900; B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. *Clerod.*] 81. 1936.

Synonymy: *Clerodendron caesium* Gürke, Engl. Bot. Jahrb. 28: 300 & 466. 1900. *Clerodeddrum caesium* Guerke ex Richards & Morony, Check List Fl. Mbala 236 sphalm. 1969.

Bibliography: J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 520. 1900; Gürke, Engl. Bot. Jahrb. 28: 300--301 & 466. 1900; K. Schum., Justs Bot. Jahresber. 28 (1): 496. 1900; Thiselt.-Dyer, Ind. Kew. Suppl. 2: 43. 1904; B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. *Clerod.*] 44, 81, & 92. 1936; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 49 & 89 (1942) and ed. 2, 116 & 180. 1949; Mold., Résumé 141, 143, 148, & 448. 1959; F. White, For. Fl. North. Rhodes. 365. 1962; Mold., Résumé Suppl. 9: 3. 1964; Richards & Morony, Check List Fl. Mbala 236. 1969; Mold., Fifth Summ. 1: 228, 235, 245, & 441 (1971) and 2: 863. 1971; Mold., Phytol. Mem. 2: 218, 224, 235, 383, & 534. 1980.

A bush or shrub, to 6.5 m. tall; young branches tetragonal, clothed with brown, weak, multicellular hairs especially at the nodes; leaves decussate-opposite, very short-petiolate; petioles about 5 mm. long, finely pilose; leaf-blades membranous or thin-membranous, elliptic or broadly elliptic, 5--12.5 cm. long, 3--5 cm. wide, twice as long as wide at the central point, apically acute or slightly acuminate, marginally weakly serrate (the teeth with short but plainly acuminate tips), basally narrowed into the petiole, glabrous on both surfaces except for the sparingly pilose larger venation with weak brownish hairs; inflorescence terminal, paniculate, very lax, with the cyme-branches thin and slender, pilose on their nodes; bracts of the main axis broadly ovate, apically acuminate, marginally entire, basally narrowed into the very short stalk, thinly herbaceous, glabrous on both surfaces or here and there sparingly pilose on the venation, the lowermost to 3 cm. long and 1.5 cm. wide, becoming smaller upwards, the uppermost only 5 mm. long and 3 mm. wide, those of the lateral axes filiform, 4--5 mm. long, apically acute; pedicels 5 mm. long; calyx broadly campanulate, 5 mm. long, basally narrowed into the pedicel, externally very sparingly pilose, 5-lobed to about the middle, the lobes deltoid, 2.5 mm. long, equaling the tube in length, apically obtusely rounded; corolla blue or pale-blue, zygomorphic, the lower lip dark-blue, the tube at most twice the length of the calyx.

This species is based on *Götze 633* from woods at Muhanga, Uhehe, in the Uchungwe Mountains, at 1800 m. altitude, in "Nördl. Nyassaland [Deutsch Ost-Afrika]" -- actually in Tanganyika, Tanzania, according to Baker (1900), Schumann (1900), and Thomas (1936) -- on February 10, 1899, and deposited in the Berlin herbarium, now lamentably destroyed.

Gürke (1900) comments that "Die Art gehört zur Section *Cyclonema* in die Verwandtschaft von *Cl. myricoides* R. Br. und von *Cl. silvicola* Gürke. Mit letzterer stimmt sie in der Behaarung überein, unterscheidet sich aber durch die blauen Blüten und durch die kürzer gestielten Blätter". He records the vernacular name, "bumbaluma", citing only the type collection. Baker (1900) also cites only the same collection. Thomas (1936) cites *Götze 633*, *Schlieben 3567*, *Troll 5000*, and *Von Brehmer 729* from Tanganyika. Richards & Moroney (1969) cite *Bull 3316* and *M. R. 4105 & 21523* from Mbala, where, they report, the plant is "Abundant along damp water courses in black cotton soil" of *dambo*.

Collectors have found *Clerodendrum caesium* growing along roadsides at the edges of relict forest patches, at 1200--2200 m. altitude, in flower in February. The *Verdick 161* collection, cited below, greatly resembles *C. erectum* DeWild., but exhibits stamens that are far too long for it to be regarded as representing that taxon.

Citations: ZAIRE: *Dewitte 548* (Br), *578* (Br); Herb. RRPP. *Salesiens S. 939* (Br); *Hock s.n.* [1911] (Br, Ld--photo, N--photo); *Quarré 2540* (Br, Br, Br, Br, N), *3413* (Br); *Verdick 161* (Br). ZAMBIA: *Burt 6124* (Br); E. *Milne-Redhead 1047* (Br). TANZANIA: Tanganyika: *Schlieben 3567* (B).

CLERODENDRUM CALAMITOSUM L., Mant. Pl. 1: 90. 1767.

Synonymy: *Volkameria alternifolia* N. L. Burm., Fl. Indica 137, pl. 44. 1767. *Clerodendrum calamitosum* Retz., Nom. Bot. 155. 1772.

Volkameria alternifolia Burm. ex Nernich, Allgem. Polyglott. Lex. 1: 1065. 1791. *Clerodendrum foliis ovalibus, subdentatis, nudis* L. ex Poir. in Lam., Encycl. Méth. Bot. 5: 164 in syn. 1804. *Volkameria (alternifolia), ramis inermibus; foliis alternis, ovatis, dentatis; floribus terminalibus* Burm. apud Poir. in Lam., Encycl. Méth. Bot. 5: 164 in syn. 1804. *Clerodendrum calamitosum* L. ex Steud., Nom. Bot. Phan., ed. 1, 207 sphalm. 1821. *Clerodendron calamitosum* L. apud Spreng. in L., Syst. Veg., ed. 16, 2: 759. 1825. *Clerodendron calamitosum* α *glabriusculum* Hassk., Retzia 58. 1855. *Clerodendron calamitosum* β *molle* Hassk., Retzia 58. 1855. *Volkameria alternifolia* Burm. f. ex Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 1219 in syn. 1895. *Clerodendron calamitosum* L. ex E. D. Merr., Fl. Manila, imp. 1, 403. 1912. *Clerodendron phlomoides* f. *luxurians* Horsf. ex Mold., Prelim. Alph. List Inv. Names 21 in syn. 1940. *Clerodendron calamitosum* var. *glabriusculum* Horsf. ex Mold., Fifth Summ. 1: 441 in syn. 1971. *Verbena clerodendron* Froes ex Mold., Fifth Summ. 2: 663 in syn. 1971. *Clerodendron calamitosum* Farnsworth, Pharmacog. Titles 9: 115 sphalm. 1974. *Clerodendron calamitosum* ϵ *glabriusculum* Horsf. ex Mold., Phytol. Mem. 2: 384 in syn. 1980. *Clerodendron jasminoides* Din ex Mold., Phytol. Mem. 2: 387 in syn. 1980.

Bibliography: L., Mant. Pl., imp. 1, 1: 90. 1767; N. L. Burm., Fl. Indica 137, pl. 44. 1768; Retz., Nom. Bot. 155. 1772; Reichard in L., Syst. Pl. 3: 198. 1780; J. F. Gmel. in L., Syst. Nat., ed. 13, imp. 1, 2: 962. 1789; Nernich, Allgem. Polyglott. Lex. 1: 1065. 1791; J. F. Gmel. in L., Syst. Nat., ed. 13, imp. 2, 2: 962. 1796; P. Mill., Gard. Dict., ed. 9, 1: *Clerodendron* 4. 1797; Raeusch., Nom. Bot., ed. 3, 182. 1797; Willd. in L., Sp. Pl., ed. 4 [5], 3 (2): 386. 1802; Poir. in Lam., Encycl. Méth. Bot. 5: 164--165. 1804; Pers., Sp. Pl. 3: 365. 1819; Steud., Nom. Bot. Phan., ed. 1, 207. 1821; Blume, Cat. Gewass., imp. 1, 82. 1823; Blume, Bijdr. Fl. Ned. Ind. 9: 810. 1825; Spreng. in L., Syst. Veg., ed. 16, 2: 759. 1825; Blume, Bijdr. Fl. Ned. Ind. 14: 810. 1826; W. Hook., Curtis Bot. Mag. 56 [ser. 2, 3]: pl. 2925. 1829; Loud., Hort. Brit., ed. 1, 247 (1830) and ed. 2, 247. 1832; Bojer, Hort. Maurit. 256. 1837; G. Don in Loud., Hort. Brit., ed. 3, 247. 1839; Steud., Nom. Bot. Phan., ed. 2, 382. 1840; D. Dietr., Syn. Pl. 3: 617. 1843; Hassk., Cat. Pl. Hort. Bogor. Cult. Alt. 136. 1844; Voigt, Hort. Suburb. Calc. 473. 1845; Walp., Repert. Bot. Syst. 4: 100 & 109. 1845; Schau. in A. DC., Prodr. 11: 657 & 663. 1847; Wittstein, Etymolog.-bot. Handwörterb., imp. 1, 206. 1852; Hassk., Retzia 58--59. 1855; Buek, Gen. Spec. Syn. Candoll. 3: 105 & 502. 1858; Miq., Fl. Ned. Ind. 2: 870--871. 1858; C. Muell. in Walp., Ann. Bot. Syst. 5: 711. 1860; Miq., Fl. Ind. Bat. Suppl. 1: 242. 1861; Balf. f., Edinb. New Philos. Journ., ser. 2, 15: 232. 1862; Bocq., Adansonia, ser. 1, 2: 159. 1862; W. Hook., Curtis Bot. Mag. 88 [ser. 3, 17]: pl. 5294. 1862; Bocq., Adansonia, ser. 1 [Baill., Rec. Observ. Bot.] 3: 214. 1863; Lem., Illust. Hort. 10: pl. 358. 1863; Houillet, Rev. Hort. 39 [ser. 2, 2]: 420. 1867; Naves & Fern.- Villar in Blanco, Fl. Filip., ed. 3. 4: Nov. App. 160. 1880; C. B. Clarke in Hook. f., Fl. Brit. India 4: 591. 1885; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 560. 1893; Stapf, Trans. Linn. Soc. Lond., ser. 2, 4: 216. 1894; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 1219. 1895. [to be continued]

BOOK REVIEWS

Alma L. Moldenke

"A DICTIONARY OF GENETICS" Third Edition by Robert C. King & William D. Stansfield, vii & 480 pp., 60 b/w fig., 14 tab., 2 photo. & 1 map. Oxford University Press, Oxford, England & New York, N. Y. 1985. \$29.95.

Between the 1972 date of the second edition and this current year the "rapid evolution of scientific knowledge and technical applications has created a burgeoning vocabulary of new terminology... especially those of microbiology, ecology, systematics, evolution... medicine and agriculture". This new edition is properly enriched with the new terms added to the old ones for a total of 5,920. The illustrations are modernized: the list above does not include the hundreds of chemical configurations. At the end of the book there are: Appendix A with Whittaker's 5 kingdom classification, Appendix B with common and scientific names of domesticated species, Appendix C with an historical chronology related to genetics and a pertinent bibliography, and Appendix D with a listing of periodicals for genetics, cytology and molecular biology. A small detail: the morning-glory genus is misspelled. This is a fine dictionary.

"BIRDS - The World of Science" by Maurice Burton, 64 pp. oversized & 120 color photos., Orbis Publishing Ltd., London, England & Facts on File Publications, Inc., New York, N. Y. 10016. 1985. \$9.95.

"WARM-BLOODED ANIMALS - The World of Science" by Maurice Burton, 64 pp. oversized, 120+ color photos., Orbis Publishing Ltd., London, England & Facts on File Publications, Inc., New York, N. Y. 10016. 1985. \$9.95.

For the young, for the casual reader and for the person who likes to mull over excellent bird and mammal photography rendered in excellent color prints and accompanied by modest and interesting text of world-wide range, these constitute fine inexpensive gifts or coffee-table books. The author will be recognized by assorted biological scientists for his research at the British Museum, his valuable "Systematic Dictionary of Mammals", his "Encyclopedia of Animal Life", etc.

"PATTERN AND PROCESS IN A FORESTED ECOSYSTEM - Disturbance, Development and the Steady State Based on the Hubbard Brook Ecosystem Study" by F. Herbert Bormann & Gene E. Likens, xii & 253 pp., 71 b/w fig. including 19 photo. & 2 maps & 27 tab. Springer-Verlag, Heidelberg, Berlin & New York, N. Y. 10010. 1981. \$20.80.

This book is a very well prepared account of a very well planned and executed ecological study, one that serves effectively as a guide for any temperate forested area. This model one is the Hubbard Brook Ecosystem site, a secondary forest in a small watershed in the White Mountains of New Hampshire. "It concentrates on the inter-relationships among biogeochemical processes, animate and inanimate structure of the ecosystem, species behavior within the ecosystem, and how these relationships change through time following a perturbation". The chapters cover such topics as energetics, biomass, hydrology, aggradation followed by a deforestation experiment, subsequent development of vegetation after clear-cutting, recovery of biotic regulation approaching a steady state. The illustrative figures and tables are particularly helpful, with most of them being the author's own work.

"CHLOROPLASTS Results and Problems in Cell Differentiation" edited by J. Reinert -- A Series of Topical Volumes in Developmental Biology, Volume 10, xi & 240 pp., 40 b/w fig. including 37 photo. & 20 tab., Springer-Verlag, Berlin, Heidelberg, & New York, N. Y. 10010. 1980. \$49.00.

This excellent survey of 6 papers by actual chloroplast-research investigators provides "a broad theoretical and experimental basis for the understanding of the development of chloroplasts and the relationship between plant cells and these organelles." These articles deal with chloroplast and other plastid development, divisions and interconversions, plastic continuity and differentiation, RNA and protein synthesis, light and chemical factors in chloroplast differentiation, etc. All is precisely and carefully presented.

"A DICTIONARY OF BIRDS" edited by Bruce Campbell & Elizabeth Lack, xxx & 670 pp., 500+ b/w photo., draw. & diag., T. & A. D. Poyser Ltd., Staffordshire, England & Buteo Books, Vermillion, P. O. Box 480, South Dakota 57069. 1985. \$75.00.

This highly valuable encyclopedic dictionary was prepared by outstanding specialists for the British Ornithological Union. It is indeed a worthy heir in succession to the famous Newton's "A Dictionary of Birds" (1896) and L. Thomson's "A New Dictionary of Birds" (1964). Its more than a million words comprising the text and succinctly used throughout supply all the basic information about all known birds and about pertinent topics such as Lorenz' theory of instinct, polymorphism, roosting, vascular systems, etc. There is thorough cross-referencing. The majority of the bird drawings catch poses of characteristic activities. This book is and will be for years to come par excellence throughout the English-reading world.

"ANNUAL REVIEW OF PHYTOPATHOLOGY" Volume 23, 1985, edited by R. James Cook and associates, x & 535 pp., 20 b/w fig., 12 tab. & 2 photo. Annual Reviews Inc., Palo Alto, California 94306. 1985. \$27.00 in U.S.A., \$30.00 foreign.

A new editor takes over with this issue. One of the first changes noticed is the omission of the prefatory autobiographical account of one of the prominent and long known phytopathologists, a feature that I always enjoyed whether I had known or known of the autobiographer or not. Instead a speech given at the joint meeting of the American and Canadian Phytopathological Societies was a less interesting substitute because many readers of this book already heard the speech or because the content could have been reduced to two pages. Among the 21 really good scientific papers there is a series on fungal, bacterial, nematode and viral pathogens, transposon mutagenesis in host-parasite interactions, monoclonal antibodies in plant disease research, and the threshold theory of crop loss assessment.

"INTRODUCTION TO INSECT PEST MANAGEMENT" Second Edition, edited by Robert L. Metcalf & William H. Luckmann, xiv & 577 pp., 111 b/w fig. including 2 maps & 74 photo., & 66 tab. Wiley-Interscience Publication of John Wiley & Sons, New York, N. Y. 10158. 1982. \$32.50.

"Pest management is the intelligent selection and use of pest-control actions (tactics) that will ensure favorable economic, ecological and sociological consequences." This text explains efficiently and effectively in terms for the undergraduate college students and for the progressive older technicians not exposed to such training the pest management principles and techniques. In order to advance the values of society there is also need for the cooperation of the biological, physical and social sciences to understand efficacious control of the insects that plague our food and other crops as well as insect-borne human and livestock diseases. There are papers on parasites, parasitoids, predators, insecticides, attractants, modelling, etc. The illustrations and tables are very helpful, but it is a pity that the very first figure was not printed as a doublepage spread so that it could more easily be read. It could make an excellent orientation to some of the many intricacies involved in this field if it is not skipped over because of the minuscule printing.

"ANNUAL REVIEW OF ENTOMOLOGY" Volume 30 edited by Thomas E. Mittler & committee, ix & 492 pp., 41 b/w fig. including 5 photo. & 3 maps. Annual Reviews Inc., Palo Alto, California 94306. 1985. \$27.00 U.S.A. & \$30.00 foreign.

This volume of 20 valuable papers is particularly interesting because of its addition of some newer types of research of the "80s" as in:

Pheromones and other semiochemicals of the *Acari* which seem to be

of much more limited influence than those in insects,

Recent learnings of "at least 14 orders with some 1,400 insect species to occur in various marine habitats, although in the open sea we find only members of the genus *Halobates*, the sea skaters or ocean striders",

Forensic entomology with just academic interests and then applied studies in suicides and murders,

Parthenogenesis and polymorphism in aphid populations for over 200 million years.

Geographical (without a single distribution map) and ecological distribution of arboreal *Psocoptera*,

Glossina, carrier of human African sleeping sickness and cattle nagana still maintaining its constant population in 40% of tropical Africa,

Reproductive competition in hymenopteran societies,

Excellent useful 4-page table of effects of insect hormones, analogues and antagonists on development of endoparasites, and 30-year cumulative indexes by authors and by topics.

"THE FACTS ON FILE SCIENTIFIC YEARBOOK 1985" edited by Bryan H. Bunch, ii & 214 pp., 100 b/w photo., 5 charts and 32 color photo. Facts on File Publications, New York, N. Y. 10016. 1985. \$24.95.

Planned for the "general" reader and therefore of possible use in public, home and school libraries, this book is composed of 30 well illustrated and simply explained articles about events and trends of special public mention during 1984 in the life sciences, in the earth and space sciences, and in the physical and mathematical sciences. This is really an attractive but only "incidental" book, failing to differentiate between monozygotic and dizygotic twins in human organ transplants and in cat coat color inheritance.

"BIOCHEMISTRY OF THE PLANT CELL WALLS" edited by C. T. Brett & J. R. Hillman for the Seminar Series 28 of the Society for Experimental Biology, xiv & 313 pp., 54 b/w fig. incl. 35 photo. & 14 tab. Cambridge University Press, Cambridge & London, England & New York, N. Y. 10022. 1985. \$34.50.

These important and freshly oriented 12 studies by 25 authors from 7 countries (about half from England and none from the U.S.A.) were directed last year in the University of Glasgow toward probing "the structure, function and biosynthesis of cell-wall macromolecules" showing "that the polysaccharide-protein-polyphenol complexes are fairly widespread in higher plant cell walls", that "biosynthesis of cell wall heterosaccharides require the interaction of several enzymes", and the "application to plant cell walls of helicoidal structure" results in "plywood laminates", etc. The text is printed by photo-offsetting of very neat typing.

"GEOLOGICAL FACTORS AND THE EVOLUTION OF PLANTS" edited by Bruce H. Tiffany, viii & 294 pp., 57 b/w fig. incl. 6 photos, 29 maps & 6 tab. Yale University Press, New Haven, Connecticut 06520. 1985. \$25.00.

This originally and interestingly prepared study of 9 papers is just about to appear from its press and is well worth the reading and/or studying by students, teachers and researchers in botany, geology, paleontology, evolution, phytogeography and ecology. There are essays on geological factors in plant evolution by the editor, geological and biochemical aspects of the origin of land plants, early development of Devonian continental positions and phytogeography, wildfire, and Pennsylvanian coal-swamp plants among others equally well prepared and presented.

"MCGRAW-HILL DICTIONARY OF BIOLOGY" by Sybil P. Parker, editor-in-chief, vi & 384 pp. McGraw-Hill Book Co., New York, N. Y. 10020. 1985. \$15.95 paperbound.

"MCGRAW-HILL DICTIONARY OF CHEMICAL TERMS" by Sybil P. Parker, editor-in-chief, v & 646 pp. McGraw-Hill Book Co., New York, N.Y. 10020. 1985. \$15.95 paperbound.

"MCGRAW-HILL DICTIONARY OF PHYSICS" by Sybil P. Parker, editor-in-chief, v & 646 pp. McGraw-Hill Book Co., New York, N. Y. 10020. 1985. \$15.95 paperbound.

Biological scientists would figuratively grade these lexicons as of "excellent genetic stock" or quality because they all have been "budded" off of the "McGraw-Hill Dictionary of Scientific and Technical Terms", the useful, high quality source book that was recently reviewed in this journal. The biology text treats some 15,000 terms from at least 20 specialties within and on the edges of this field. The chemistry text treats over 6,800 terms from at least 7 overlapping divisions. The physics text defines 11,200 terms from at least 18 included specialties. The explanations of these terms are clearcut and as precise as the range of the concepts permits. Abbreviations and cross-referencing are very helpful. While many students and others will depend upon institutional libraries as sources of the original, they can make a reasonable financial investment in their own "buds".



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