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SOLANUM SARASARAE (SECT. PETOTA), NOVA SPECIE PERUVIANA

by C. Ochoa*

Herbaceum, tuberiferum. Planta parva, 25-35 cm alta, pilis brevibus, haut minus quam 1.0 mm sparsim obsita. Caulis erectus, 5-7 mm diam. simplex vel paulo ramosus, pallide viridis in parte basilari flocculis violaceis ornatus, axillae subpigmentatae. Internodia, 1.5-2.5 cm diam. Stolones 40-60 cm longos, graciles; tubercula parva, alba, ovalia o rotunda, 1.0-1.5 cm diam. Folia imparipinnata, 8.7-13.5 cm longa, 5.0-8.5 cm lata, caule anguste decurrentes, valde segmentata (5-)6-juga, foliolis interjectis, 25-30, valde inaequalis ornata. Foliola primi jugis superi, 2.8-3.8 cm longa, 1.2-1.7 cm lata, foliola interjecta ab 1.5 mm diam, usque ad 10 mm longa, orbicularia, vel ovalia, sessilia. Foliola lanceolata vel anguste elliptico-lanceolatae, subacuto, basi rotundata, symmetrica vel non, sparse pilosa. Petioluli, 1-2 mm longi, basi subpigmentati, rhachis pilis supra densioribus, subtus sparsioribus obtectus. Foliola pseudo stipulacea anguste falcata, 5-7 mm longa, 3 mm lata. Inflorescentia cymosa, 4-6-flora, pedunculi dilute virides, 6 cm longi, basi, 1.5-2.0 mm diam. pilis minutis obsiti, tamquam pedicelli et calyx. Pedicelli, 12-15 mm longi, graciles, 4 mm infra calycem articulati. Calyx, 5.0-5.5 mm longus, viridis, subpigmentatus vel basi pigmentatus, lobuli lati, apicem subquadrati, acumina, 1.0-1.5 mm longi, subacuti vel acuti. Corolla rotata vel rotato-pentagonal, 2.0-2.5 cm diam, dilute azureo-violacea, lobi, 3-4 mm longi, acumina, 1.5-2.0 mm longa, stella interna grisea vel albido grisea. Columna antherarum truncato-conica, asymmetrica, antherae difficulter, 3.5-4.0 mm longae, flavae, filamenta, 0.4-0.8 mm longae, glabrae. Stylus tenuis, 8.0-8.5 mm longus, basi usque ad 2/3 longitudinis dense papillis ornatus, papillae perbreves. Stigma claviformis, fissum, styli apice manifeste non crassius. Fructus globosus, pallide viridis, 10-14 mm diam. Species ad seriem Tuberosa pertinet. Numerus cromosomatum: $2n=2x=24$.

Typus: PERU, departamenti Ayacucho, provinci Parinacochas, paucos km ad sudoeste Chilcar, directione monte Pucapuca, apud Sara-sara, plus minusve 3000 m altitudine. C. Ochoa 4197, Martius 1973 (holotypus, OCH; isotypus, US).

Affinitas: Foliorum dissectione similitudinem cum Solanum bukasovii habet, distinguitur foliorum forman et indumentum delicatum, maxime corollae parvae. S. sarasarae species valde diversa et typica videtur.

Habitat: Ante-puna, inter Polylepis sp. et Lobivia sp., in locis petrosis, pauperibus.

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Solanum sarasarae Ochoa. Holotypus OCH-4197, ca. $\times 1/2$

SPECIES NOVAE GENERIS OURATEA AUBLET (OCHNACEAE)

par Claude SASTRE

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Ouratea steyermarkii Sastre sp. nov.

A O. thyrsoidea, frutex 0,1-0,5 m (non arbor 4-15 m), lamina 2-4 x 1-1,5 cm (non 7,5-10 x 3,5-4 cm) differt.

Frutex 0,1-0,5 m alta, ramis glabris. Folia petiolo 2-4 mm longo, lamina coriacea 2-4 x 1-1,5 cm, oblongo-ovata, basi attenuato-subtruncata, margine integerrima, apice acuminata, nervo principali pagine inferiore proeminenti, nervis lateralis adscendentiis cum venis horizontaliis subtus prominiis. Inflorescentia racemosa, terminalis, 4-9 cm longa, bracteae triangulares coriaceae, 1 mm altae. Flores pedunculis 2-3 mm longis, sepalis 2(-3) partibus, coriaceis 6-7 x 2 mm ovatis, petala, 5, membranacea, 7 x 4 mm, obovata, stamina 10, sessilia, 7 mm longa, carpella 5, stylo 5 mm longo. Fructus ex 1(2) carpello oblongo, 6-7 x 3 mm, carpophoro subconico 6 mm alto.

TIPUS : Venezuela, Terr. Fed. Amazonas, Canaripo, lado sur del río Ventuari 4°55'N, 66°50'W, alt. 125 m, leg. Steyermark et Redmond (112797) 28 XII 1976 (holo- P, iso- VEN).

Ouratea articulata Sastre sp. nov.

A O. steyermarkii, ramis articulatis, lamina 5-6 x 2-3 cm elliptica, petiolo crasso, inflorescentia axillare, flore pendula, 5-7 C differt.

Frutex 0,5-1 m alta, ramis glabris. Folia petiolo crasso 3-4 mm longo, lamina coriacea 5-6 x 2-3 cm, elliptica, basi attenuata, margine interrigima, apice emarginata, nervo principali pagine inferiore prominenti, nervis secundaris pagine superiore non visis. Inflorescentia axillare 4-6 cm longa, bracteae linearibis 1 mm longae. Flores pedunculis arcuatis 5-6 mm longis, alabastra conica, sepalis 2, coriacea, triangulare 5 mm alta, petala 5, obovata, 5 mm longa, stamina 10, sessilia, 4 mm longa, carpello 5-7. Fructus ex 2-3 carpellis ellipticis 6 x 3 mm, carpophoro subconico 5 x 5 mm.

TIPUS : Venezuela, Est. Bolívar, Gran Sabana, altiplanicie del suelo arenoso, formación Roraima, en el drenaje del río Apongúao, entre Arauta-paru y el río Apongúao, cerca del Km 147 al sur de El Dorado, ALT. 1350-1400 m, leg. Steyermark et Dunsterville (104188) 21 XII 1970 - cum flores (holo- P, iso- VEN).

Paratipus : Venezuela, Est. Bolivar, via Kavanayen, El Jardin, 55 Km E. de Puerto Luepa, Gran Sabana; lugares pedregosos, leg. Ramirez (731) 22 II 1983 - cum fructus - P, VEN. Ibid., leg. Ramirez (844) 25 VI 1983- cum fructus - P, VEN.

Ouratea soderstromii Sastre sp. nov.

A O. pendula (Poepp.) Engler, lamina elliptica, 8-10 x 3-4,5 cm (non oblongo-lanceolata 10-20 x 5-6 cm), inflorescentia 6-8 cm longa (non 2-4 cm) differt.

Arbor, 4-20 m alta, ramis glabris. Folia petiolo crasso 5 mm longo, lamina 8-10 x 3-4,5 cm elliptica, basi attenuata, margine undulato-denticulata, apice acuminata, nervo principali pagine superiore immerso, pagine inferiore prominenti, nervis lateralis ascendentiis cum venis horizontalis parallelis. Inflorescentia racemosa pendula terminalis o axillaris, 6-8 cm longa. Flores pedunculis 6-8 mm longis, curvatis, sepala 5 6 x 1-1,5 mm oblonga, petala 5 6 x 3, elliptica, stamina 10, sessilia, 5 mm longa, carpello 5, stilo 4 mm longo. Fructus ex 1-3 carpellis subsphericis, 3 mm diam., carpophoro sub-conico 7 mm longo, 2 mm diam.

TIPUS : Guyana, Kaieteur Plateau, forest along Potaro R., 4,5 miles above Kaieteur Falls, alt. 1400', leg. Cowan et Soderstrom (2079) 9 III 1962 (holo- US, iso- F).

Paratipus : Venezuela, Guyana, Río Caroni, bosques a orilla del río Ictebe, leg. Cardona (2179) X 1947 F, VEN.

Ouratea yapacana Sastre sp. nov.

A O. mexicana (H. et B.) Engler, folia sessile, obovata (non elliptica), lamina margine revoluta, differt.

Frutex 0,2-0,3 m alto monocaule. Folia sessile, lamina coriacea 10-12 x 2,5-3 cm, obovata, basi attenuata, margine revoluta, apice acuta, nervo medio pagine inferiore prominente. Inflorescencia ramiflora 3 cm longa. Flores pedunculis 2 mm longis, sepala 5 coriacea 5 x 2 mm ovata, petala 5 membranacea 5 x 3 mm ovata, stamina 10 sessilia 4 cm longa, carpella 5. Fructus ignotus.

TIPUS : Venezuela, Terr. Amazonas, Cerro Yapacana, en la sabana grande, entre el caño Cotua y el pie del cerro. 3°45'N, 66°45'W, alt. 125 m, leg. Steyermark et Bunting (103236) 7 V 1970 (holo- P, iso- NY, VEN).

NEW SPECIES AND COMBINATIONS IN THE GENUS SCAPHYGLOTTIS
(ORCHIDACEAE)

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A revisionary study of the neotropical orchid genus Scaphyglottis Poepp. & Endl. has revealed the existence of a number of undescribed species, six of which are herein described as new. Four new combinations are also proposed, two involving transfers from Hexisea. This paper is preparatory to an account of the genus as a whole, in which the new species will be illustrated and nomenclatural changes more fully discussed.

SCAPHYGLOTTIS CHLORANTHA B. R. Adams sp. nov. S. densae (Schltr.) B. R. Adams affinis, sed floribus majoribus, labello oblongo vel ovato-oblongo, columna multo longiore (6-6.5 mm longa), nectario profundiore differt. Typus: Panama, Sytisma 2003 (holotypus MO).

An erect to spreading epiphytic herb, 18-45 cm tall. Stems superimposed, slender, 1.5-3 mm in diam., longitudinally angulate-sulcate, jointed and sometimes somewhat stipitate at base, apically bifoliate, 1/3 to entirely covered by imbricate sheaths when young; primary stems caespitose, 4-20 cm long; secondary stems produced 1-3 together from the apex of the stem below, often developing aerial roots at the base, 0.5-15 cm long; sheaths scarious, keeled, with narrowly triangular free apices. Leaves erect-spreading, narrowly lanceolate to narrowly elliptic, subcoriaceous, unequally bilobulate at the apex, 1.7-5.5 cm long, 4-7.5 mm wide. Inflorescences terminal, initially 1-flowered, subtended by 2 conduplicate bracts up to 2 cm long which conceal the short peduncle, subsequently often developing from basal buds 1 or 2 additional flowers (1-flowered branches), each subtended by several further bracts. Flowers with a rather inconspicuous obtuse mentum, pale green; pedicel and ovary long-exserted from subtending bracts, 2.2-3.5 cm long. Sepals 9-9.5 mm long; dorsal sepal oblong-elliptic, concave, apiculate or acuminate, 2.7-3.2 mm wide; lateral sepals united for about 1 mm at base, somewhat obliquely elliptic-lanceolate or oblong-elliptic, acute or apiculate, 2.5-3.7 mm wide. Petals ligulate-lanceolate, somewhat constricted above the middle, acute, about 9 mm long, 1.6-2.5 mm wide. Lip united to the column-foot, shortly clawed, oblong to ovate-oblong, keeled, + emarginate, apiculate, somewhat decurved above the claw and bearing at the point of curvature a pair of

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sublamellate calli, 7-8 mm long, 3.5-5.5 mm wide. Column prominently winged in the upper two-thirds, 6-6.5 mm long, 4-4.5 mm wide across the wings when spread; foot projecting forward, 1.5-2 mm long; wings semi-circular, at base continuous with tissue extending between column and column-foot to form a nectary 1.5-2 mm deep; clinandrium with an obtuse mid-tooth curved over the anther, somewhat exceeded by the wings so column apex appears + tridentate; pollinia 4, equal in size, ellipsoid, compressed, prominently caudiculate; stigmatic cavity subquadrate; rostellum a transverse plate with a median notch, apparently developing a viscidium. Capsule not seen.

PANAMA. Panamá: Cerro Jefe, 29 Oct. 1980, Sytsma 2003 (holotype MO); Cerro Jefe, flowered in cultivation 25 Oct. 1976, Taylor 100 (in spirit, K); newly bulldozed trail off Cerro Jefe road, 0.4 km beyond turnoff to Altos de Pacora, 29 Sept. 1975, J. T. & F. Witherspoon 8571 (MO). Veraguas: vicinity of Escuela Agricultura, Alto Piedra near Santa Fé, toward Atlantic slope along trail to top of Cerro Tute, 26 Jan. 1980, Antonio 3474 (MO).

S. chlorantha is vegetatively very like and evidently closely allied to S. densa (Schltr.) B. R. Adams. It has, however, a more southerly distribution and is well distinguished by its flowers which are larger, have an oblong or ovate-oblong rather than pandurate lip, a column about three-quarters rather than less than half as long as the lip and a substantially deeper nectary.

SCAPHYGLOTTIS LIMONENSIS B. R. Adams sp. nov. S. minutiflorae Ames & Correll arcte affinis, sed habitu graciliore, bracteis inflorescentiae brevioribus et vix in fibras solutis, mento parviore, labello ovato-spatulato differt. Typus: Costa Rica, Standley & Valerio 48920 (holotypus AMES; isotypus US).

An erect-spreading epiphytic herb, 15-40 cm tall. Stems superimposed, slender, cylindrical, 1-3 mm in diam., longitudinally plurisulcate when dry, jointed at base, apically bi- or trifoliate, about 1/2 covered by imbricate sheaths when young; primary stems caespitose, 8-19 cm long; secondary stems produced 1-5 together from the apex of the stem below, commonly developing aerial roots at the base, 2.5-10 cm long; sheaths scarious, the upper 1-2 at first bearing leaflets up to 2 cm long, the remainder with triangular free apices. Leaves erect-spreading, linear to lanceolate-linear, chartaceous, unequally bilobulate at the very narrow apex, 5-10 cm long, 2.5-5 mm wide. Inflorescences terminal, initially 1-flowered, subtended by about 6 conduplicate bracts up to 4.5 mm long which conceal the short peduncle, over the following up to 3 seasons developing from basal buds rather numerous additional flowers (1-flowered branches), up to 3 appearing at a time and each subtended by about 4 further bracts. Flowers with a + inconspicuous obtuse mentum, white; pedicel and ovary partly exserted from subtending bracts, 2.8-3.5 mm long. Sepals concave, acute; dorsal sepal

oblong, keeled, 2.5-2.8 mm long, 0.8-1 mm wide; lateral sepals essentially free, somewhat obliquely oblong, 2.6-2.9 mm long, 1.1-1.2 mm wide. Petals somewhat obliquely ligulate, subacute, 2.2-2.5 mm long, about 0.4 mm wide. Lip subarticulate with the column-foot, ovate-spatulate, concave, obtuse to somewhat trilobulate at the apex, somewhat fleshy-thickened in the basal third, ecallose, 2.3-2.7 mm long, about 1.4 mm wide. Column clavate, lacking wings, somewhat concave at base, with a dorsal ridge, 1.8-2 mm long, about 1 mm wide below the apex; foot almost obsolete, about 0.1 mm long; clinandrium with a short obtuse mid-tooth curved over the anther, dorsal margin repand and somewhat exceeding lateral margins; pollinia 4, subequal in size, ellipsoid to somewhat D-shaped, compressed, prominently caudiculate; stigmatic cavity transversely lunate; rostellum a transverse plate. Capsule ellipsoid, with persistent perianth, 3.5-4 mm long, \pm exserted from subtending bracts; pedicel 0.5-0.7 mm long.

COSTA RICA. Limón: La Lola, 10 Jan. 1957, Carlson 3295 (F); Hamburg Finca, on the Rio Reventazón below Cairo, 19 Feb. 1926, Standley & Valerio 48771 (AMES, US), 48919 (AMES) & 48920 (holotype AMES; isotype US).

So far only known from the lowlands of eastern Costa Rica, *S. limonensis* is undoubtedly closely allied to *S. minutiflora* Ames & Correll but obviously differs in its more slender stems and shorter and narrower leaves. In addition, the bracts of the inflorescences are fewer and shorter and do not break down to form the conspicuous fibrous tufts that are so characteristic of *S. minutiflora*. Perhaps most notably, the flower has a less well-developed mentum and an ovate-spatulate rather than distinctly 3-lobed lip.

SCAPHYGLOTTIS PANAMENSIS B. R. Adams sp. nov. *S. bilineatae* (Reichb. f.) Schltr. arcte affinis, sed caulibus gracilioribus et flexilioribus, foliis oblongo-lanceolatis ad anguste ovatis, lobis lateralibus labelli minoribus differt. Typus: Panama, Churchill 3942 (holotypus MO).

An erect-spreading to straggly epiphytic herb, 5-30 cm tall or up to 35 cm long. Stems superimposed, slender and flexible, cylindrical and often slightly pseudobulbous above, 1-3 mm in diam., longitudinally plurisulcate when dry, below the middle or at base \pm contracted into a jointed stipe, apically bifoliate, 1/2 to almost entirely covered by imbricate sheaths when young; primary stems caespitose, 2-24 cm long; secondary stems produced 1-5 together from the apex of the stem below, often developing aerial roots at the base, 1-9 cm long; sheaths scarious, the upper 1-3 at first bearing leaflets up to 1 cm long, the remainder with broadly triangular free apices. Leaves erect-spreading to spreading, oblong-lanceolate to lanceolate or narrowly ovate, apparently coriaceous, unequally bilobulate at the apex with the lobules often overlapping or the apex somewhat twisted, 1.2-5 cm long, 3-12 mm wide. Inflorescences

terminal, initially 1-flowered, subtended by about 3 conduplicate bracts up to 1 cm long which conceal the short peduncle, over the following 1-2 seasons commonly developing from basal buds several additional flowers (1-flowered branches), 1 or 2 appearing at a time and each subtended by about 3 further bracts. Flowers with a conspicuous rounded mentum; sepals and petals greenish or yellowish, sometimes tinged with purple; lip white; column purple or maroon; pedicel and ovary concealed by subtending bracts, 3-7 mm long. Sepals concave, acute or obtuse; dorsal sepal narrowly oblong-ob lanceolate or oblong-elliptic, keeled, 6-8 mm long, 1.8-2 mm wide; lateral sepals united for 0.7-1 mm at base, narrowly and obliquely oblong, 8-10.5 mm long, 2-2.5 mm wide. Petals ligulate, obtuse, 6-8 mm long, 0.8-1 mm wide. Lip + united to the column-foot, somewhat arcuate, prominently clawed, obscurely to distinctly 3-lobed above the middle, 8-10.5 mm long, 3.5-4.3 mm wide; claw strongly concave at base, somewhat fleshy-thickened, with the thickening extending forward between the lateral lobes as a broad and indistinct callus with raised margins; lateral lobes broadly rounded; mid-lobe transversely oblong to transversely elliptic, retuse. Column somewhat clavate, + winged below the apex, 5-6 mm long, 2-2.5 mm wide across the wings when spread; foot projecting downward, concave-winged, 0.7-1 mm long, forming with the concave base of the lip a nectary 0.7-1 mm deep; wings broadly rounded; clinandrium with an obtuse mid-tooth curved over the anther, dorsal margin considerably exceeding lateral margins; pollinia 4, subequal in size, + D-shaped, strongly compressed, prominently caudiculate; stigmatic cavity obovate; rostellum tongue-like, decurved. Capsule ellipsoid, 8-9 mm long including a beak about 1.5 mm long, subsessile, only partly exserted from subtending bracts.

PANAMA. Bocas del Toro: oleoducto road, Fortuna Dam area, 5 Feb. 1984, Churchill et al 4561 (MO). Cocle: El Potroso, Alto Calvario, 1 Feb. 1977, Folsom & Collins 1556 (MO); 7 km N of El Copé, near Rivera Sawmill at Alto Calvario, Forgotten Hill, 2 July 1977, Folsom 4103 (MO); around Rivera Sawmill, 7 km N of El Copé, 2 Oct. 1977, Folsom et al 5722 (MO); Caribbean side of divide at El Copé, 3 Feb. 1983, Hamilton & Davidse 2627 (MO); near sawmill 8 km N of El Copé, 1 Sept 1977, Maas et al 2768 (MO, U); above El Potroso Sawmill at continental divide, 24 Oct. 1980, Sytsma 1833 (MO) & 25 Oct. 1980, Sytsma 1854 (MO). Panamá: vicinity of Cerro Jefe, near tower, 23 May 1980, Antonio 413 (MO); summit of Cerro Jefe near radio towers, 30 Nov. 1983, Churchill 3942 (holotype MO); between Cerro Jefe and Eneida, 17 Jan. 1968, Dwyer et al 8203 (MO); road from Pan-Am. Highway to Cerro Jefe, summit, 22 June 1977, Folsom 3828 (MO); near top of Cerro Jefe to 1 mi beyond, 1 Jan. 1972, Gentry et al 3529A (MO); region of Cerro Jefe, Altos de Pacora, 22 Feb. 1976, Kennedy & Dressler 3513 (F); Cerro Jefe, 2 March 1976, Luer et al 701 (SEL); Cerro Jefe, along trail on ridge running NE from summit, 18 Dec. 1974, Mori et al 3757 (MO) & 11 May 1975, Mori & Kallunki 6071 (MO); Cerro Jefe, 14 July 1975, Mori 7118 (MO); Cerro Jefe, 2 March 1976, Taylor 13208a (K); newly bulldozed trail off Cerro Jefe road, 0.4 km beyond turnoff to Altos de Pacora, 29

Sept. 1975, J. T. & F. Witherspoon 8573 (MO). Veraguas: near the divide above Santa Fé, 5 Sept. 1976, Luer & Dressler 1129 (SEL); Cerro Tute, E slopes 1 km beyond Escuela Agrícola Alto Piedra above Santa Fé, 14 May 1981, Sytsma & Andersson 4661 (MO).

Although closely allied to *S. bilineata* (Reichb. f.) Schltr., this species is instantly distinguishable by its slender flexible stems and more or less lanceolate leaves. Florally the two species are very similar, although the lip of *S. bilineata* has rather better developed lateral lobes. Whilst apparently endemic to Panama, *S. panamensis* is of fairly wide occurrence in that country.

SCAPHYGLOTTIS ROBUSTA B. R. Adams sp. nov. *S. modestae* (Reichb. f.) Schltr. affinis, sed habitu generaliter robustiore, floribus majoribus, labello simplici, alis columnae subquadratis differt. Typus: Panama, Luteyn & Wilbur 4679 (holotypus DUKE).

An erect to rather straggly epiphytic herb, 16-50 cm tall. Stems superimposed, cylindrical to narrowly fusiform, pseudobulbous, 2-6 mm in diam., longitudinally plurisulcate when dry, contracted at base into a jointed stipe, apically bifoliate, 1/3 to almost entirely covered by imbricate sheaths when young; primary stems caespitose, 4.5-23 cm long; secondary stems produced 1-2 together from the apex of the stem below, often developing aerial roots at the base, 2.5-14 cm long; sheaths scarious, the upper 1-3 often at first bearing recurved leaflets up to 13 mm long, the remainder with broadly triangular to subtruncate free apices. Leaves erect-spreading, narrowly oblong to oblong-elliptic or elliptic, subcoriaceous, unequally bilobed at the apex with the lobes commonly overlapping or the apex somewhat twisted, 4-18.5 cm long, 1.3-3.4 cm wide. Inflorescences terminal, initially 1- or more commonly 2-flowered, subtended by about 5 conduplicate bracts up to 1.8 cm long which conceal the short peduncle, over the following up to 3 seasons developing from basal buds several to numerous additional flowers (1-flowered branches), up to 6 appearing at a time and each subtended by 4 further bracts. Flowers with a + conspicuous rounded mentum, varying in colour from greenish-white to pale brownish, often suffused or veined with purple or pink; pedicel and ovary + concealed by subtending bracts, 8-9 mm long. Sepals subacute or obtuse; dorsal sepal oblong to oblong-elliptic, concave, 7-9.5 mm long, 3-4 mm wide; lateral sepals united for 1.2-1.5 mm at base, obliquely oblong-elliptic to ovate-elliptic, 7-10 mm long, 3.5-5 mm wide. Petals somewhat obliquely oblong-elliptic, + constricted above the middle, obtuse, somewhat fleshy-thickened at base, 6.5-8.5 mm long, 2-3.2 mm wide. Lip articulate with the column-foot, somewhat arcuate, lanceolate-oblong from a cuneate base, retuse, with erose-crenulate margins above the middle, prominently callose in the basal half, 8-9.5 mm long, 3.8-4.5 mm wide; callus oblong, with + verrucose margins, terminating in a pair of + distinct fleshy humps. Column arcuate, prominently winged above the middle, 5.5-6 mm long, 4-4.3 mm wide across the wings when spread; foot projecting

downward, deeply concave, 1.2-1.5 mm long; wings subquadrate; clinandrium with irregularly dentate margins, dorsal margin greatly exceeding lateral margins, tapering to a truncate apex and curved over the anther; pollinia 4, subequal in size, + D-shaped, strongly compressed, prominently caudiculate; stigmatic cavity obovate; rostellum shortly tongue-like, decurved. Capsule ellipsoid, 9-12 mm long including a beak about 2 mm long, subsessile, only the upper part exerted from subtending bracts.

PANAMA. Panamá: top of Cerro Jefe, 1 April 1972, Gentry 4869 (MO); Campo Tres, 3 mi NE of Altos de Pacora, 10 March 1973, Liesner 532 (MO); road from El Llano to Carti-Tupile, 12 mi above Pan-Am. Highway, 13 March 1973, Liesner 644 (MO) & 26-27 March 1973, Liesner 1156 (MO); Cerro Jefe, 13 Feb. 1977, C. & J. Luer 1708 (SEL); El Llano-Carti-Tupile road, 10-12 km N of Inter-Am. Highway, 9 Jan. 1975, Luteyn & Wilbur 4679 (holotype DUKE); El Llano-Carti road at El Llano, 16 Jan. 1974, Nee & Dressler 9360 (MO); El Llano-Carti road, 12 km from Pan-Am. Highway, 22 Oct. 1980, Sytsma 1744 (MO); Cerro Jefe 6 mi past Cerro Azul on road to Altos de Pacora, 19 Feb. 1981, Sytsma & D'Arcy 3693 (MO); Cerro Jefe, flowered in cultivation 6 Feb. 1980, Taylor 81 (in spirit, K); between El Llano and Carti, about 12-15 km N of El Llano, 3 March 1976, Taylor 13217 (K). San Blas: Nusagandi, El Llano-Carti road, 28 July 1984, de Nevers & Todzia 3538 (MO); Cerro Habú, trail from Rio Sidro, 18 Dec. 1980, Sytsma et al 2667 (MO); El Llano-Carti road, 14-15 mi from Pan-Am. Highway, 10 May 1981, Sytsma & Andersson 4467 (MO). Veraguas: Mts. 3.9-5 mi N of Santa Fé, 12 Dec. 1971, Gentry 2966 (MO).

S. robusta is clearly allied to S. modesta (Reichb. f.) Schltr. but mature plants tend to be substantially larger and more robust. They also have larger flowers with a simple lip and prominent subquadrate wings on the column. The smaller flowers of S. modesta have, in contrast, a distinctly 3-lobed lip and less well-developed, rounded column-wings. S. modesta has a wide distribution in northern South America and the West Indies but is not known to extend to Panama where all collections of S. robusta have so far been made.

SCAPHYLOTTIS SESSILIFLORA B. R. Adams sp. nov. S. pulchellae (Schltr.) L. O. Williams arcte affinis, sed partibus apicalibus caulium non pseudobulbosis, ramis inflorescentiae subsessilibus et semper unifloris, sepalis et petalis longioribus et valde acuminatis differt. Typus: Costa Rica, Standley 33080 (holotypus US; isotypus AMES).

An erect to straggly or pendent epiphytic herb, 40-90 cm tall or up to 120 cm long. Stems superimposed, cylindrical, jointed, 1-4.5 mm in diam., at least the uppermost internode (normally the longest) longitudinally plurisulcate-wrinkled when dry, commonly somewhat narrowed in the lower 1/2-2/3 but not obviously stipitate, apically bifoliate, entirely covered by imbricate sheaths when

young; primary stems caespitose, 17-58 cm long; secondary stems produced 1-6(-12) together from the apex of the stem below, often developing aerial roots at the base, 2-17 cm long; sheaths scarious, the upper 1-2 at first commonly bearing leaflets up to 1.8 cm long, the remainder with triangular free apices. Leaves erect to erect-spreading, linear-lanceolate to linear, chartaceous, unequally bilobulate at the very narrow apex, 8-21 cm long, 4-13 mm wide. Inflorescences terminal, initially 1-flowered, subtended by 2 conduplicate bracts up to 2.5 cm long which conceal the 3-5 mm long peduncle, over the following 2 seasons frequently developing from basal buds 1-few additional flowers (1-flowered branches), 1 or 2 appearing at a time and each subtended by several further bracts. Flowers with an inconspicuous obtuse mentum, whitish, pale green or yellowish, often tinged with dark red; pedicel and ovary long-exserted from subtending bracts, 2-5 cm long. Sepals 17.5-20 mm long, 4-4.5 mm wide; dorsal sepal narrowly lanceolate, concave, long-acuminate; lateral sepals united for about 1 mm at base, narrowly and obliquely lanceolate, acuminate. Petals lanceolate, acuminate, 16.5-19 mm long, 5.5-6.5 mm wide. Lip articulate with the column-foot, + sessile, oblong-obovate, keeled, obtuse, apiculate, rounded-subcordate at base, slightly decurved above the base, provided in the lower third with a pair of parallel callose ridges which form the margins of a central channel, 1.4-1.6 cm long, 8-8.5 mm wide. Column arcuate, lacking wings, 7-7.5 mm long, about 1.7 mm wide below the apex; foot projecting downward, deeply concave, about 1.5 mm long; clinandrium with an acute mid-tooth curved over the anther, lateral margins broadly rounded; pollinia 6; stigmatic cavity obovate-elliptic, the margins raised and on the lower side forming a small rounded tooth; rostellum tongue-like, decurved. Capsule ellipsoid, 2.3-3 cm long, exserted from subtending bracts; pedicel 1.3-1.6 cm long.

COSTA RICA. Alajuela: La Palma de San Ramon, 26 July 1924, Brenes 929 (NY) & 26 Aug. 1924, Brenes 1024 (NY) & 27 Aug. 1925, Brenes (230)1418 (F). Cartago: Cerro de La Carpintera, Feb 1924, Standley 34475 (AMES, US), 35557 (AMES, US), 35580 (AMES, US) & 35604 (AMES, US). Guancaste: Parque Nacional Rincon de la Vieja, SE slopes of Volcan Santa Maria, above Estacion Hacienda Santa Maria, 27-28 Jan. 1983, Davidse et al 23408 (MO). Heredia: Yerba Buena, NE of San Isidro, 22, 28 Feb. 1926, Standley & Valerio 49103 (AMES, US), 49138 (AMES), 50203 (AMES, US) & 50238 (AMES, US); Cerro de Las Lajas, N of San Isidro, 7 March 1926, Standley & Valerio 51480 (AMES, US). San José: La Palma, 3 Feb 1924, Standley 33080 (holotype US; isotype AMES) & 17 March 1924, Standley 38259 (AMES, US); Zurqui, 13 Feb. 1926, Standley & Valerio 48067 (AMES, US) & 48094 (AMES, US).

Although rather numerous collections of this species have lain in herbaria for over 50 years, its distinctness has remained unrecognised due to confusion with *S. pulchella* (Schltr.) L. O. Williams. It is readily separated by its longer and markedly acuminate sepals and petals and by the very short inflorescence

branches which are concealed by subtending bracts and always 1-flowered. In S. pulchella the inflorescence branches are much longer, exerted from subtending bracts and not infrequently 2-flowered. When not flowering, the two species are usually distinguishable by the upper 1-2 internodes of the stems which tend to be more or less pseudobulbous in S. pulchella but not in S. sessiliflora.

Somewhat more widely distributed in Costa Rica than S. pulchella but, unlike that species, not apparently extending to Panama.

SCAPHYGLOTTIS TRILOBA B. R. Adams sp. nov. a congeneris labelli lobis lateralibus magnis triangularibus et tertio basali unguis subtus plicato manifeste distinguenda. Typus: Colombia, Dodson & Hills 3128 (holotypus SEL).

An erect-spreading to straggly probably epiphytic herb, up to 1 m long. Stems superimposed, flexible, cylindrical, 1.5-3.5 mm in diam., slightly compressed above, longitudinally plurisulcate when dry, somewhat narrowed and jointed below the middle but not obviously stipitate, apically bifoliate, 1/2-3/4 covered by imbricate sheaths when young; primary stems 20-40 cm long; secondary stems produced 1-4 together from the apex of the stem below, often developing aerial roots at the base, 5-22 cm long; sheaths becoming scarious, the upper 1-3 at first bearing leaflets up to 2 cm long, the remainder with triangular free apices. Leaves erect-spreading, linear-lanceolate to linear, subcoriaceous, unequally bilobulate at the apex, 7-14 cm long, 5-11.5 mm wide. Inflorescences terminal, initially 1-flowered, subtended by 4 conduplicate bracts up to 2 cm long which conceal the 7-10 mm long peduncle, over the following season sometimes developing from a basal bud a second flower (1-flowered branch) subtended by several further bracts. Flowers with an inconspicuous obtuse mentum, often nutant; sepals and petals greenish or yellowish; lip white, often marked with purple in the centre; pedicel and ovary long exerted from subtending bracts, 1.5-1.8 cm long. Sepals 11-11.5 mm long, acute; dorsal sepal narrowly oblong, 2.7-3.2 mm wide; lateral sepals united for about 1 mm at base, obliquely oblong, adjacent margins somewhat dilated in the lower third, 3.3-3.5 mm wide. Petals somewhat obliquely ligulate, rounded at the apex, 10.5-11 mm long, 1.5-1.7 mm wide. Lip subarticulate with the column-foot, with a well-developed claw, prominently 3-lobed above the middle, 11-11.5 mm long, 6-7 mm wide; claw fleshy-thickened, markedly geniculate with the basal third folded under the rest of the lip, bearing a pair of parallel keel-like calli running from near the base to between the lateral lobes; lateral lobes triangular, somewhat antrorse; mid-lobe strongly decurved, subquadrate, retuse, with crenulate margins. Column rather slender, winged below the apex, 9-9.5 mm long, 3.2-3.5 mm wide across the wings when spread; foot projecting forward, strongly concave, 3-3.5 mm long; wings small, rounded-triangular; clinandrium with an acute mid-tooth curved over the anther, dorsal margin

somewhat exceeding lateral margins; pollinia 4, subequal in size, D-shaped, strongly compressed, prominently caudiculate; stigmatic cavity broadly obovate; rostellum tongue-like, decurved. Capsule not seen.

COLOMBIA. El Valle: km 54 Cali-Buenaventura (old road), 20 June 1965, Dodson & Hills 3128 (holotype SEL); km 46 Cali-Buenaventura, 1 July 1965, Dodson & Hills 3203 (SEL). Without locality, cultivated at La Ceja by the Robledos, 22 Jan. 1978, Luer 2802 (SEL) & 24 Oct. 1979, Luer 4323 (SEL).

A very distinctive species perhaps most closely related to *S. bilineata* (Reichb. f.) Schltr. and *S. panamensis*. The form of the lip, with its large triangular lateral lobes and basal third of the claw folded beneath the remainder, is unique in the genus. So far *S. triloba* is known from the wild by only two collections, both from the same area of south-central Colombia. It has also been found in cultivation at La Ceja which is in Dept. Antioquia, some 300 km to the north. The fact that such a large plant with fairly conspicuous flowers is not represented by more collections suggests that it is either very rare or extremely local in occurrence.

SCAPHYGLOTTIS ARCTATA (Dressler) B. R. Adams comb. nov.

Hexisea arctata Dressler in *Orquidea* 7(3): 223, 1979. Type: Panama, Veraguas, ridge E of Cerro Tute, about 7 km NW of Santa Fé, 12 Oct. 1975, Dressler 5185 (holotype US; isotype MO).

This and the following new combination are made since I am unable to support the continued placement of these two species in *Hexisea*. It seems clear that their closest allies are to be found among the group of species around *Scaphyglottis jimenezii* Schltr., particularly *S. corallorrhiza* (Ames) Ames, Hubbard & C. Schweinf. and the herein described *S. chlorantha*.

SCAPHYGLOTTIS SIGMOIDEA (Ames & C. Schweinf.) B. R. Adams comb. nov.

Hexisea sigmoidea Ames & C. Schweinf. in *Sched. Orch.* 8: 39, 1925. Type: Costa Rica, Santa Clara de Cartago, 23 Dec. 1923, Jankester 570 (holotype AMES).

SCAPHYGLOTTIS BOLIVIENSIS (Rolfe) B. R. Adams comb. nov.

Hexadesmia boliviensis Rolfe in *Mem. Torrey Bot. Club* 6(1): 122, 1896. Type: Bolivia, between Guanai and Tipuani, April-June 1892, Bang 1329 (holotype K; isotypes BM, G, MICH, MO, NY, US). *Scaphyglottis huebneri* Schltr. in *Beih. Bot. Centralbl.* 42(2): 95, 1925. Type: Brazil, Amazonas, Iguapo Caicara, Hübner 126 (holotype B, destroyed).

- Ornithidium flaccidum Kraenzl. in Repert. Spec. Nov. Regni. Veg. 25: 31, 1928. Type: Bolivia, Región de Mapiro, San Carlos, bei Sarampiuni, 7 April 1927, Buchtien 526 (holotype B, destroyed; isotype US).
- Scaphyglottis matogrossensis Brade in Arq. Serv. Florest. 1(1): 44, 1939. Type: Brazil, Mato Grosso, flowered in cultivation 6 July 1939, Rio de Janeiro Bot. Gard. 14462 (holotype RB; isotype RB).
- S. decipiens C. Schweinf. in Bot. Mus. Leaflet. 17(2): 43, t. 17, 1955. Type: Costa Rica, Puntarenas, between Golfo Dulce and Rio Térraba, Dec. 1947, Skutch 5314 (holotype US; isotypes AMES, MICH, SEL).
- S. flaccida (Kraenzl.) Garay in Canad. J. Bot. 34(2): 255, 1956.

Although the flowers are old and pollinia are lacking, study of the rather abundant type material has convinced me that Hexadesmia boliviensis is the earliest legitimate name for one of the more widespread and variable of the Scaphyglottis species. A new combination is required since this epithet does not appear to have been previously transferred to Scaphyglottis.

SCAPHYGLOTTIS DENSA (Schltr.) B. R. Adams comb. nov.

- Pachystele densa Schltr. in Repert. Spec. Nov. Regni. Veg. Beih. 19: 29, 1923. Type: Costa Rica, La Palma, Sept. 1921, Wercklé 71 (holotype B, destroyed).

Of the five species at one time included in Pachystele Schltr., one was originally described in Scaphyglottis and the remainder, with the exception of P. densa have since been transferred to that genus. Doubts as to the distinctness of P. densa from S. jimenezii Schltr. probably explain the reluctance of previous authors to treat it similarly but it is in fact well separated by a number of vegetative features, particularly the nature of the stem-sheaths which are smooth with acute apices rather than verrucose and truncate.

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SUBMERGENCE OF THE GENERA ASANTHUS AND DYSCRITOGYNE
WITHIN STEVIOPSIS (ASTERACEAE, EUPATORIEAE),
INCLUDING NEW COMBINATIONS

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In King and Robinson's (1987) overview of the tribe Eupatorieae they recognize three small genera, Steviopsis, Asanthus and Dyscritogyne which were originally separated out of Brickellia and Eupatorium (sensu lato). These several genera are interesting in that the seven species concerned all look very much as if they belong to Brickellia (indeed, several were so treated by both B.L. Robinson, 1917 and McVaugh, 1984), yet all lack a pubescent basal swelling on the stylar shaft which readily distinguishes these from Brickellia.

King and Robinson (1987) place Asanthus, Dyscritogyne and Steviopsis in their subtribe Alomiinae (which includes Brickellia) positioning them as generic numbers 87, 91 and 94, respectively. Nevertheless, they comment under Asanthus that "In relationship, Asanthus may be closest to Steviopsis..." [having positioned the genus between Ageratella (86) and Malperia (88)]. Under Dyscritogyne they note that "The genus is distinct from its closest potential relative, Steviopsis, by the densely glanduliferous achenes and by the multiseriate involucre with round-tipped bracts..." [having positioned the genus between Alomia (90) and Kyrsteniopsis (92)]. Finally, under Steviopsis, they note that "the sum of all characters of Steviopsis continues to indicate a position in the Alomiinae close to Dyscritogyne and possibly Asanthus [having positioned this between Pseudokyrsteniopsis (93) and Carminatia (95)].

In our forthcoming treatment of the Asteraceae of Mexico (Turner and Nesom, in prep.) we intend to combine these several generic names under Steviopsis with the belief that there is reasonable evidence that they do not belong to Brickellia (largely because they lack a node at the base of the stylar shaft, the best single apomorphy) yet in many characters of the involucre, corolla, and style branches they appear to relate to Brickellia. The latter genus, as is well known, has a chromosome base of $x=9$. Unfortunately, chromosome numbers are not known for any of the seven species which make up my concept of Steviopsis. If, however, any of these were to have a chromosome number of $n=9$, the group might have to be looked at anew as regards phyletic relationships. But, as of now, I feel the present treatment is superior to that accorded the group by King and Robinson in that the several disparate elements appear more closely related one to the other than they do to yet other groups; in addition the nomenclature is much simplified.

STEVIOPSIS King & H. Rob., Emended Description

Asanthus King & H. Rob.

Dyscritogyne King & H. Rob.

Perennial, suffruticose, herbs or shrubs. Stems brittle, terete, arising from stout woody rootstocks. Leaves mostly alternate but sometimes opposite throughout, linear-lanceolate to cordate, petiolate or sessile, firm, reticulate-venose and often glandular-punctate beneath, (1)3-nervate from the base. Heads pink or yellowish, 3-numerous in mostly terminal cymules. Involucres 2-7 seriate, very imbricate to nearly eximbricate. Receptacles plane or convex, glabrous, epaleate. Corollas tubular, glabrous or atomiferous-glandular. Anthers appendaged. Style branches narrowly linear, smooth, expanded towards the apex, the basal shaft not swollen or nodose. Achenes 5-sided, the ribs basically 5, or 6 to 10 by intercalation of lesser ribs.

Type species, Steviopsis rapunculoides (DC.) King & H. Rob.

STEVIOPSIS ADENOSPERMA (Sch.-Bip) B. Turner, comb. nov.---

Based upon Eupatorium adenospermum Sch.-Bip, in Seem. Bot. Voy. Herald 299. 1856.

STEVIOPSIS DRYOPHILA (B.L. Rob.) B. Turner, comb. nov.---

Based upon Eupatorium dryophilum B.L. Rob., Proc. Amer. Acad. Arts 36:478. 1901.

King and Robinson (1987) place both of the above taxa as the only species of their genus Dyscritogyne. McVaugh (1984), however, positions the two within his broadly conceived Eupatorium, largely because of their 5-ribbed achenes, much as would B.L. Robinson (1917) who excluded them from Brickellia, largely for the same reason, although he placed Brickellia arsenei B.L. Rob., a synonym of Steviopsis adenosperma, within Brickellia, largely because the specimens concerned were sufficiently immature so that the ribbing on the achenes was not evident.

STEVIOPSIS SQUAMULOSA (A. Gray) B. Turner, comb. nov.---

Based upon Brickellia squamulosa A. Gray, Proc. Amer. Acad. Arts 15:30. 1879.

This species is positioned by King and Robinson (1987), along with two other species, in their genus Asanthus. As noted by these authors, it is a more-or-less discordant element within their Asanthus; indeed, I would count it as the most remote element within my concept of Steviopsis.

STEVIOPSIS THYRSIFLORA (A. Gray) B. Turner, comb. nov.---

Based upon Brickellia thyrsoflora A. Gray, Proc. Amer. Acad. Arts 15:30. 1879.

I recognize two somewhat intergrading allopatric varieties under this taxon as follows:

1) var. thyrsoflora, occurring from southern Durango eastward to San Luis Potosi, from whence the type (GH!) and

2) var. SOLIDAGINIFOLIA (A. Gray) B. Turner, comb. nov.-based

upon Brickellia solidaginifolia A. Gray, Proc. Amer. Acad. Arts 22:306. 1887.

This taxon is largely confined to western Chihuahua and northern Durango and is distinguished by its smaller involucre, less imbricate, narrower involucral bracts in fewer series, the type from Chihuahua (GH!).

King and Robinson (1987) recognize both of the above taxa as specifically distinct members of their genus Asanthus. McVaugh (1984), however, considers these to be synonymous, recognizing only Brickellia thrysiflora. He clearly recognized the relatively trivial distinctions between the two regional entities, however, noting also that seeming intermediates between these occur, which indeed is the case. The "intermediates", however, are largely rather isolated examples of intermediate character states; i.e., the suite of several characters which distinguish them do not breakdown. The following key will distinguish between the varieties from among those specimens available to me (largely ARIZ, GH, LL and TEX).

Involucres 2-4 seriate, the inner bracts 1 mm wide or less-----
-----var. solidaginifolia

Involucres 4-6 seriate, the inner bracts 1-2 mm wide-----
-----var. thrysiflora

The distribution of the two taxa is shown in Fig. 1.

It should be noted that King and Robinson (1987) retain S. arsenei King & H. Rob, but I consider this to be a leaf-form of Steviopsis rapunculoides. It is distinguished almost solely by its ternate leaves (mostly 3 to a node), a not uncommon anomaly among Asteraceae generally. Also, it should be mentioned that King and Robinson (1972) recognized the name Steviopsis pulcherrima (B.L. Rob.) King & H. Rob., which B.L. Robinson (1927, by annotation and comments on a sketch of the type of S. vigintisetata, GH!) clearly indicated to be a synonym of Stevia vigintisetata DC. For this reason the name Steviopsis pulcherrima disappeared from their 1987 contribution, albeit arrived at without knowledge of B.L. Robinson's earlier discovery.

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LITERATURE CITED

- King, R. and H. Robinson. 1972... Additions to the genus Steviopsis. Phytologia. 24:60-62.
- _____. 1987. The Genera of the Eupatorieae. Monographs Syst. Bot., Missouri Bot. Gard. 22:1-581.

McVaugh, R. 1984. Asteraceae. Flora Novo-Galiciana 12:1-1157.

Robinson, B.L. 1917. A monograph of the genus *Brickellia*. Mem. Gray Herb. 1:1-151.

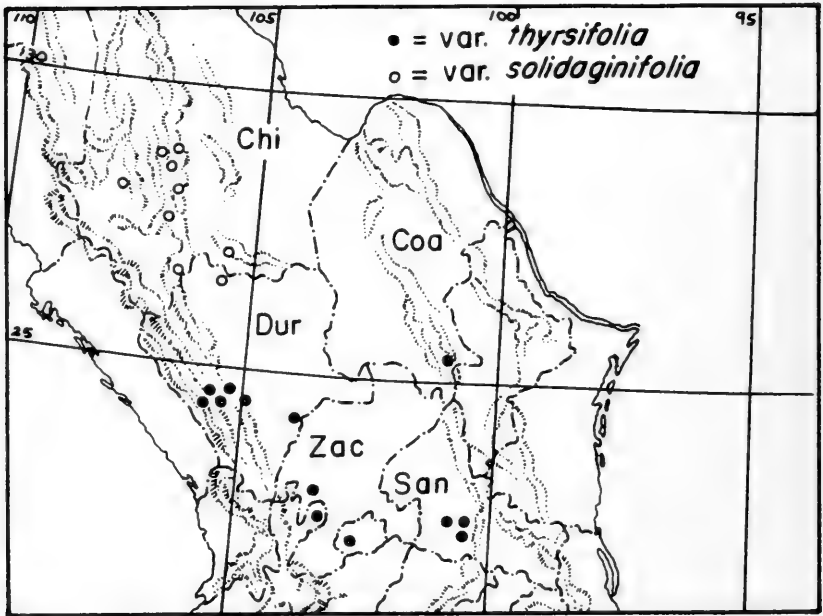


Fig.1 Distribution of *Steviopsis thyrsofolia*

NEW COMBINATIONS IN PERYMENIUM WITH SPECIAL REFERENCE TO *P. BUPHTHALMOIDES* (ASTERACEAE)

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ABSTRACT

Perymeniopsis ovalifolia (A.Gray) H. Rob. is transferred into *Perymenium* as *P. ovalifolium* (A. Gray) B. Turner. *Perymenium buphthalmoides* is given an inclusive treatment in which five regional varieties are recognized, one of these 'previously described as *P. diguetii* McVaugh, and another, from Sonora, Mexico, is described as new.

Robinson (1978) noted that *Oyedaea ovalifolium* A. Gray was not properly positioned in the genus *Oyedaea*, being more closely related to *Perymenium*. He believed it did not readily fit in the latter genus, largely because of its neuter, sterile, ray florets, "and the numerous stomates on the corolla lobes." Fay (1978), who revised the genus *Perymenium*, did not cope with the problem of *Oyedaea ovalifolia*, presumably excluding this from *Perymenium* because of its sterile rays. Nevertheless, the taxon appears closely related to a group of *Perymenium* species centering around *P. gymnomioides*, which is a clambering shrub (like *P. ovalifolium*) with completely winged disk achenes (also like *P. ovalifolium*); indeed, except for the technical character of neuter ray florets, I can find no definitive characters with which to exclude it from *Perymenium*. In addition, the chromosome number of *P. ovalifolium* is reported as $n=ca\ 30$ pairs, this presumably being a tetraploid on a base of $x = 15$, as is all of *Perymenium*.

In any case, in a forthcoming treatment of *Perymenium* for Mexico I intend to treat *Oyedaea ovalifolia* as belonging to that genus and so make the appropriate combination here.

PERYMENIUM OVALIFOLIUM (A. Gray) B. Turner, comb. nov.

--Based upon *Oyedaea ovalifolia* A. Gray, Proc. Amer. Acad. Arts 5: 183. 1861.

Within *Perymenium*, as treated by Fay (1978), there exist four small, wholly herbaceous, species, the rest being shrubs, subshrubs or suffrutescent herbs, the stems of which apparently do not die back to the roots. These are 1). *P. oxycarpum*, a widespread species along the Pacific slopes with small, mostly graduate, involucre bracts; 2). *P. buphthalmoides*, also widespread but with a more interior distribution, having nongraduate involucre bracts; 3). *P. diguetii*, a rather localized endemic of Durango and Nayarit, with mostly procumbent stems; and 4). *P. jaliscoense*, a localized endemic near Guadalajara, Jalisco with erect

stems and elliptic, glabrescent, leaves.

McVaugh (1984) treated P. oxycarphum as synonymous (albeit questionably) with P. jaliscense, but accepted the remaining species. Within the widespread P. bupthalmoides he recognized four varieties, noting the group to be "a highly variable species complex." He recognized var. bupthalmoides as a widespread taxon extending from Sonora to Oaxaca; var. flexuosum (Greenm.) McVaugh as a localized taxon (western Michoacan and Mexico State) of generally higher elevations (2,500-3,000 m); var. occidentale McVaugh along the Pacific slopes (300-2,350 m); and var. tenellum (A. Gray) McVaugh from the Central Plateau of Mexico extending from Chihuahua to Mexico State.

Fay (1978) recognized only three varieties under P. bupthalmoides: 1). var. bupthalmoides (including var. flexuosum); 2). var. occidentale; and 3). var. tenellum.

I agree with Fay's treatment of P. bupthalmoides (accepting var. flexuosum as an high elevational form of var. bupthalmoides, but would add a fourth taxon, var. sonoranum, to the complex, and reduce to varietal status P. diguetii.

The latter is remarkably variable in the region southwest of Durango City; indeed, numerous intergrades between this and var. tenellum may be found. At least the variation appears to be one of a clinal nature, and not that expected from in situ hybridization with clear putative hybrids and both parents present.

A key to the various varietal taxon within this complex is provided below, along with a map showing their distribution. The latter is constructed from Fay's data plus new collections at TEX and additional sheets from ARIZ, ASU and LL. Finally, it should be noted that occasional plants of P. oxycarphum may be mistaken for P. bupthalmoides, usually either very old plants, where the involucre has not matured, or where, with age the inner bracts have been sloughed off. Vegetatively, P. oxycarphum much resembles P. bupthalmoides var. tenellum and one or two sheets of the former were identified tentatively as the latter by Fay (1978).

KEY TO VARIETIES

1. Receptacular bracts (chaff), mostly 3-5 mm long; involucre 5-7(8) mm high; heads mostly borne single or 1-2 on peduncles with appressed hairs; Central Plateau, Jal to Oax.....var. bupthalmoides
1. Receptacular bracts mostly (4)5-8 mm long; involucre (4)7-12 mm high; heads borne single or 2-4 on peduncles with appressed or spreading hairs (2)
 2. Stems prostrate; outer involucre bracts longer than the inner, mostly (4)8-12 mm long; heads solitary on peduncles with spreading hairs; achenes with 1 bristle and mostly very reduced awns (0.0-0.3

mm long); Nay-Dur.....var. diguetii

2. Stems erect; outer involucre bracts shorter or longer than the inner, 5-14 mm long; heads solitary or borne 2-4 on a common peduncle (3)
3. Heads borne solitary, these arising terminal from out of a leafy stem, not at all borne 2-4 on a rather common elongate peduncle (4)
3. Heads borne (1)2-4 at the end of a rather naked common peduncle, not arising solitary at the apex of a single leafy stem; Son.....var. sonoranum
4. Involucre bracts 8-14 mm long, subequal; plants mostly small, 10-30 cm high, more or less recumbent, stems and foliage coarsely hispid; Central Plateau from Dur to Pue.....var. tenellum
4. Involucre bracts 5-8 mm long, the outer somewhat reduced; plants stiffly erect, 30-60 cm high; stem and foliage appressed-pubescent; Pacific slopes.....var. occidentale

var. BUPHTHALMOIDES

Perymenium flexuosum Greenm.

Perymenium bupthalmoides var. flexuosum (Greenm.) McVaugh

Stems 15-50 cm long, erect or recumbent below; leaves 3-6 cm long, 0.5-3.0 cm wide; petioles 1-4 mm long; blades strigillose; heads single or rarely 2 on peduncles mostly 5-10 cm long; involucre bracts mostly appressed, 5-7 mm long; chromosome number, $n=ca$ 30 pairs.

This variety is largely confined to the Central Plateau from Jalisco and Nayarit to eastern Oaxaca. McVaugh (1984) recognized the var. flexuosum, largely by leaf shape (manifestly ovate with petioles 3-6 mm long) and distribution, at higher elevations (2500-3000 m); the var. bupthalmoides is said to have subsessile, elliptic to lanceolate, leaves, occurring at lower elevations (2000-2500 m). Since the types of both varieties are from the vicinity of Mexico City, there being much variation in leaf shape, etc., in this region, I accept Fay's treatment of var. flexuosum as a synonym of var. bupthalmoides.

var. DIGUETII (McVaugh) B. Turner, comb. nov.

Based upon Perymenium diguetii McVaugh, Contr. Univ. Michigan Herb. 9:437. 1972.

The type of this variety is from Nayarit and differs from the material in adjacent Durango in having very short involucre bracts (3.7-5.5 mm long). Nevertheless, in all other characters, the collections are very similar. Indeed, Fay (1978), while recognizing P. diguetii as a "good" species, nevertheless cited material of the latter from areas sw of

Durango City. We agree with this assessment and apply the varietal name diguetii to both, since in the latter region the taxon appears to intergrade with the var. tenellum to some considerable degree. An alternative treatment might recognize the prostrate plants with large involucre in sw Durango as a distinct variety, which would only emphasize the need to reduce diguetii to varietal status under P. buphthalmoides.

Specimens Examined: MEXICO. DURANGO: 25 mi W of Durango, route 40, stems prostrate, 24 Jul 1958, Correll & Johnston 20098 (LL); ca 32 mi W of Durango, 8300 ft, 2 Aug 1977, Bennett et al. 773 (TEX); 32.7 mi W of Durango, 8500 ft, 23 Jul 1955, Johnston 2687 (TEX); ca 31 mi SW of Durango, 16 Aug 1960, King 3749 (TEX). The latter two collections were annotated by Fay as Perymenium buphthalmoides var. tenellum.

var. OCCIDENTALE McVaugh, Contr. Univ. Michigan Herb. 9: 434. 1972.

A rather weakly defined taxon distinguished from var. buphthalmoides by its longer receptacular bracts and somewhat higher involucre, and by its more strict habit and sparsely strigose foliage. Intergrades between these occur.

PERYMENIUM BUPHTHALMOIDES var. SONORANUM B. Turner, var. nov.

Var. buphthalmoides simile sed caulibus strictibus, internodiis 5-18 cm longis, et capitulis (l) 2-4 (6) ad apices caulium portatis differt.

TYPE: MEXICO. SONORA: Yecora, 3 Aug 1970, Campbell W. Pennington 115 (holotype TEX).

ADDITIONAL SPECIMENS EXAMINED: MEXICO. CHIHUAHUA: Yapachic, 4 Sep 1971, Pennington 39 (TEX).

A very distinct taxon, perhaps deserving of specific rank. Fay (1978) cited the type as belonging to the var. buphthalmoides but in subsequent correspondence with me (Jan, 1981) he notes that this inclusion "has nagged at me continually" for it is far out of range and the upper portions of the plant appear somewhat shrubby; at least it is not certain that the shoots concerned arise from a caudex of the P. buphthalmoides type.

var. TENELLUM (A. Gray) McVaugh, Contr. Univ. Michigan Herb. 9: 435. 1972.

Perymenium rosei Rob. & Greenm.

Perymenium simulans Blake

This variety intergrades to the west with varieties diguetii and occidentale and to the south with var. buphthalmoides. Fay (1978) cites a number of intermediates between the latter and var. tenellum. As noted above, Fay positioned under this taxon, two sheets which I would assign to the var. diguetii. In addition, Fay (1978) cites a collection from 42 mi WSW of Cd. Durango (Maysilles 8490-A, MICH) which is in the

vicinity of these same specimens, and I can find little to distinguish among them.

LITERATURE CITED

Fay, S.J. 1978. Revision of *Perymenium* (Asteraceae-Heliantheae) in Mexico and Central America. *Allertonia* 1: 235-296.

McVaugh, R. 1984. *Perymenium*, in *Flora Novo-Galiciana* 12: 713-733.

Robinson, H. 1978...A new genus *Perymeniopsis* *Phytologia* 40: 495-496.

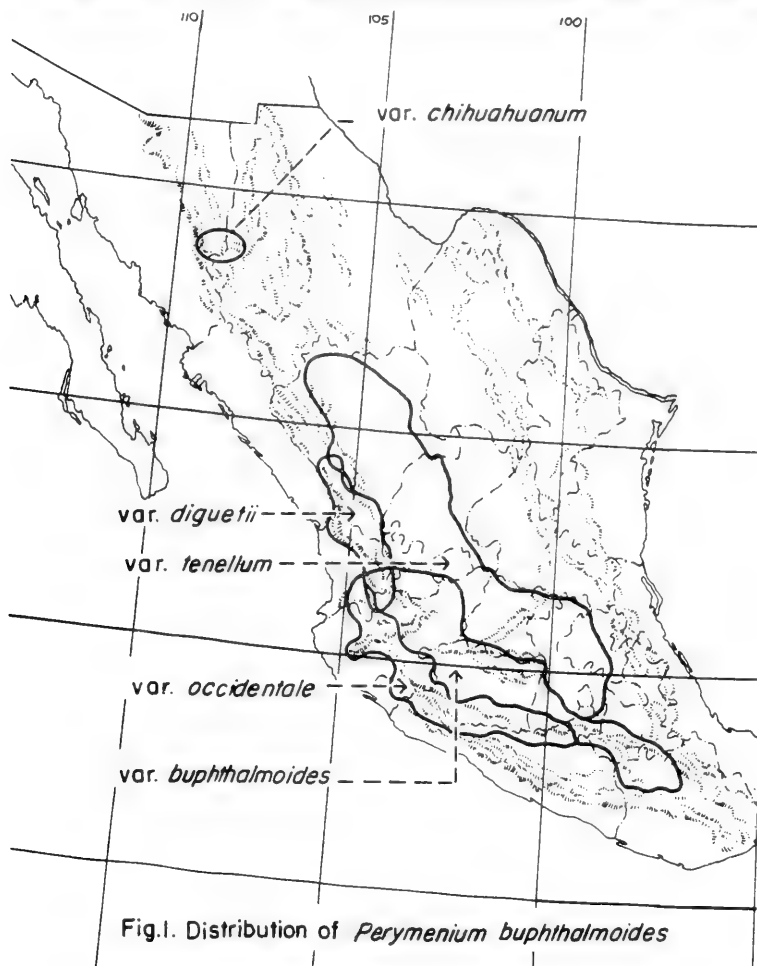


Fig.1. Distribution of *Perymenium bupthalmoides*



NEW TAXA AND COMBINATIONS IN MEXICAN ASTERACEAE
(AGERATINA, BERLANDIERA AND VERBESINA)

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In connection with the preparation of a treatment of the Asteraceae of Mexico, the following new taxa and names are deemed necessary.

AGERATINA MANANTLANA B. Turner, sp. nov.

A. rubricauli (H.B.K.) King & H. Rob. simile sed foliis parvioribus ovatis, capitulis amplioribus corollis longioribus, et setis pappi numerosioribus (60-80) in 2-3 seriebus differt.

Apparently suffruticose herbs or shrublets over 40 cm high; stems densely hirsute-puberulous; leaves opposite, 4-7 cm long, 3.0-4.5 cm wide; petioles 10-20 mm long; blades thin, broadly ovate, 3(5)-nervate from the base, sparsely pubescent on both surfaces, glandular-punctate or atomiferous-glandular beneath, the margins crenulodentate, obtuse or rounded at the apices; heads ca 10, borne in a lax, but strict, terminal corymb, the ultimate peduncles 10-20 mm long; involucre ca 7 mm high, the bracts lanceolate to narrowly ovate, purplish, puberulent, not noticeably ribbed; corollas white, tubular, glabrous, 8-9 mm long; achenes 3.5-4.0 mm long, markedly hispid, the pappus 2-3 seriate, of numerous (60-80) bristles, the outer series 3-6 mm long, the inner series 8-10 mm long.

TYPE: MEXICO. JALISCO: Reserva Biosfera Sierra de Manantlan, Cerro Capulin, shallow valley between the two highest points on the road (19°33'N x 104°09'W), oak-pine woodland, ca 2800 m, 9 Mar 1987, H.H. Iltis, B.F. Benz, A. Vazquez G. & M. Chazaro B 29400 (holotype TEX; isotype WISC).

The species belongs to the subgenus Neogreenella and is perhaps closest to A. rubricaulis, but differs from the latter in leaf shape, head size, corolla size, and especially by the 2-3 seriate pappus. The latter character suggests a relationship with the A. mairetiana complex (Turner, 1987) but it is strikingly different from members of this complex, both in its presumably suffruticose habit and in features of the achene.

In McVaugh's (1984) treatment of Eupatorium (which includes Ageratina) the species will key to, or near, Eupatorium ceriferum, a member of the Ageratina mairetiana complex, but A. manantlana resembles that species not at all. Apparently the latter is a localized endemic of the Sierra de Manantlan.

VERBESINA LINEARIS (McVaugh) B. Turner, comb. nov.

Based upon Encelia linearis McVaugh, Contr. Univ. Michigan Herb.

9:414.1972.

McVaugh (1984) states that "This plant resembles no other known to me from Mexico. It is assigned to Encelia because of the alternate leaves, the very flat disk-achenes with two weak awns, and the presumed sterility of the ray florets." All of these characters are found, in combination, within the genus Verbesina and the species concerned is clearly related to V. parviflora, possessing all of the head and floral characters of that highly variable, widespread, species. Verbesina linearis has no obvious characters which might relate it to Encelia, the latter having distinctive style branches and flat, markedly ciliate, achenes which dehisce with the adjoining pales at maturity.

McVaugh (1984) also included withing his concept of Encelia, E. angustifolia Greenm, which Blake had correctly transferred to Verbesina (as V. angustissima Blake), the name V. angustifolia (Benth.) Blake having priority. I treat Encelia angustifolia as a synonym of Verbesina parviflora. However, McVaugh states that he treats the latter species under Encelia "for convenience only" and notes that examination of mature fruits might lead to its placement elsewhere. Strangely, he does observe that his Encelia angustissima "may be confused with V. parviflora var. zacatecana" but can be distinguished by its nearly glabrous peduncles with a few rather upwardly-appressed hairs (as opposed to densely retrosely-hispidulous hairs on the peduncles of V. parviflora). Actually, vestiture of the peduncles in the latter species is highly variable, even within Jalisco, some populations having upwardly turned hairs (e.g., Cronquist 11154) and others with retrose hairs, as noted by McVaugh. In short, peduncular pubescence aside, both Encelia linearis and E. angustifolia are closely related to Verbesina parviflora and should reside in that genus near their congeners.

BERLANDIERA LYRATA var. MONOCEPHALA B. Turner, var. nov.

A. Berlandiera lyrata A. Gray var. lyrata scapis monocephalis non ramosis, foliis non lobatis, et pedunculis dense albohirsutis differt.

The above Latin diagnosis was rendered without its designated name in *Phytologia* 64: 206.1988. This was occasioned by a secretarial error in that the line concerned was inadvertently deleted from the original disk in the redaction process. Of course I should have reproofed the secretary's work, but what's a disk for? In any case, the oversight is corrected here since I was not sure that the proposed name might stand without its designated "banner".

ACKNOWLEDGEMENTS

I am grateful to Dr. Guy Nesom for the Latin diagnoses.

LITERATURE CITED

McVaugh, R. 1984. Encelia, in *Flora Novo-Galiciana* 12: 325.

- Turner, B.L. 1987. Study of the Ageratina mairiana complex. (Asteraceae-Eupatorieae). Phytologia 63: 417-427.
- Turner, B.L. 1988. A new variety of Berlandiera lyrata from northwestern Mexico. Phytologia 64: 205-208.

COBALT 60 RADIATION AND NITROGEN UTILIZATION BY THE

CLADONIA CRISTATELLA PHYCOBIONT TREBOUXIA ERICI

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Summary

Trebouxia erici Ahmadjian, the phycobiont of the lichen Cladonia cristatella Tuck., was grown in nitrogen modified media and irradiated by exposure to Co⁶⁰ in doses of 4, 40, and 480 kr. The alga was spectrophotometrically analyzed for changes in chlorophyll and phaeophytin content 4 and 8 d after irradiation. Dry weights of the cultures were also measured. After irradiation, chlorophyll content decreased over the 5 d period in all cases. The magnitude of the decrease in chlorophyll 'a' was inversely related to the radiation dose. The effect of radiation of the chlorophyll content was minimal and few changes were noted on the growth rate as measured by the dry cell weight. However, the 480 kr dose reduced the actual chlorophyll 'a' content of the cultures, while change in the quantity of chlorophyll 'b' was less affected. (NH₄)₂SO₄, KNO₃, l-alanine, and NH₄NO₃ had greater effects on the phycobiont compared with Co⁶⁰ induced changes. The pigments in the cultures were chlorophylls 4 days after irradiation, and mostly phaeophytins at 8 days. Cobalt 60 was not a significant factor in degrading chlorophyll to phaeophytin, apparently change was related to the growth phase of the culture. Certain nitrogen sources such as KNO₃ produced little effect in the change of chlorophyll to phaeophytin while with other sources such as l-alanine, complete conversion occurred.

Introduction

Lichens are known to be radioresistant. Hale (1967) found some species of lichens able to tolerate 10 to 12 kr/d for 3 yrs, while 11 species survived 2,250 r/d for 32 months (Woodwell and Whitaker, 1968). Various explanations identify lichen radioresistance. Hawksworth and Rose (1976) suggested that frequent dry dormant periods to which lichens are prone help increase their tolerance to radiation. Gannutz (1968) found both lichen symbionts and thalli were more radiosensitive when dry, while Brode (1964) attributed the radioresistance of lichens to diffuse meristematic tissue and the small nuclei of the fungal symbiont.

Few studies of radiation effects on lichen phycobionts have been made. Gannutz (1968) found reduced growth in Lecanora lathimii, Lesides varians, and Candelaria concolor, but not their isolated symbionts. He proposed that the radiosensitivity of the phycobiont

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was the limiting factor in the survival of irradiated lichens, however, the lichen thallus was more radiosensitive than either symbiont. Gannutz (1968) found a marked reduction in the DNA content of *T. erici* irradiated with 100 kr of gamma radiation.

The effects of ionizing radiation on free living algae are well known (Godward, 1962). In general, algae are more radioresistant than higher plants. Some cells may survive exposure to 2 million rads and continue to grow indefinitely. Zill and Tolbert (1958) found decreases in CO₂ fixation and O₂ evolution during photosynthesis in irradiated *Chlorella pyrenoidosa*.

Certain chemicals protect or aid recovery of irradiated algae. Thiourea, cysteine, and anaerobiosis produced by bubbling nitrogen through culture media protected algae from X-irradiation (Godward, 1962). Lawrence (1971) indicated nutrient treatments after irradiation effected cellular radiation damage in algae.

Modification of the nitrogen source effected the growth of *T. erici* and possibly effected the algal response to irradiation in the visible range, thus Fox (1967) reported increased growth on organic nitrogen compounds and reduced nitrogen sources for 3 species of *Trebouxia*. Ahmadjian (1967) also found better growth of *Trebouxia* on organic nitrogen sources, but only when a carbon source was included. Fox noted the best growth of *T. erici* on media containing arginine, followed by alanine, casamino acids, proline, and guanosine.

The current study was designed to examine the effects of nitrogen sources on the response of *T. erici* to irradiation. Changes in the dry weight and chlorophyll content of colonies were studied.

Materials and Methods

Algal cultures and growth conditions

Axenic cultures of the lichen phycobiont *T. erici* were obtained from the collection of Dr. Vernon Ahmadjian, Clark University, Worcester, Massachusetts. Algal cells were grown in 25 x 150 mm screw cap glass culture tubes containing 28 ml of modified Bold's Basal Medium (Ahmadjian, 1967). Culture tubes were divided into 8 sets of 14 tubes. One tube in each set contained no nitrogen source while the other 13 each contained one of the following nitrogen sources, equivalent in N content to 0.75 g/l NaNO₃: l-alanine, l-arginine, l-asparagine, casein, KNO₃, l-lysine, NaNO₃, NH₄Cl, NH₄NC₃, (NH₄)₂SO₄, peptone, tryptophan, urea. All media were sterilized in an autoclave at 121 C for 20 min except that which contained urea. The urea solution was sterilized in a Seitz filter and added to autoclaved media.

Tubes containing the media were inoculated with suspensions of cells grown in liquid medium with NaNO₃ as the nitrogen source. Each set of tubes was placed in separate baskets and illuminated from below with fluorescent light providing 550 lux of constant illumination. Cultures were incubated at 20 C.

Two sets of culture tubes each were irradiated at 4, 40, and 480 kr acute radiation at the Phoenix Memorial Laboratory, The Univ. of Michigan. A radiation source of Co^{60} was used. Irradiation was carried out 24 d after inoculation during log phase of growth. Two sets of tubes were not irradiated and served as controls.

Dry weight and chlorophyll content analysis

On day 4 and 8 after irradiation the cultures were analyzed for chlorophyll content using a spectrophotometric analysis adapted from Strickland and Parsons (1972). Four drops of a solution of Na_2CO_3 at pH 11 were added to each tube to prevent the degradation of chlorophyll to phaeophytin. Algal cells were then centrifuged using a Vortex Jr. mixer. The volume of the sample was measured and divided in two. One half of each cell culture was filtered using a tared millipore HA filter (pore size, 45 μm), dried to a constant weight at 60 C, and weighed, while the other half was filtered on an unweighed millipore filter.

Each of the unweighed filters with the collected cells was ground with approximately 6 ml of 90% acetone in a glass tissue grinder. It was further ground in a small mortar with a pestle in the presence of a small amount of quartz sand and 90% acetone. The 90% acetone was prepared by shaking reagent grade acetone (B.P. 56.6 C with granular, anhydrous sodium carbonate, decanting the acetone into a dark bottle and mixing in a ratio of 9:1, acetone:distilled water. The solution was transferred to a 15 ml screw cap centrifuge tube and stored at 4 C in the dark for 40 h to extract the chlorophyll. After extraction the sample was allowed to come to room temperature in the dark and was then centrifuged at 3,000 rpm for 10 min. The sample was then brought to 10 ml volume in a fresh tube by adding 90% acetone. A portion was then transferred to a 1.0 cm path length cuvette. The absorbance of the solution was measured against an acetone - filter blank at wave lengths of 750, 665, 645, and 630 nm through a slit width of 0.5 nm with a Varion Techtron spectrophotometer. To determine the quantity of phaeopigments, the solution was acidified by the addition of 2 drops of dilute HCl (concentrated HCl: distilled water, 1:1) per cuvette. The absorbance of the solution was then remeasured at 665 and 750 nm. A ratio of absorbance after acidification (a) to the absorbance before acidification (b) was made for each sample at the designated wavelengths by using the equation $665_b - 750_b / 665_a - 750_a = \alpha$. Acidification of a solution of pure chlorophyll 'a' results in a 40% reduction in its optical density at 665 nm. Samples with α equal to 1.7 contained little phaeophytin while those of pure phaeophytin yield α equal to 1.0 (American Public Health Association, 1971). Contents of chlorophylls 'a' and 'b' were determined using the following equations: $\text{Chl. 'a' (mg/l extract)} = 11.6 A_{665} - 13.1 A_{645} - 0.14 A_{630}$; and $\text{Chl. 'b' (mg/l extract)} = 20.7 A_{645} - 4.33 A_{665} - 4.42 A_{630}$, where A = the absorbance of the extract at the wave length (nm) indicated by the subscript. The absorbance readings at 750 nm were used as a correction for turbidity by subtracting any value measured at that wavelength from the absorbance values at the

other wavelengths. Chlorophyll values for each sample were determined and expressed in terms of the dry weight of the sample by weighing the other half on a Mettler analytical balance. Samples were analyzed in replicates of three. Mean values were then used for a computer analysis of frequency distributions of values at all radiation levels and the control versus those recorded at 480 kr exposures only. Least squares multiple regression analysis was used to determine the strongest factors affecting chlorophyll content using a computer and SPSS program (Nie et al., 1975).

Results and Discussion

Dry weights

Table 1 shows the dry weight of *T. erici* cultures after 28 and 32 d growth. It can be seen that $(\text{NH}_4)_2\text{SO}_4$, KNO_3 , l-arginine, and NH_4NO_3 promoted the most rapid growth. Rapid algal growth on media containing ammonium salts has been documented in previous studies but rapid growth on KNO_3 is somewhat unusual. Most green algae do not prefer nitrate containing media (Round, 1965). Results showed that exposure to radiation affected the rate of increase of the dry weight over time. Even if the algae were killed by the radiation, the weight of the cell materials would be about the same as a control culture of the same age. Cultures with a majority of dead or reproductively incapacitated cells can not increase, limiting their potential for weight increase over time.

As can be seen in Table 2, the percent change in dry weight of the algae from 4 to 8 d after irradiation produced little change at 4 and 40 kr, however a decrease was noted at 480 kr. Algae grown on some media, such as l-arginine and peptone, had reduced growth rates in the non-irradiated state (Table 1). There was not clear interaction between nitrogen source and radiation exposure with respect to changes in dry weight. Radiation may well have accelerated the onset of the senescent growth phase of the cultures, by killing or disabling cells.

Chlorophyll content

Radiation exposure, when compared to media type, was not a major factor in determining the chlorophyll content of *T. erici* at the specific dates of analysis (Tables 3,4). KNO_3 , $(\text{NH}_4)_2\text{SO}_4$, NH_4NO_3 , and NH_4Cl had important effects on the chlorophyll content of the algae. Exposure to 480 kr radiation reduced the actual amount of Chl. 'a', but its effects were much less pronounced than the effects of the nitrogen sources listed.

Table 5 shows that the reduction in Chl. 'a' content from 4 to 8 d after irradiation is inversely related to the radiation dosage, as were the changes in dry weight. The correlation was less apparent with Chl. 'b'. Mutated cells, with various changes in pigmentation, are known to occur in the progeny of irradiated algae (Zakharov and Tugerinov, 1964). Although some destruction of pigment in the *T. erici* cultures by radiation exposure may occur, the observed

effects appear related to changes in growth rate. Algae grown under the nonirradiated control condition showed the greatest decrease in Chl. 'a' content from 4 to 8 d after irradiation (Table 5). It seems unlikely that radiation was the major factor in changes of pigment quality. Increases in cell chlorophyll content lagged behind gains in dry weight. The control cultures, unaffected by radiation, continued to grow rapidly and had a loss of pigment for the interval between 30 and 34 d after inoculation. Reduced growth in the irradiated cultures having a stable chlorophyll content would account for a smaller differential between the weight of chlorophyll and cell weight as the radiation dose increased.

Table 5 shows the radiation effect is different for the two types of chlorophyll, therefore modification in dry weight gains by radiation can not completely explain the results. The least relative reduction in Chl. 'b' from day 4 to day 8 after irradiation was 40 k. Less degradation of Chl. 'b' is apparent. On the other hand, the production of the pigment may be stimulated. Effects on the RNA or enzyme systems could be responsible since the biosynthesis of Chl. 'b' involves a sequential oxidative step from Chl. 'a' (Meeks, 1974), and radiation could effect this, or another, step in the process.

Phaeophytin 'a' content

The non-photosynthetic phaeophytin pigment that absorbs light at the same wavelengths as Chl. 'a' can be estimated by converting all of the Chl. 'a' to phaeophytin 'a' by acidification. Solutions of pure Chl. 'a' show approximately 40% reduction in optical density when converted to phaeophytin 'a' (American Public Health Assoc., 1971), and demonstrate no reduction in optical density when acidified. Table 6 presents the results of acidification of all chlorophyll solutions of the isolates as well as the means within radiation doses with all media. These results identify the amount of Chl. 'a' and phaeophytin 'a'. Percentage values close to or equalling 40% identify a large reduction in optical density indicating the presence of mostly Chl. 'a'. Percentage values near or equal to 0 showed no reduction in optical density of the solution by the addition of acid, therefore most of the pigment was phaeophytin 'a'. Some solutions showed a reduction in optical density slightly greater than 40% due to the sensitivity of the spectrophotometric method. All values above 40% were standardized to that value for purposes of analysis.

Mean values within radiation doses were all close to 32% 4 days after irradiation, indicating a greater proportion of Chl. 'a' than phaeophytin 'a' in the solutions (Table 6). At 8 days however, all reductions dropped to only about 9% indicating a natural degradation of Chl. 'a' to phaeophytin 'a' regardless of radiation dose. Examining the means for each medium, KNO_3 showed little degradation of Chl. 'a' from 4 to 8 days after irradiation. NH_4NO_3 , $(\text{NH}_4)_2\text{SO}_4$, and l-lysine media produced algal cells with pigment as phaeophytin, initially showing optical density reductions after

acidification of 23%, 24%, and 13% respectively. Some conversion of Chl. 'a' to phaeophytin 'a' from day 4 to day 8 was noted with NaNO_3 , while a greater change was noted with l-alanine which contained pure Chl. 'a' 4 days after irradiation and pure phaeophytin at 8 days.

Nitrogen sources had a more pronounced affect on the alga than did radiation exposure. Radiation appeared to modify growth. Affects on the chlorophyll content were relative to weight changes. The source of nitrogen in the medium did not protect *T. erici* against radiation effects, nor did it enhance those effects.

Acknowledgments

Appreciation is extended to Dr. Vernon Ahmadjian, Clark University, for the algal isolate.

References

- Ahmadjian, V. 1967. The Lichen Symbiosis. Elaisdell Publishing Co., Waltham, Massachusetts.
- American Public Health Association. 1971. Standard Methods for Examination of Water and Wastewater, 17th Ed.
- Brode, I.M. 1964. Field studies on the effects of ionizing radiation on lichens. Bryologist 67:76-87.
- Fox, C.H. 1967. Studies of the cultural physiology of the lichen alga *Trebouxia*. Physiologia Plantarum 20:251-262.
- Gannutz, T.P. 1968. The Biological Effects of Gamma Irradiation on Lichens and Lichen Symbionts. Ph.D. thesis, Clark University, Worcester, Massachusetts.
- Godward, M.B.E. 1962. Invisible radiations. In: Physiology and Biochemistry of the Algae. Ed. R.A. Lewin., pp. 551-566. Academic Press, New York.
- Hale, M.E. 1967. The Biology of Lichens. Edward Arnold Co., London.
- Hawksworth, D.L. and F. Rose. 1976. Lichens as pollution monitors. Institute of Biology Studies, n.66 Edward Arnold Co., London.
- Lawrence, C.W. 1971 Cellular Radiobiology. Edward Arnold Co. London
- Meeks, J. C. 1974. Chlorophylls. In: Algal Physiology and Biochemistry. Ed. W.D.P. Stewart., pp. 161-176. Univ. of Calif. Press.
- Nie, N.H., C.H. Hall, J.J. Jenkins, K. Steinbrenner, and D.H. Bent. 1975. Statistical Package for the Social Sciences. McGraw Hill, NY
- Round, F.E. 1965. The Biology of Algae. Edward Arnold Co., London.
- Strickland, J.D.H. and T.R. Parsons. 1972. A Practical Handbook of Seawater Analysis. Bull. 167. Fisheries Research. Ottawa, Canada.
- Woodwell, G.M. and R.H. Whittaker. 1968. Effects of chronic gamma irradiation on plant communities. Quarterly Review of Biology 43:41-55.
- Zakharov, I.A. and V.V. Tugarinov. 1964. Radiosensitivity of the unicellular alga *Chlorella vulgaris*. Radiobiology 6:126-130.
- Zill, L.P. and N.E. 1958. The effect of ionizing and ultraviolet radiations on photosynthesis. Archives of Biochemistry and Biophysics 76:196-203.

Table 1. Mean dry weights of Trebouxia erici grown in 14 ml of nitrogen modified media

Medium	Mean dry weight		Percent change
	A	(mg) B	
1-Alanine	4.98 (6.68)	6.77 (7.68)	+36 (-15)
No nitrogen	3.73 (3.39)	4.83 (4.91)	+29 (+45)
NaNO ₃	7.87 (5.67)	9.93 (11.44)	+26 (+102)
NH ₄ NO ₃	8.72 (10.63)	10.68 (12.73)	+22 (+20)
Tryptophan	4.50 (3.54)	5.30 (7.38)	+18 (+108)
NH ₄ Cl	7.64 (4.38)	8.94 (10.63)	+17 (+143)
1-Lysine	4.06 (3.60)	4.51 (3.66)	+11 (+2)
Urea	7.91 (9.35)	8.64 (8.52)	+9 (-9)
KNO ₃	9.52 (8.55)	10.16 (11.78)	+7 (+38)
1-Asparagine	7.38 (7.23)	7.73 (7.88)	+5 (+9)
Peptone	6.67 (6.90)	6.78 (6.77)	+1 (-2)
1-Arginine	9.22 (10.20)	8.07 (5.71)	-12 (-44)
(NH ₄) ₂ SO ₄	10.49 (11.23)	9.11 (9.06)	-13 (-19)
Casein	5.75 (4.26)	4.49	-14

Means calculated from control and 3 radiation dose values. Control values in parentheses. A - 28 days after inoculation and 4 days after irradiation. B - 32 days after inoculation and 8 days after irradiation.

Table 2. Mean dry weights of Trebouxia erici colonies grown in 14 ml of all nitrogen modified media

Radiation dose (kr)	Mean dry weight (mg)		Percent change
	Days after irradiation 4	8	
Control	6.83	8.32	+21.8
4	7.56	8.71	+15.2
40	7.16	8.71	+21.6
480	6.58	6.57	-0.2

Table 3. OLS regression estimation of factors affecting the chlorophyll "a" content of T. erici

4 Days after irradiation		
Dependent variable: Chl. 'a'	(n=56)	R ² =0.60 α =0.8397 μ g
Independent variable	B	β
	(g/mg dry wt. cells)	
KNO ₃	2.3000	0.5881
NH ₄ Cl	1.4287	0.3653
1-Arginine	1.3532	0.3460
NaNO ₃	1.1340	0.2900
NH ₄ NO ₃	0.9834	0.2515
480 kr	-0.5413	-0.2329

Table 3. continued

8 Days after irradiation

Dependent variable: Chl. 'a'

(n=56) $R^2=0.82$ $\alpha=0.2619$ μg

Independent variable

	B	β
(g/mg dry wt. cells)		
KNO ₃	1.7525	0.6519
NaNO ₃	1.6169	0.6015
NH ₄ NO ₃	1.2781	0.4158
NH ₄ Cl	0.9793	0.3643
l-Arginine	0.6547	0.2436
(NH ₄) ₂ SO ₄	0.4875	0.1814

No independent variable is listed unless it is significant at 0.05.

Table 4. OLS regression estimation of factors affecting the chlorophyll 'b' content of *T. erici*

4 Days after irradiation

Dependent variable: Chl. 'b'

(n=56) $R^2=0.68$ $\alpha=0.1620$ μg

Independent variable

	B	β
(g/mg dry wt. cells)		
KNO ₃	0.6222	0.6860
NaNO ₃	0.3147	0.3470
l-Arginine	0.2962	0.3265
NH ₄ Cl	0.2301	0.2536
Tryptophan	0.1541	0.1699
l-Lysine	-0.1428	-0.1575

8 Days after irradiation

Dependent variable: Chl. 'b'

(n=56) $R^2=0.47$ $\alpha=0.2659$ μg

Independent variable

	B	β
(g/mg dry wt. cells)		
KNO ₃	0.4054	0.5436
NH ₄ Cl	0.2744	0.3680
NaNO ₃	0.2545	0.3413

Table 5. Chlorophyll content of *T. erici* cultures after irradiation

Radiation dose (kr)	Chlorophyll 'a'		Percent change
	(g/mg dry wt. cells)		
	Days after irradiation		
	4	8	
Control	1.467	0.769	-47.6
4	1.305	0.758	-41.9
40	1.290	0.764	-40.8
480	0.812	0.670	-17.5
	Chlorophyll 'b'		
Control	0.352	0.049	-86.1
4	0.228	0.065	-71.5
40	0.249	0.130	-47.8
480	0.217	0.069	-68.2

Values based on means of 3 trials across 14 types of media.

Table 6. Percent reduction in optical density of chlorophyll solutions after acidification with select nitrogen media

Radiation dose (kr)	Reduction in optical density (%)				Mean
	Control	4	40	480	
1-Alanine	40 (0)	40 (0)	40 (0)	40 (0)	40 (0)
1-Arginine	34 (0)	40 (4)	40 (4)	40 (0)	39 (2)
1-Asparagine	40 (0)	34 (7)	40 (0)	40 (0)	38 (2)
Casein	40 (20)	23 (-)	40 (-)	40 (-)	36 (5)
KNO ₃	37 (32)	40 (37)	36 (35)	40 (28)	38 (33)
1-Lysine	0 (0)	40 (-)	0 (-)	- (-)	13 (0)
NaNO ₃	22 (21)	40 (22)	40 (0)	23 (35)	31 (20)
NH ₄ Cl	40 (7)	31 (19)	18 (0)	34 (0)	31 (7)
NH ₄ NO ₃	24 (0)	30 (0)	14 (16)	13 (0)	23 (4)
(NH ₄) ₂ SC ₄	23 (0)	40 (0)	40 (7)	0 (0)	24 (2)
No Nitrogen	- (-)	- (-)	- (-)	- (-)	-
Peptone	32 (0)	40 (0)	40 (0)	40 (-)	38 (0)
Tryptophan	40 (-)	36 (-)	12 (0)	40 (-)	32 (0)
Urea	40 (18)	0 (0)	40 (36)	40 (0)	30 (14)
Mean within radiation dose	32 (8)	34 (9)	31 (9)	32 (7)	

Unbracketed values - 4 days after irradiation

Bracketed values - 8 days after irradiation

(-) - No pigment present

NEW OR NOTEWORTHY SPECIES OF *ALSTROEMERIA*
(ALSTROEMERIACEAE)

Pierfelice Ravenna

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The main purpose of this brief account on *Alstroemeria*, is to advance the Latin diagnosis of a number of new species. Most of them were included in a partial revisional work, illustrated with colour photographs, that was necessary to retire from an U.S.A. journal, after two years of having submitted it.

Since my treatment of *Alstroemeria* for Flora Patagonica (Ravenna 1969), I began to study in the field and collect the species of this genus, in Brazil, Chile, and Peru. The results are now being published.

ALSTROEMERIA SABULOSA Ravenna, sp. nov.

Planta in loco natali 4-7 cm alta, sub cultura usque 40 cm alta. Folia congesta rosulata lanceolata cinereo-viridia vel subdistantia 12-25 mm longa et 3-4 mm lata. Lamina tepalorum rosea vel albo-rosea in medio vel duis tertiis superioribus purpureo-tincta apiculo lutescente; tepala interiora superiora in duis tertiis superioribus purpureo-punctata saepissime zona lutea notata.

Collections. Culta in Santiago Chiliae ex plantis in arenosis littoraneis pr. El Tabo prov. Valparaiso collectis; Ravenna 1521, Oct. 1977 (Herb. Ravennae holotype, BM, K, NY, SGO isotypes).

ALSTROEMERIA TIMIDA Ravenna, sp. nov.

Ab *A. recumbente* Herb. et *A. sabulosa* Rav. proxima necnon a prima radiis unifloribus tepalis exterioribus praeter apiculum superne magis rotundatis, ab altera foliis tenuioribus et tepalis gracilioribus pallidioribusque distincta. Folia caulis haud resupinata lineari-lanceolata pallide viridia 3.5-5 cm longa et 2.7-3.5 mm lata. Perigonium praesertim albicans et dilute roseum 23-24 mm longum et 37-39 mm i diametro verticale aut 39-40 mm in diametro horizontale.

Collections. Culta in Santiago Chiliae ex plantis in decliviis superioribus montis Roble Alto pr. Polpaico collectis; Ravenna 3078, 14 Nov. 1985 (Herb. Ravennae holotype, NY, SGO isotypes).

ALSTROEMERIA YAEAE Ravenna, sp. nov.

Species ab *A. timida* Rav. proxima sed habito multo majore foliis caulium vegetativum haud rosulatis illis caulium floriferum deciduis, inflorescentia latiora usque 11-3 radiata floribus majoribus roseo-purpureis recedit. Planta 30-90 cm alta. Folia lineari-lanceolata glaucescentia glabra ad 6 cm longa et 2-4 mm lata. Perigonium 27-40 mm longum et 37-48 mm in diametro verticale aut 34-41 mm in diametro horizontale.

Collections. Prope ripas rivuli in convalle Macul prov. Santiago Chiliae; Ravenna 3081, 8 Dec. 1985 (Herb. Ravennae holotype, BM, NY, SGO et caet. isotypes).

ALSTROEMERIA VENUSTA Ravenna, sp. nov.

Species *A. pelegninam* L. simulans sed foliis herbaceis anguste oblanceolatis apice recto (haud carnosulo-deli-quescentibus apice recurvo). Planta subparva usque 22 cm alta; tepala late spathulata alba late sensimque roseo-vittata.

Collections. In arenosis a Laraquete meridionem versus prov. Arauco Chiliae; Ravenna 1025, Nov. 1970 (Herb. Ravennae holotype).

ALSTROEMERIA NIDULARIS Ravenna, sp. nov.

Ab *A. ciliata* Poepp. affinis sed perigonio roseo, tepalis haud recurvatis late obovato-oblanceolatis ad apicem valde rotundatis. Caules vegetativi foliis herbaceis resupinatis late oblanceolatis marginibus ciliatis. Inflorescentia 6-8-radiata radiis unifloribus ad medium bractea unica instructis.

Collections. Ad Cipreses in valle fluminis Maule prov. Talca Chiliae; Ravenna 1103, Nov. 1971 (Herb. Ravennae holotype).

ALSTROEMERIA BILABIATA Ravenna, sp. nov.

Species *A. revoluta* Ruiz et Pav. in herbario interdum simulans sed caulibus vegetativis foliis late oblanceolatis marginibus ciliatis instructis; caulis floriferus foliis flexuosis marginibus glabris, radiis inflorescentiae laxe patentibus 2-3-floribus raro unifloris, floribus bilabiatis et tepalis interiori-superioribus viperatis haud luteo-zonatis.

Collections. Chile, prov. Santiago, Cerro Robles; A. Hoffman s.n., 30 Nov. 1978 (Herb. Ravennae holotype, NY, SGO isotypes). In nemoribus altiplanitie Cantillanae prov. Cachapoal Chiliae; Ravenna 3300, Dec. 1987 (Herb. Ravennae).- Philippi (1896), mistaken this species for *A. revoluta* Ruiz et Pav.

ALSTROEMERIA POLPAICANA Ravenna, sp. nov.

Planta ad anthesin usque 18 cm alta. Folia tarde hyemalia et vernalia suberecta conferta oblanceolata viridipruinosa paulo flexuosa 4-6 cm longa et 6-9 mm lata. Inflorescentia saepe 3-radiata radiis unifloribus in tertio superiore bractea sterili 7 mm longa instructis. Perigonium erecto-patente. Tepala dilute roseo-albicantia basin versus viridescencia tertio superiore sordide viride; exteriora ad 29 mm longa et 8.8 mm lata sursum in facie adaxiale castaneo-striolata, interiori-superiora 30 mm longa et 6.4 mm lata castaneo-striolata, interiori-inferius 29 mm longum et 6.4 mm latum in summo rubellum et pallide viride acutum.

Collections. Culta in Santiago Chiliae ex plantis pr. summum montis Roble Alto collectis; Ravenna 2346, Oct. 1984 (Herb. Ravennae holotype, BM, NY isotypes). Chile, prov. Santiago, Caleu, Cerro Robles; A. Hoffman s.n., 30 Oct. 1978 (Herb. Rav.).

ALSTROEMERIA EPULAUQUENSIS Ravenna, sp. nov.

Planta 17-30 cm alta. Caules erecti foliis resupinatis distantibus lineari-lanceolatis 2-5 cm longis et 1.7-4 mm latis instructis. Inflorescentia 2-3-radiata radiis 1-2-floribus. Perigonium roseo-lilaceum vel roseo-purpureum 30-32 mm latum. Tepala exteriora obovato-ungiculata ad 27 mm longa et 9.5 mm lata superne margines minute denticulatos. Tepala interiora circ. 32 mm longa et 4-5 mm lata, superiora zona media lutea striis rubellis notata.

Collections. Argentina, prov. Neuquen, 5 km de Las Ovejas, camino a las Lagunas Epulauquen, subida a Mallín Verde; Boelcke et al. 10757 (BAB holotype, BAA, SI isotypes). Idem, dept. Minas, Lagunas Epulauquen, extremo oeste; Boelcke et al. 10919, 16-I-1964 (BAA, BAB, SI). Idem, Lagunas Epulauquen, antigua aduana; M. Dimitri et al. 7-II-1963 (DPN 4453 at BA). Idem, Parque Nac. Lanín, a 8 km de las lagunas; Dimitri et al. 7-II-1963 (DPN 4313 at BA). Idem; Otto Asplund, 11-VI-1902 (BAB), det. Hicken A. *diazii* Phil. Idem, Arroyo Chenque-Pehuen; P. Navarrete Piñeiro, XII-1903 (BAB 14565), det. Hicken A. *diazii* Phil.

ALSTROEMERIA LACRIMA-SOLIS Ravenna, sp. nov.

Species ab *A. spathulata* Presl et *A. pigmaea* Herb. proxima; a prima floribus majoribus insigniter luteis tepalis interioribus rubro-suffusis, a secunda foliis coriaceis saepe latioribus spathulatisque et tepalis majoribus.

Collections. Argentina, prov. Neuquen, Pampa del Río Sa-

lado; S. Schajovskoy s.n., 10-XII-1966 (Herb. Ravennae holotype, M, SI isotypes). Dept. Chos-Malal, a 9 km de Chos-Malal, camino a Andacollo; Boelcke et al. 10667 (BAA, BAB, SI). De Balsa Huitren a Buta Ranquil; F.A. Roig, Herb. Ruiz-Leal 26738, 19-XI-1969 (MEN). Prov. Rio Negro, Paso Limay-Paso Flores; M.N. Correa 3144 (BAB).

ALSTROEMERIA SPECTABILIS Ravenna, sp. nov.

Planta 40-100 cm alta. Folia resupinata oblanceolata flexuosa patentia tenora in facie abaxiale resupinata nitide viridia, adaxiale glaucescente ad margines minutissime sparseque ciliolata 4.4-11.2 cm longa et 8.5-27 lata acuta. Inflorescentia 6-12-radiata. Flores inodori cernui vel erecto-patentes. Ovarium obovato-truncatum viride 12-costulatum costulis viscoso-tumescens liquidum secretantibus 5-8.2 mm longum et 4-7.2 mm latum. Perigonium plus minusve infundibulatum vel apertum pallide lilaceo-violaceum 55-80 mm in diametro verticale et 42-60 mm in diametro horizontale.

Collections. Chile, prov. Aconcagua, mun. Maipú, Quebrada de La Plata; C. Muñoz, X-1936 (SGO 47019 & 47020). Sine loc. (SGO 38095 & 38142). In decliviis meridiem exadversus ad Quebrada de la Plata in praedio Rinconada mun. Maipú prov. Santiago Chiliae; Ravenna 2405, X-1974 (Herb. Ravennae holotype, BM, G, NY, SGO, U isotypes). Prov. Aconcagua, Catemu; Philippi (SGO 38095).

ALSTROEMERIA MAGNA Ravenna, sp. nov.

Species ab ovario 12-costulato affinitate cum *A. spectabilis* Rav. prompte distinguitur, sed statura ad 1.60 m habitu robustiore caule florifero crassiore foliis deliquescentibus in facie abaxiale fusco-viridibus tepalis latioribus rigidulis recedit.

Collections. Inter frutices inter Los Molles et Los Vilos prov. Aconcagua Chiliae; Ravenna 1127, Oct. 1971 (Herb. Ravennae holotype).

ALSTROEMERIA LOCUNDA Ravenna, sp. nov.

Caules vegetativi vernaes elongati 10-30 cm longi foliis late oblanceolatis interdum confertis apice rotundato inferioribus ad 5 cm longis et 7-18 mm latis parce contortis vel rectis cinereo-viridibus. Caulis floriferus foliis lanceolatis vel anguste lanceolatis haud resupinatis undulatis crassiusculis acutis 1.5-6 cm longis et 3-11 mm latis. Perigonium laete roseum 40-50 mm longum et 55-83 mm in diametro verticale et 21-33 in diametro horizontale.

Collections. In decliviis supra Laguna Lo Encañado in Andibus supra Santiago Chiliae; Ravenna 1201, Febr. 1972

(Herb. Ravennae holotype, NY, K, SGO isotypes).

ALSTROEMERIA CANTILLANICA Ravenna, sp. nov.

Species ab *A. inconspicua* Phil. et *A. polypaicana* Rav. affinis sed a prima floribus majoribus ambis serieis tepalorum castaneo-striolatis, a secunda statura majore et perigonio magis aperto. Planta usque 40 cm alta. Folia cinereo-viridia anguste lanceolata flexuosa haud resupinata 5-7 cm longa et 48 mm lata. Perigonium roseum 30-37 mm longum et 37-57 mm in diametro horizontale aut 48-58 mm in diametro verticale.

Collections. Infra marginem altiplanitie Cantillana aut sub umbra Nothofagi prov. Cachapoal Chiliae; Ravenna 3299, Dec. 1987 (Herb. Ravennae holotype, K, NY isotypes).

ALSTROEMERIA POETICA Ravenna, sp. nov.

Ab *A. magnifica* Herb. et *A. violacea* Phil. relata sed ab ambis foliis glabris flaccioribus glaucescentibus (haud laete viridibus vel nitentibus) a secunda etiam perigonio ad lateras leviter compresso tepalo interiori-inferiore basin versus profuse atro-rubro-striato recedit.

Collections. Chile, prov. Coquimbo, dept. Ovalle, Zorri-lla; Jiles 1645, 22-X-1949 (Herb. Rav., CONC). Idem, Hda. Amolanas; Jiles 948, 3-X-1948 (Herb. Rav., CONC). Idem, Talinay, Quebrada de Talca; Jiles 444, 16-XI-1947 (Herb. Rav., CONC). Idem, Fray Jorge; Jiles 5583, 20-XII-1970 (Herb. Rav., CONC). In collibus prope sylvas Fray Jorge dictas prov. Coquimbo Chiliae; Ravenna 1621, Oct. 1971 (Herb. Ravennae holotype, NY, SGO isotypes).

ALSTROEMERIA LONGAVIENSIS Ravenna, sp. nov.

Species ab *A. revoluta* Ruiz et Pav. et *A. timida* Rav. quibus confundere potuit similis sed a prima perigonio roseo (haud pallide violaceo) tepalisque minus recurvatis et a secunda foliis caulis vegetativis haud rosulatis tepalis interioribus distincte roseis distinguo.

Collections. In nemoribus vallis fluminis Longaví ditione La Balsa prov. Linares Chiliae; Ravenna 1630, Nov. 1971 (Herb. Ravennae holotype, NY, SGO isotypes).

ALSTROEMERIA HUEMULLINA Ravenna, sp. nov.

Ab *A. ligtu* L. similis sed foliis flaccidioribus et floribus scarlatinis vel aurantiacis differt. Folia oblanceolata 6-7.5 cm longa et 10-14.5 mm lata pallide viridia in facie abaxiali resupinata cinerea marginibus glabris.

Collections. Chile, prov. Ñuble, Termas de Chillán; F. W. Pennell 12387 (SGO). Idem, Montes de Chillán; M.A. solís de Obando (SGO 38121). In nemoribus pr. Termas de Chillán; Ravenna 1700, II-1972 (Herb. Ravennae Holotype, SGO isotype).

ALSTROEMERIA MONANTHA Ravenna, sp. nov.

Species ab *A. poetica* Rav. relata sed foliis caulis vegetativi parvis 3-4 cm longis rosulatis inflorescentia uniradiata radio unifloro. Perigonio violaceo-purpureo majusculus tepalis exterioribus late oblanceolatis sursum rotundatis apiculo deltaceo instructis.

Collections. A Puerto Oscuro septentrionem versus prov. Aconcagua Chilíae; Ravenna 3327, Oct. 1985 (Herb. Ravennae holotype, K, NY, SGO isotypes). Also found near Los Vilos, in the same province.

ALSTROEMERIA OXYPHYLLA Ravenna, nom. nov.

Syn.: *Alstroemeria crocea* Philippi (nom. illeg.), An. Univ. Chile 21 (2): 449, 1862; non *A. crocea* Ruiz et Pavón (1802).

Collections. Chile, prov. Maule (?), Tres Cruces (SGO 47067 holotype).

ALSTROEMERIA MUTABILIS Kuntze ex Kunth, Enum. Pl.: 777, 1850. Syn.: *A. araucana* Philippi, An. Univ. Chile 43: 551, 1873.- *A. stenopetala* Philippi, loc. cit. 43: 547, 1873.- *A. volkmannii* Baker, Handb. Irid.: 139, 1888.

This is a well marked species, that had been confused since long time ago for *A. aurantiaca* D. Don, and as such it appears in the literature (Hauman & Vanderweken 1917, Ravenna 1969). Both species have in common the bright yellow to deep orange colour of the perigone. *A. aurantiaca*, however, is a much stouter plant (up to 1.70 m high), with dark-green, larger flaccid leaves, and larger flowers that occasionally reach red tones.

A. mutabilis Kuntze ex Kunth had originally been collected by Pöppig on the Andes near the Antuco Vulcano. The present writer found it in the same area, and verified that the Argentine plants previously known as *A. aurantiaca*, belong here. The specific epithet refers to a variability of colour, supposedly even to pink tones. The latter condition, however, is not really true, and was originated in a confusion of Pöppig, who actually collected a pink species on Cerro Pilque, labelling it with the same data as the yellow-flowered one. The former specimen, which I have on loan from BR, is now referable to *A. chillanensis* Grau & Bayer; the latter, at P, I select as the holotype of *A. mutabilis*. This spec-

ies varies from bright yellow to nearly bronze flowers.

The flowers of *Alstroemeria versicolor* Ruiz & Pav. had been described as yellow with dark streaks. According to Ruiz & Pavón (1802: 59), it was collected "prope Huilquilemu et oppidum et in Laxa campis". Huilquilemo is a railroad station, and also an old estate, both placed near the town of Talca (35° 26' S). Laja is found much to the south (37° 17' S) in the province of Bio-Bio, at a low level above the sea. There is no type-material preserved at Madrid, Paris, or Firenze, but there is ground to presume that this is an earlier name for *A. aurantiaca*.

Distribution and habitat. Frequent in the Argentine Patagonia, at foot of the Andes, ascending to 2000 m, in the provinces of Río Negro and Neuquén; also in Chile, in the provinces of Cautín, Malleco, and Bio-Bio. In the latter country it is only found on the mountains, high valleys, and uplands to the east. It often grows in clearings of *Nothofagus*, or *Araucaria* woods.

Collections. Argentina, prov. Chubut, dept. Cushamen, Cholila; R. Martínez-Crovetto 3020 (SI). Prov. Río Negro, dept. Bariloche, Parque Nac. Nahuel Huapi, Lago Hess-Lago Roca; O. Boelcke & M.N. Correa 6013 (BAA, BAB, SI). Prov. Neuquén, región del Lago Nahuel Huapi; J. Pita (BAB 30640). Chile, prov. Cautín, faldeos del volcán Villarica, entre el refugio y Pucón; M. Rojas, 10-II-1948 (SGO 69463 & 69477). Chil. australis alpinis graminosis Andes de Antuco; Poeppig 756, lect Decbr. P lectotype).

ALSTROEMERIA MAGNIFICA Herbert, Edwards's Bot. Req. 29: Misc. p. 64, 1843. Syn.: *A. gayana* Philippi, Linnaea 29: 71, 1858. - *A. siennae* Muñoz, Fl. Silv. Chile: 66, 1966.

This is the earlier name for a plant often found somewhat to the north from the town of La Serena, prov. Coquimbo, and to the south as far as to the mouth of the Limarí river. It is one of the large-flowered species, if not the largest of the whole genus. Its leaves are stiff, with the edges ciliate, rather aqueous ("deliquescent"), and breakable, the abaxial, resupinate face being bright green.

Collections. Chile, prov. Coquimbo, carretera Panamericana, km 490 al N de La Serena; E. Sierra & C. Muñoz, 13-IX-1963 (SGO 75665 type of *A. siennae* Muñoz & SGO 75666). Idem, in umbrosis Serena; Gay 426, 1836 (SGO 46965 type of *A. gayana* Phil.). Idem ibid; Kausel 5494, 12-X-1971 (SGO 80526). In umbrosis inter rupes ad fodinam El Romeral pr. Serenam; Ravenna 1598, Aug. 1971 (Herb. Ravennae neotype).

REFERENCES

- Hauman-Merck, L. & Vanderweken, G. 1917. Catalogue des Phanérogames de l'Argentine; An. Mus. Nac. Buenos Aires 29: 274-286.
- Philippi, R.A. 1896. Plantas Nuevas Chilenas; An. Univ. Chile 93: 143-166.
- Ravenna, P. 1969. Amaryllidaceae; M.N. Correa Flora Patagónica 2: 152-164.
- Ruíz, H. & Pavón, J. 1802; Flora Peruviana et Chilensis 3: 59.

NEW OR NOTEWORTHY TECOPHILAEACEAE

Pierfelice Ravenna

Prior to the preparation of a treatment of the Chilean Tecophilaeaceae, it seems advisable to advance brief descriptions of new species in *Conanthera*, some new combinations, and to review the status of *Tecophilaea* Bert. ex Colla in relation to *Zephyra* D. Don.

CONANTHERA SABULLOSA Ravenna, sp. nov.

Planta elata praealta. Cormus stoloniferus. Folia convoluta sursum sensim attenuata. Inflorescentia successive bifurcata ramis gracilibus 5-12 instructa. Flores axillares a pedicellis 3-4 mm longis sustentati. Perigonium azureo-violaceum 20-23 mm longum et 14-18 mm latum. Tepala in poculo circ. 5 mm longo connata; exteriora extus ad margines albicantia maculis violaceis, apiculo 0.2 mm longo; interiora medio inferiore azureo violacea deinde alba maculis dvis latiusculis et alteribus paucis minutis notata. Filamenta complanata albiuscula 0.6 mm longa. Antherae hastato-lanceolatae contiguae fusco sordideque viridescentes praeter apicem albicantem. Ovarium late ellipticum vel ovatum 3.9 mm longum. Stylus albicans vel dilute violaceum; stigma punctatus.

Collections. In decliviis arenosis 6 km a La Serena septentrionem versus prov. Coquimbo Chiliae; Ravenna 3058 Oct. 1985 (Herb. Ravennae holotype, BM, K, NY, SCO isotypes).

CONANTHERA URCEOLATA Ravenna, sp. nov.

Planta laxe inclinata. Cormus depresso-globosus circ. 2 cm latus ad basin subplana radice paucis emitens. Folia basalia saepe dua convoluta sursum sensim attenuata 12-15 cm longa et 2-3 mm lata. Caulis floriferus efoliato inclinato-patens. Inflorescentia ad basin tantum brevi-

ter 2-ramosa apicem versus simplex. Flores fere expansunt simul unilaterales nutantes ex bractea lanceolata singuli. Pedicelli validi recurvati. Perigonium urceolatum 10-12 mm latum apice tepalorum tantum recurvato. Antherae lineares conniventes.

Collections. In convalle supra portum Huasco prov. Atacama Chililae; Ravenna 3198, Nov. 1985 (Herb. Ravennae holotype).

CONANTHERA TENELLA (Sw. ex Kunth) Ravenna, comb. nov.

Basionym: *Cumingia tenella* D. Don, Sweet's Brit. Fl. Gard. ser. 2, 4: Sub tab. 88, 1834. - Syn.: *C. parvula* Philippi, Linnaea 29: 74, 1857-58.

TECOPHILAEA Bert. ex Colla merged in *ZEPHYRA* D. Don

The genus *Tecophilaea* had been proposed for a small plant named *T. violaeiflora* Bert. ex Colla. According to the Linnean customary procedure, the epithet must be spelled *violiflora*, not "*violaeiflora*" although being the latter grammatically correct. Save by the fact of having three staminodes, instead of two, *Tecophilaea* agrees with *Zephyra* in habit, leaves, inflorescence, perigone, gynoecium, fruit, and seeds.

ZEPHYRA VIOLIFLORA (Bert. ex Colla, Ravenna, comb. nov.

Basionym: *Tecophilaea violiflora* Bertero ex Colla, Mem. Accad. Torino 39: 20, 1836.

ZEPHYRA CYANOCROCUS (Leyb.) Ravenna, comb. nov.

Basionym: *Tecophilaea cyanocrocus* Leybold, Bonplandia 10: 370, 1862.

NOTES ON IRIDACEAE. VII

Pierfelice Ravenna

TIGRIDIA RAIMONDII Ravenna, sp. nov.

Planta 30-40 cm alta. Folium basale ad anthesin unicum raro dua tenere viride flaccidum 30-35 cm longum et 14-18 mm latum. Spatha unica vel dua multiflora usque 5 cm longa. Perigonium album praeter zonam violaceam ad basin laminae tepalorum exteriorum et basin laminae interiorum ad lateras vitellinam circ. 26 mm latum.

Collections. Peru, Arequipa, prov. Caraveli, Altos de Atiquipa; A. Raimondi 11652 (USM). Idem, Lomas de Capac; Ferreyra 11929 (USM). Culta in Bonaria ex bulbis in colibus maritimis Atiquipae prov. Caraveli Peruviae collectis; Ravenna 89, Dec. 1961 (Herb. Ravennae holotype).

A second *Tigridia* species from the coastal "lomas" of Peru.

NOTES ON ASIAN-PACIFIC **PODOCARPACEAE**, I (**PODOCARPUS**)

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In reviewing old and new herbarium collections of **Podocarpus** from the Asian-Pacific area it seems that three new entities are worth recognizing. Other poorly explored areas in these regions need further collecting, particularly of fertile material and may yet yield other species to be described.

Podocarpus neriifolius Don has long been known from herbarium collections in southern Asia. One of these areas further studied involved collections made in northern Burma and adjacent areas. After seeing duplicate material of an interesting collection made by J. Keenan et al from Burma at Kew and Harvard, the original more complete specimen was recently seen at Edinburgh. The specimen **Keenan et al 3081** (E) has distinctly wide short acuminate leaves compared to typical **P. neriifolius**. However, even further distinctions were evident on the more complete specimen at Edinburgh. Of most striking interest the specimen was noted as being an epiphytic shrub in the wild and is the only **Podocarpus** species thus known to be an epiphyte. Other features such as relatively long foliola on the female strobilus and large globose seed structure seem to distinguish this collection markedly from typical **P. neriifolius**. A collection made in Assam as **Parry 108** (K) from Chakang, Lushai Hills (Lakher Country), 1829 m., has similar relatively wide acuminate leaves. It is not known however if **Parry 108** came from an epiphytic plant though it could be the same species as **Keenan et al 3081**. Also, **Henry 12919** (K, A, US, NY) from Sjemes Yub, Yunnan, China, 1219 m. has relatively large leaves, however the leaf is lanceolate and the specimen was from an enormous tree 5.5 m. in circumference. The collection by Henry seems to be within the range of typical **P. neriifolius** and is here treated as that species.

The Keenan specimen does not easily fit into any section of the genus **Podocarpus**, but goes reasonably well in section **Globulus** where wide acuminate leaves with broad flat midribs are well represented. One or two erect bud scales are not unusual in the section **Globulus** although overlapping bud scales are characteristic. The Keenan specimen has tight buds but with some erect scales. Actually this new species resembles **P. teysmanii** Miquel rather closely but the erect scales are a difference while the long foliola are unique for this section, those of **P. teysmanii** being notably short (1 mm.). **Podocarpus teysmanii** is a low elevation equatorial understory tree.

Podocarpus epiphyticus de Laubenfels et Silba, sp. nova.

Frutex epiphytica. Gemma globosa, 3 mm. longis, squamis exterioribus triangularibus. Folia lineria vel elliptica, 11.3-13.3 cm. longis et 2.2-2.3 cm. latis, costis superis latis prominentibus, apicibus

acuminatis, petiolis 5-6 mm. longis. Strobili feminei pedunculis 9-20 mm. longis, foliolis basalibus 2-2.5 mm. longis, receptaculis 6.5-7 mm. longis. Fructibus globosa, 8 mm. longis et 6-7 mm. latis.

Northern Burma: Kachin State, Sumprabum sub-division, eastern approaches from Sumprabum to Kumon Range, Kanang to Mapi-Zup, western slopes, 1829-2591 m., an epiphytic shrub, scattered, J. Keenan et al 3081 (Holo-E, Iso-K, A).

An epiphytic shrub. Leaves linear-elliptic, 11.3-13.3 cm. long by 2.2-2.3 cm. wide, narrowed gradually to a bluntly acuminate apex, midrib a distinct broad raised ridge above, base gradually narrowed to a petiole 5-6 mm. long. Female cone on a peduncle 9-20 mm. long, receptacle 6.5-7 mm. long with 2 bracts, foliola 2-2.5 mm. long. Seed globular, 8 mm. long by 6-7 mm. wide.

Recently de Laubenfels (1978) had revised the nomenclature of the Philippine *Podocarpaceae*. Since then further herbarium collections have been made from the island of Palawan and one collection is quite distinct in its pollen cones. Other species previously known from Palawan include *P. neriifolius* from Tabat 19914 (US) and *P. polystachus* R. Brown from Foxworthy 904 (BO, K, NY, US).

The collection here discussed from Palawan by Ridsdale suggests *P. rumphii* Blume because of the globular buds, the low elevation, and the long narrow leaves. The pollen cone is however markedly distinct from typical *P. rumphii*, the leaves are tapering at both ends and the midrib is sharp and narrow. Tapering leaves suggest *Podocarpus* sections *Longifoliolatus*, section *Polystachyus* and section *Macrostachyus*. The last section is indeed characterized by pollen cones with elongated apices, more or less globular buds, and narrow but sharp midribs. The new species based on the Ridsdale specimen most resembles *P. crassigemma* de Laub. a high elevation species of New Guinea with substantially smaller leaves, more definitely spreading bud scales, and pollen cones on a peduncle, as well as thick (stiff) leaves.

Podocarpus palawanensis de Laubenfels et Silba, sp. nova.

Arbor ad 7 m. alta. Gemma 4-6 mm. longis et 4-5 mm. latis, squamis exterioribus triangularibus. Folia linearia, ad basis et apicis, lanceolata, 10.5-18.4 cm. longis et 0.8-1.1 cm. latis, costis superioribus prominentibus, apicibus acutis, petiolis 5-7 mm. longis. Strobili masculi 3.5-4.5 cm. longis et 6.5-8 mm. latis, apicibus microsporophyllis lanceolatis 4 mm. longis. Strobili feminei ignoti.

Philippines: Palawan: Pagdanan Range, Ibangley Brookside Hill, 40 m. altitude, closed broad-leaved rainforest, C.E. RIDSDALE SMRI 1502 (Holo-L).

While working on the Flora Malesiana project de Laubenfels (1982) had included a number of odd *Podocarpus* specimens under a new species he would soon publish. Later in his revision of the genus *Podocarpus*

de Laubenfels (1985) named the species *P. rubens* based on a number of allied collections in Indonesia and New Guinea. After reviewing these different populations it seems a separate entity from high elevation in the Celebes is worth recognizing. The Celebes material is different from typical *P. rubens* in that the leaves are not linear in shape but are elliptical and narrowly blunt at the apex. Little is known about the elliptical leaved *Podocarpus* entity from the Celebes, but the pollen cone is rather smallish and solitary.

Another interesting collection made in Indonesia is a *Podocarpus* from the island of Ambon. The collection *Eyma* 3078 (L) was annotated by N.E. Gray as having continuous upper hypoderm in the leaves and in this way resembling *P. gibbsii* Gray. The *Eyma* collection from Ambon also has elliptical leaves similar to the high elevation Celebes material. It has yet to be determined if the high elevation Celebes material has continuous upper hypoderm but the Ambon specimen is included under the new species on the basis of leaf shape, and belonging to *Podocarpus* section *Foliolatus*.

Podocarpus indonesiensis de Laubenfels et Silba, sp. nova.

Arbor ad 1.5 m. alta. Gemma 3 mm. longis et 5 mm. latis, squamis exterioribus triangularibus, apicibus patulis vel recurvatis. Folia elliptica, 3.3-5.2 cm. longis et 0.5-0.8 cm. latis, costis superis prominentibus, apicibus acutis vel obtusa, petiolis 3-4 mm. longis. Strobili masculi 2 cm. longis et 4 mm. latis. Strobili feminei ignoti.

Type: Indonesia: Celebes: Massimbollong, Lati-Madjong, 2700 m., moss forest, *Eyma* 1034 (Holo-L, Iso-BO).

Indonesia: Celebes: between Kambuno and Tamadu, Masamba, *Eyma* 1406 (L,BO), 2550-2800 m.; Celebes: Massimbollong, Enrekang, 3000 m., *Eyma* 982 (L, BO); Celebes: between Pokapindjand and Tenabang, 2800-3000 m., *Eyma* 624 (L,BO); Ambon: Salahutu Bivouac III, around summit, 1000 m., *Eyma* 3078 (BO, L).

A tree 1.5 m. or more tall. Buds relatively short, 3 mm. long by 5 mm. wide, with acute triangular scales, apex spreading or somewhat recurved. Leaves elliptical, 3.3-5.2 cm. long by 5-8 mm. wide; midrib a raised ridge above, somewhat broader below; leaves sometimes with continuous upper hypoderm, margins wavy, apex bluntly acute to obtuse, base narrowed to a petiole 3-4 mm. long. Male pollen cone solitary, 2 cm. long by 4 mm. wide.

Literature Cited

- de Laubenfels, D.J. (1978). The Taxonomy of Philippine *Coniferae* and *Taxaceae*. *Kaliskan, Philipp. J. Biol.* 7(2): 117-152.
 _____ (1982). Identification Lists of Malesian Specimens. *Fl. Males.*: 1133-1160.
 _____ (1985). A Taxonomic Revision of the genus *Podocarpus*. *Blumea* 30: 251-278.

CERTAMEN MELASTOMATACEIS XXXVIII

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MERIANIA ALBERTIAE Wurdack, sp. nov.

Sect. Davya. M. urceolatae Triana affinis, foliis glabris 3-5-plinervatis differt.

Arbor 6-15 m; ramuli primum sulcato-quadrangulati demum teretes in nodis caduce arachnoideo-puberuli alioqui glabri. Petioli 1-2 cm longi; lamina 10-14(-15.5) X 2.5-3(-4.7) cm elliptica vel oblongo-elliptica apice breviter gradatimque hebeti-acuminato basi acuta, subcoriacea et integra, primum amorpho-furfuracea mox glabrata subtus modice puncticulata, 0.3-0.5(-1) cm 5-pseudoplinervata nervis secundariis ca 5 mm inter se distantibus nervulis laxe reticulatis areolis 2-3 mm latis. Panicula 8-11 cm longa submultiflora; flores 5-meri, pedicellis 6-8 mm longis infra medium articulatis, bracteolis 1-1.5 X 0.2-0.3 mm caducis. Hypanthium (ad torum) 3 mm longum glabrum; calycis tubus 1 mm longus, lobis 1.5-2 mm longis late ovatis furfuraceo-ciliolatis intus furfuraceis, dentibus exterioribus obscuris adhaerentibus inframarginalibus. Petala alba 10.5-11.5 X 6-6.5 mm obovato-oblonga truncata glabra. Stamina dimorphica glabra, antheris oblongo-subulatis poro 0.1 mm diam. Stamina maiora: filamenta 6.2-6.3 mm longa; antherarum thecae 5.7 X 0.5 mm, poro dorsaliter inclinato; connectivum 1.3 mm prolongatum, dente basali 0.6 mm longo acuto, appendice ascendenti 2.7-2.8 X 0.4 mm apice hebetate trilobulato. Stamina minora: filamenta 7.8-8 mm longa; antherarum thecae 4 X 0.5 mm, poro ventraliter inclinato; connectivum 0.9 mm prolongatum, dente basali 0.5 mm longo acuto, appendice ascendenti 1.2 X 0.25 mm hebeti. Stigma non expansum; stylus 6.3 X 0.4-0.1 mm glaber in ovarii apicem ca 0.4 mm immersus; ovarium 3-loculare glabrum.

Type Collection: Linda Albert de Escobar, Alicia Uribe, & Javier Vallejo 6096 (holotype HUA 027796; isotype US), collected in rain forest on Finca Montepinar, Municipio Guatapé, Vereda Santa Rita, Antioquia, Colombia, elev. ca 1850 m, 28 Nov. 1985.

Paratypes (all topotypical, HUA, US): Escobar & Folsom 2413, 1 Oct. 1982 (fruiting); Escobar, Uribe, & Vallejo 3655, 27 Oct. 1983 (young bud); Escobar, Londoño, Roldán, & Betancur 5306, 4 Jul. 1985 (flowering); and Escobar, Londoño, Roldán, & Betancur 5346, 5 Jul. 1985 (flowering).

The cluster of species with 3-celled ovaries around M. urceolata all have barbellate to stellate hairs on young leaves, branchlets, and hypanthia, but stamens similar to those of M. albertiae. The regularly lobed calyx combined with the anther pore inclination and 3-celled ovary indicate placement in Meriania

rather than Adelobotrys. Certainly A. antioquiensis Wurdack and A. hoyosii Wurdack do not seem intimately related to M. albertiae.

LAVOISIERA MUCUGENSIS Wurdack, sp. nov.

In systemate Cogniauxii L. glutinosae Cogn. affinis, foliis ad basim cordulatis pedicellis brevioribus floribus 5-meris differt.

Ramuli primum obscure tetragoni mox teretes glutinosi sicut pedicelli modice decidueque glanduloso-setulosi pilis 0.1-0.3 mm longis. Folia sessilia (5-)7-10 X (3.5-)6-8 mm ovato-oblonga apice rotundato basi 0.5-1 mm cordulata, rigida et integra, patens vel paulo deflexa, modice punctata glabra viscosa, debiliter 3-5-nervata. Flores terminales vel subterminales 5-meri, pedicellis 1-1.5 mm longis. Hypanthium (ad torum) 4.5-4.8 mm longum modice resinoso-granulosum et basim versus sparse glanduloso-setulosum (0.1-0.2 mm); calycis tubus 0.4-0.6 mm longus, lobis 3.5-4.2 X 1.2 mm lanceato-subulatis ad apicem 0.3-0.5 mm aristiferis glanduloso-marginatis. Petala 12-14 X 9-10 mm obovata glabra. Stamina dimorphica glabra, filamentis 4.5-5.5 mm vel 4.3-5.5 mm longis, poris ca 0.25 mm diam. ventraliter inclinati. Stamina maiora: thecae (rostris exclusis) 2.5-2.7 X 0.5 X 0.8-0.9 mm, rostris 0.5 mm longis, connectivo 3.8-4.2 mm prolongato, appendice ventrali 1.7-2 X 0.5 X 0.7 mm. Stamina minora: thecae (rostris exclusis) 2-2.1 mm longae, connectivo 1.8-2 mm prolongato, appendice ventrali 0.8-1 X 0.4 X 0.6 mm. Stigma non expansum; stylus 11 X 0.4-0.15 mm glaber; ovarium plerumque 5-loculare glabrum, apice truncato.

Type Collection: G. Hatschbach 47502 (holotype MBM 87814; isotype US), collected at Corrego Moreira, Mun. Mucugê, Bahia, Brazil, 22 Jan. 1984. "Sublenhosa, 50 cm, petalas purpureas, anteras amarelas. Campo rupestre, solo arenoso."

Paratypes (all Bahia, Brazil): Mori, King, dos Santos, & Hage 12559 (CEPEC, US), from 3 km south of Mucugê on route to Jussape, elev. 1000 m ("Subarbusto, 1 m de altura. Corola lilás, estames completamente amarelos."); Hatschbach 48248 (MBM, US), from Km 5-15, Mucugê-Andaraí road ("Arbusto ramoso 1 m; flor rosada, anteras amarelas. Campo rupestre, sobre rochas.").

The suggested relative (isotype US) has ovate leaf blades tapering to the base, 6-merous flowers with pedicels 6-7 mm long, and linear-oblong remote-based calyx lobes 2 mm long. The other two species in this alliance, L. cerifera Gardner (originally described with 3-celled ovary, this feature neither confirmed nor denied by Cogniaux) and L. rigida Cogn. seem more distantly related. Lavoisiera goyazensis Cogn. ex char. differs at least in the relatively narrower leaf blades tapered to the base, longer (5-7 mm) calyx lobes, and longer anthers with short ventral appendages; the Ule type needs comparison with Microlicia crebropunctata Pilger (based on "Glaziou" 21224), also from Serra Balisa. Vegetatively, especially in cauline pubescence and leaf punctuation, L. mucugensis resembles Microlicia hatschbachii Wurdack, which has leaves acute at the base, shorter (1.5-2 mm) deltoid calyx lobes, large stamen connectives prolonged only 1.8-

2.5 mm, and 3-celled ovaries. Two fruiting (ovary 5-celled) collections, Mori 12913 and 14368 (both from Pai Inácio, Mun. Palmeiras, Bahia) represent a taxon related to L. mucugensis, but with somewhat larger leaves and wider glandular-ciliolate calyx lobes.

TIBOUCHINA TAPEROENSIS Wurdack, sp. nov.

T. urceolari (DC.) Cogn. et T. litorali Ule in foliorum pubescentia affinis, foliis ad basim non cordatis filamentis modice puberulis differt.

Sect. Pleroma. Trichomata basim versus aspera. Ramuli primum quadrangulares demum tereti sicut petioli foliorum subtus venae primariae inflorescentia hypanthiaque pilis subappressis 0.5-1 mm longis dense induti. Petioli 0.8-1.5 cm longi; lamina (4.5-)7-9(-10.5) X (2-)3-3.5(-4.5) cm oblongo-elliptica apice late acuto basi late acuta vel obtusa, integra et appresso-ciliata, supra modice appresso-setulosa pilis gracilibus 0.5-1 mm longis ad basim non vel vix (0.1 mm) adnatis, subtus dense setulosa pilis gracilibus ca 1 mm longis, 5-nervata paribus exterioribus ad basim ca 0.5 cm coalitis nervis secundariis ca 2-3 mm inter se distantibus supra invis. Panicula 4-7 cm longa, floribus 5-10 5-meris, pedicellis infra articulum 1.5-2 cm longis supra 0.3-0.5 cm; bracteolae duae 6-7 X 1.5-2 mm dense appresso-setulosae caducae. Hypanthium (ad torum) 8 mm longum; calycis tubus ca 0.5 mm longus, lobis 4-4.5 X 4-4.5 mm oblongo-ellipticis (apice rotundato) dense ciliolatis (0.2-1 mm) extus centraliter dense appresso-setulosus marginem versus glabris ad anthesim deciduis. Petala 22-26 X 15-20 mm asymmetrice obovata (apice paulo emarginato) densiuscule ciliolata ciliis eglandulosis 0.4-1 mm longis. Stamina paullulo dimorphica; filamenta 13-14 mm vel 11-12 mm longa centraliter modice setulosa pilis 0.8-1.5 mm longis p. p. glanduliferis; antherarum thecae 12-13 X 1-1.2 mm subulatae poro 0.4 mm lato ventraliter inclinato; connectivum 1.5 mm vel 0.5 mm prolongatum, lobis ventralibus hebetibus 0.5-0.8 mm longis. Stigma non expansum; stylus 25 X 0.7-0.9 mm glaber; ovarii apex dense sericeus pilis ca 1-1.5 mm longis laevibus eglandulosis.

Type Collection: André M. de Carvalho, L. A. Mattos Silva, & J. L. Hage 354 (holotype CEPEC 22902; isotype US), collected along "ramal de fazendas a W de Taperoá a 4-7 km da cidade," Mun. Taperoá, Bahia, Brazil, 8 Dec. 1980. "Arvore com ca 8 m de altura. Folhas discolor com face ventral ferrugínea. Flores com pétalas arroxeadas, lelás, estames vinosos."

Both suggested relatives have cordate leaves and smaller flowers with sparsely glandular-setulose filaments; T. urceolaris has 4-axillary branches and short calyx lobes, while T. litoralis has petioles only 3-5 mm long. In filament pubescence, T. taperoensis is suggestive of T. stenocarpa (DC.) Cogn., T. fissinervia (DC.) Cogn., and T. rigidula (Naud.) Wurdack; all these species have large floral bracts and upper leaf surface hairs long-adnate to the surface. In Cogniaux' monograph, T. taperoensis might key to near T. formosa Cogn., which differs (ex char.) at least in the

short petioles (1-2 mm) and smaller flowers with stamen connectives prolonged 4 mm or 2 mm.

BRACHYOTUM VIRESCENS (Cogn.) Wurdack, comb. nov.

Tibouchina virescens Cogn., Bot. Jahrb. 42: 133. 1908.

Two recent flowering Junín collections (Díaz & Boldeón 2218 and Stein et al 3828, both essentially topotypical) confirm my original suspicions (Phytologia 11: 379. 1965) about the generic placement of this taxon. The anthers are not appendaged, the pubescence somewhat roughened, the flowers 5-merous. Perhaps the closest relative of *B. virescens* is *B. weberbaueri* Cogn., with smaller bracteoles and 4-merous flowers. Both recent collections of *B. virescens* indicate deep red or purple petals.

MICONIA CACUMINA Wurdack, sp. nov.

M. nitidissima Cogn. affinis, ramulis acute quadrangulatis foliorum subtus venulis laxius reticulatis floribus minoribus differt.

Ramuli robusti acute subalato-quadrangulares novelli sicut foliorum subtus venae primariae inflorescentia hypanthiaque modice vel sparse glandulis rubris deciduis armati alioqui glabri. Petioli (1.5-)2-2.5(-3.5) cm longi; lamina 5.5-8.5 X 3.5-6 cm late elliptica vel ovato-elliptica apice breviter (ca 0.3 cm) hebeti-acuminato basi late obtusa vel subcordata, coriacea et integra, 5-nervata (pari inframarginali tenui incluso) nervis secundariis ca 5 mm inter se distantibus nervulis subtus paullulo elevatis areolis ca 1.5 mm latis. Panicula 3-7.5 cm longa summultiflora; flores 5-meri, pedicellis crassis 0.5-1 mm longis, bracteolis ca 0.3 mm longis subulatis subpersistentibus ca 0.3 mm infra hypanthium insertis. Hypanthium (ad torum) ca 1.3 mm longum; calycis tubus ca 0.5-0.7 mm longus vix (0.1-0.2 mm) 5-undulatus, dentibus exterioribus crassis adnatis non eminentibus. Petala 3 X 2.7-2.8 mm subrotundata extus minute granulosa. Stamina essentialiter isomorphica glabra; filamenta 2.7-3 mm longa; antherarum thecae 2.6-2.8 X 0.6 X 0.5 mm paullulo subulatae poro 0.25 mm diam. ventraliter inclinato, connectivo non prolongato ad basim dorsaliter obscure elevato ventraliter obscure bilobulato. Stigma non expansum; stylus 4.6 X 0.3-0.4 mm glaber in ovarii apicem 0.2 mm immersus; ovarium 3-loculare et ca 1/4 inferum apice conico obscure glanduloso.

Type Collection: Peter J. Edwards K. E. R. 107 (holotype K; isotypes K, US), collected in dense scrub on north ridge escarpment of Mt. Roraima, 5°15'25" N, 60°44'50" W, Guyana, elev. ca 2280 m, 26 Mar. 1978. "Shrub 3-5 ft. Leaves olive-green adaxially, slightly shiny and strongly fluted, mid-green abaxially. Corolla pink-blotched and washed off-white. Buds pink. Anthers straw-coloured, tipped pink, filaments off-white."

The suggested Andean relative has obtusely tetragonal or subterete branchlets, leaf venule areoles beneath ca 1 mm wide, hypanthium plus calyx 5 mm long, thick divergent external calyx teeth, and petals ca 7 mm long. *Miconia lucida* Naud. has inconspicuously quadrangular branchlets, 5-plinerved acute-based

leaf blades, larger petals, and somewhat smaller anthers. While the anthers of M. cacumina are slightly subulate, there seems to be no other real affinity with species 40-44 of Cogniaux' monograph (all with dorsally inclined anther pores).

MICONIA LAMBAYEQUENSIS Wurdack, sp. nov.

Sect. Amblyarrhena. M. pilaloensi Wurdack affinis, petiolis longioribus laminis 3-nervatis pedicellis longioribus, calycis lobis maioribus differt.

Ramuli teretes sicut foliorum subtus venae primariae inflorescentiaque sparse vel modice pilis dendriticis ca 0.1 mm longis et sparse setulis laevibus 0.3-0.5 mm longis induti. Petioli 1-2(-3) cm longi; lamina (4-)5-7.5 X (2-)2.5-3.5 cm elliptica vel ovato-elliptica apice hebeti-acuto basi late acuta vel obtusa, chartacea et integra distanter ciliolata, supra glabra, subtus in superficie sparse setulosa pilis laevibus 0.3-0.6 mm longis, 3-nervata nervis secundariis plerumque 2-3 mm inter se distantibus nervulis subtus planis laxe reticulatis (areolis ca 1 mm latis). Panicula 7-15 cm longa multiflora, ramulis sparse glanduloso-setulosis; flores 5(-6)-meri, pedicellis (1-)3-3.7 mm longis et ca 0.5 mm infra hypanthium articulatis, bracteolis 0.3-0.4 mm longis subulatis stellulato-furfuraceis caducis. Hypanthium (ad torum) ca 2.8 mm longum extus densiuscule stellulato-puberulum et modice glanduloso-setulosum (pilis 0.3-0.5 mm longis laevibus); calycis tubus 0.3 mm longus, lobis interioribus 1 X 1.5 mm ovato-oblongis, dentibus exterioribus crassius non vel paullulo (0.2 mm) eminentibus; torus intus sparse glanduloso-setulosus. Petala 4.8 X 3.2-3.5 mm obovata (apice rotundato vel vix emarginato) densiuscule granulosa. Stamina isomorphica; filamenta 3-3.1 mm longa sparse vel modice glanduloso-setulosa; antherarum thecae 2.9-3 X 0.6 X 0.7 mm anguste oblongae poro unico 0.2 mm diam. terminali vel paullulo dorsaliter inclinato, connectivo nec prolongato nec appendiculato. Stigma capitellatum 0.7 mm diam.; stylus 10 X 0.4-0.3 mm modice glanduloso-setulosus in ovarii collo 0.7 mm immersus; ovarium 5-loculare et ca 1/3 inferum apice modice glanduloso-setuloso.

Type Collection: S. Llatas Quiroz 1976 (holotype F 1984344; isotype US), collected in low forest between Huaratara and Colaya, Prov. Lambayeque, Depto. Lambayeque, Peru, elev. 2000 m, 7 May 1986. "Arbusto perenne, erguido de 2 m de porte, flores blancas con las anteras amarillas."

The suggested Ecuadorian relative has petioles 0.5-0.7 cm long, 5-7-nerved leaf blades subcordate at the base, pedicels 0.7-2 mm long, and interior calyx lobes only 0.2-0.4 mm long. More distant relatives are M. cajanumana Wurdack (plinerved leaf blades, sessile or barely pedicellate flowers, esetulose hypanthia, prominently projecting external calyx teeth, truncate stigma) and M. subglabra Cogn. (oblong-lanceate 5-plinerved leaf blades, sessile flowers, eglandular hypanthial pubescence, smaller petals).

MICONIA AURITINODA Wurdack, sp. nov.

M. polyneurae Triana affinis, foliis vere ciliolatis petalis integris ovario omnino infero differt.

Sect. Cremanium. Ramulorum internodia teretia glabra, nodis tumidis et auriculis 0.4-0.6 cm longis infra petiolorum insertiones armatis lineis interpetiolaribus crassis ca 0.5-1 mm elevatis. Petioli 1.2-2(-2.5) cm longi; lamina plerumque 6-10 X 4-7 cm late elliptica vel paulo ovato-elliptica apice late acuto vel obtuso basi rotundato-truncata, coriacea et integra, modice ciliolata ciliis crassis ca 1 mm longis, glabra vel in venis primariis subtus sparsissime pilis stipitato-stellatis armata, 5-nervata nervis secundariis ca 3 mm inter se distantibus nervulis reticulatis areolis 0.6-1 mm latis. Panícula 27-30 cm longa multiflora glabra, ramulis oppositis; flores 5-meri, pedicellis ca 1 mm longis, bracteolis setaceis caducis. Hypanthium (ad torum) 2.2 mm longum glabrum; calycis tubus 0.4 mm longus, lobis 0.3 mm longis remotis, dentibus exterioribus inframarginalibus caduce setiferis. Petala 2.2 X 1.8 mm obovato-suborbicularia glabra integra. Stamina paullulo dimorphica glabra; filamenta 2.5-2.6 mm longa; antherarum thecae 1.2 X 0.5 X 0.8 mm late (0.5 mm) biporosae (incomplete 4-porosae) ad basim dente dorsali 0.1-0.2 mm et appendice ventrali bilobulata 0.25 mm longa ornatae. Stigma capitellatum 0.9 mm diam.; stylus 5 X 0.4-0.6 mm glaber; ovarium 3-loculare et omnino inferum glabrum.

Type Collection: J. L. Luteyn & E. Cotton 11007 (holotype NY, 2 sheets; isotype US), collected in montane cloud forest 8-12 km ESE of Santa Barbara, Prov. Napo, Ecuador, elev. 2780-2880 m, 11 Jan. 1985. "Weak shrub leaning on others for support, to 2.5 m tall. Calyx pale green; corolla white."

Miconia polyneura has leaf blades with incurved teeth and (as the inflorescence) dendroid-puberulous on the primary veins beneath, fimbriate petals, and ovary ca 0.4 inferior; the branchlet nodes are less manicate. Miconia manicata Gleason has thinner relatively narrower 3-nerved leaf blades and considerably smaller flowers, as well as the ovary only 1/3 inferior. Other manicate species of Sect. Cremanium (M. cundinamarcensis Wurdack, M. turgida Gleason, M. wurdackii Uribe) all seem more distantly related.

MICONIA CREBRIBULLATA Wurdack, sp. nov.

M. caelatae (Bonpl.) DC. affinis, foliis floribusque maioribus differt.

Sect. Cremanium. Ramuli primum sulcato-quadrangulares demum teretes sicut petioli laminarum subtus venae primariae inflorescentia hypanthiaque dense pilis stellulato-dendroideis furfuracei. Petioli (2.5-)-3-5 cm longi; lamina 12-18(-22) X 5-8(-10) cm elliptica vel ovato-elliptica apice gradatim acuminato basi late acuta vel obtusa, coriacea et integra, supra glabra et dense bullata, subtus densiuscule stellato-puberula, 3-nervata (pari exteriori inframarginali debili neglecto) nervis secundariis 3-5 mm inter se distantibus nervulis subtus elevato-reticulatis areolis ca 1 mm latis. Panícula 10-12 cm longa multiflora, ramis

in quoque nodo (2-)4; flores 5-6-meri sessiles, bracteolis ca 1 mm longis subulatis caducis; hypanthium (ad torum) 1.9 mm longum; calycis tubus 0.3 mm longus, lobis interioribus ca 0.15 mm longis rotundatis, dentibus exterioribus obscuris inframarginalibus. Petala 1.5-1.6 X 1.3 mm oblongo-subrotundata minute granulosa. Stamina paulo dimorphica glabra; filamenta 1.8-1.9 mm longa; antherarum thecae 1.1-1.2 X 0.4 X 0.5 mm oblongae late biporosae, connectivo non prolongato ad basim dorsaliter dente 0.3 mm vel 0.1 mm obsito. Stigma paulo expansum 0.3 mm diam.; stylus 3.5 X 0.2-0.3 mm glaber; ovarium 3-loculare et ca 2/3 inferum apice 0.3 mm alto granuloso et sparsissime glanduloso.

Type Collection: F. H. Dobson & F. H. Wolfe 1080 (holotype US 3013932; isotype CONN), collected in pastures above Baeza, Prov. Napo, Ecuador, 29 Jan. 1972. "Tree 20 ft. tall at edge of cut forest. White stamens."

The 3-nerved leaf blades of M. caelata are 3.5-7 X 1.3-2.2 cm, the hypanthia 1.5-1.6 mm long, the calyx lobes 0.3-0.35 mm long, and the petals 1 X 1 mm; in pubescence and rugose-bullate leaves, the species are alike. Miconia jahnni Pittier has finer pubescence and plane leaf blades.

CHALYBEA CORYMBIFERA Naudin, Ann. Sci. Nat. ser. 3 Bot. 16: 100. 1851.

As treated by Cogniaux, all species of Pachyanthus except for one Colombian taxon were West Indian endemics. However, the Andean exception has lateral inflorescences (from opposite upper leaf axils) and bipored anthers. All of the West Indian species have terminal inflorescences; all of the eight species (P. augustifolius Grisebach, P. blancheanus [Urban] Urban & Ekman, P. cubensis A. Richard, P. longifolius Jennings, P. pedicellatus Urban, P. poiretii Grisebach, P. reticulatus Britton & Wilson, P. wrightii Grisebach) with visible stamens (US) show 1-pored anthers. From the descriptions of the Antilles species, the ovary-cell number is (2-)3-5. Naudin's description and illustration of C. corymbifera indicated lateral inflorescences and 6-merous flowers with 1-pored anthers and 4-celled ovaries. Two Colombian collections (Killip & Smith 17180 and Stein, Sierra, & Garcia 3610, both from near La Baja, Santander) matching in all external details the Funck & Schlim type have bipored anthers, thus resembling the species of Huillaea Wurdack. All species of Huillaea have 3(-5)-flowered inflorescences and 6-celled ovaries. In preserved flowers from the Stein collection (furnished by Dr. Hiroshi Tobe from his nectary studies), 10 ovaries were 4-celled, 9 were 5-celled, and one was 6-celled; inflorescence flower number was (11-)23-40(-61). For now, I am inclined to treat Chalybea as a monotypic genus, without synonymizing Huillaea; the two genera seem distinct from Pachyanthus. As noted by Louis Williams, Miconia lundelliana L. Wms. has all the facies (including pubescence) of several of the species of Pachyanthus, with 1-pored anthers and 4-celled ovaries (Molina 14731 and 14821, both from Nicaragua); any evaluation of Pachyanthus must include this Central American species.

CLIDEMIA FOREROI Wurdack, sp. nov.

C. petiolari (S. & C.) Schlecht. ex Triana et C. fulvae Gleason affinis, floribus minoribus differt.

Ramuli teretes; internodi sicut inflorescentia modice vel dense pilis laevibus patulis incurvo-ascendentibus 2-3 mm longis induti; nodi pilis paleaceis 3-6 X 0.3-0.5 mm dense armati. Petioli 0.5-1(-1.5) cm longi; lamina 6-10 X 2.5-4 cm ovato-elliptica apice gradatim acuminato basi late acuta vel obtusa, rigidiuscula et obscure serrulata, supra modice laxequae strigosa pilis laevibus gracilibus 1.5-2 mm longis, subtus densiuscule laxequae strigosa pilis laevibus gracilibus 1.5-2(-3) mm longis, 5-nervata vel paullulo (usque ad 4 mm) plinervata nervis secundariis 3-4 mm inter se distantibus nervulorum areolis ca 1-1.5 mm latis. Inflorescentiae in quoque nodo superiori singulae 3-5 cm longae paulo (ca 1 cm) supra basim trifurcatae pauciflorae, bracteolis ca 2-3 X 1.2-1.5 mm persistentibus; flores 5-meri, pedicellis 2-3 mm longis. Hypanthium (ad torum) 1.5 mm longum dense setosum pilis laevibus gracilibus ca 2 mm longis; calycis tubus 0.1-0.2 mm longus, lobis interioribus 0.6 mm longis oblatis eciliolatis, dentibus exterioribus setiferis ca 0.6 mm eminentibus; torus intus sparse glandulosus. Petala 3-3.4 X 1.3-1.5 mm oblonga minutissime granulosa alioqui glabra. Stamina essentialiter isomorphica glabra; filamenta 1.6-2 mm longa; antherarum thecae 1.2-1.6 X 0.4 X 0.3 mm oblongae, poro 0.1 mm diam. dorsaliter inclinato, connectivo non vel vix (0.1 mm) prolongato non appendiculato. Stigma paullulo expansum 0.25-0.3 mm diam.; stylus 4.1-4.5 X 0.2-0.25 mm glaber; ovarium 5-loculare et ca 2/3 inferum, apice truncato sparse glanduloso (0.1 mm).

Type Collection: E. Forero & R. Jaramillo 2455 (holotype COL 191955; isotypes MO, US), collected on mountain SW and near to San José del Palmar, Depto. Chocó, Colombia, elev. 1370 m, 1 Sep. 1976. "Arbusto 1 m. Pétalos blancos. Frutos morado oscuro."

Paratypes (both Chocó, Colombia): Forero, Gentry, Sugden, & Daly 3377 (COL, US), topotypical, elev. 1300 m ("Arbusto. Pétalos blancos. Frutos verdes con pubescencia violeta. Vegetación extremadamente dañada por insectos"); Lozano & Diaz 3201 (US), Km 55 of Ansermanuevo-San José del Palmar road, elev. 1950-1700 m ("Sub-frutex de 1.5 m. Calíz puneo, corola blanca, estambres amarillos").

Both suggested relatives have flowers with petals 4-8 mm long and 2 mm or more wide, as well as ciliolate interior calyx lobes, external calyx teeth projecting 1.5 mm or more, and anthers 2 mm or more long; both species lack flattened nodal branchlet hairs and have less dense pubescence on the leaf surface beneath. Clidemia lundellii Wurdack has much finer cauline pubescence and larger flowers. In Gleason's treatment of Clidemia in Central America and Mexico (Brittonia 3: 97-140. 1939), C. foreroi would also key to near C. costaricensis Gleason, which has deflexed cauline setae, small subulate bracteoles, and sparse stellulate hairs on the branchlets and basally on the hypanthium. The general aspect of C. foreroi is rather like that of a depauperate

C. capitellata (Bonpl.) D. Don, this having underlying stellulate pubescence as well as long smooth hairs, larger flowers, and ventrally inclined anther pores.

HENRIETTELLA ININIENSIS Wurdack, sp. nov.

H. bracteosa Wurdack affinis, foliorum laminis proportionaliter angustioribus ad basim anguste acutis ovario omnino infero differt.

Ramuli primum quadrangulares demum teretes sicut foliorum subtus venae primariae basim versus sparse strigosi pilis 1-1.5 mm longis (basi expansa obscure aspera) demum deciduis. Petioli (1.5-)3-5 cm longi; lamina (7-)10-18 X (2-)3.5-5.5 cm elliptica apice gradatim acuminato base anguste acuta, chartacea et integra distanter appresso-ciliolata, ubique primum glandulis 0.05 mm diam. deciduis modice obsita alioqui glabra supra obscure verruculosa subtus densiuscule verruculis conicis ca 0.1 mm altis obsita, breviter (1-2.5 cm) 5-plinervata nervis secundariis plerumque 3-4 mm inter se distantibus nervulis subtus planis obscuris laxe reticulatis (areolis 2-3 mm latis). Flores 5-meri sessiles ad nodos paucifasciculati bractearum paribus 3-4 persistentibus arcte investi; bractee 1.2 X 1 mm vel 2 X 2.6 mm vel 2.6 X 3.5 mm vel 3.4 X 4 mm suborbiculares vel late oblongae (apice rotundato vel paulo emarginato) extus centraliter sparse strigulosae alioqui glabrae. Hypanthium (ad torum) ca 2.9 mm longum extus dense sericeo-strigosum pilis laevibus paulo compressis 2-2.5 mm longis; calyx ca 0.4 mm longus paulo (0.1 mm) 5-undulatus; torus intus glaber. Petala (paulo immatura) 4 X 2 mm oblongo-lanceata, extus carinata apice extus mucronulato et setula unica 0.1-0.2 mm longa terminata alioqui glabra. Stamina isomorphica glabra; antherarum thecae 1.8 X 0.6 X 0.5 mm oblongae minute uniporosae, connectivo non vel obscure (0.1 mm) prolongato exappendiculato. Stigma non expansum; stylus glaber in ovarii collo ca 0.2 mm alto hebeti-lobulato insertus; ovarium 5-loculare et omnino inferum glabrum.

Type Collection: J. J. de Granville, L. Allorge, G. Cremers, A. R. A. Gorts-van Rijn, & J. F. Kodjoed-Bonneton 7753 (holotype US 3102751; isotype CAY), collected in humid forest along a streamlet near the summit of Montagne Bellevue de l'Inini, French Guiana, elev. 700 m, 23 August 1985. "Arbuste de 2 m de haut, cauliflore, poussant dans l'eau. Flores à calice vert et corolle blanche."

H. bracteosa, endemic to northeastern Venezuela (and perhaps Tobago), has leaf blades with length/width ratio of 1.8-2.3 (rather than 3-3.5) and with broadly acute to obtuse base (and rather sparsely pustulate), as well as ovary only 1/3-1/2 inferior (cone well developed). No other close relatives of H. ininiensis are apparent.

AN ADDITION TO THE ORCHID FLORA OF PUERTO RICO

Ruben P. Sauleda, Ralph M. Adams (Department of Biological Sciences, Florida Atlantic University, Boca Raton, FL 33431) and Marvin E. Ragan (126 Wild Orchid Lane, Orange Park, FL 32073).

During our studies for a forthcoming treatment of the Orchid Flora of Puerto Rico, we have discovered the presence of Epidendrum pseudoramosum Schltr., a species heretofore not reported from Puerto Rico.

Epidendrum pseudoramosum Schltr. in Fedde Rep. 10: 361. 1912.

Type: GUATEMALA: Alta Verapaz, near Coban, Sep 1907, Turckheim II 1951 (Holotype: B; isotype: AMES).

A search of the major herbaria of Europe and the United States has failed to uncover the holotype. The holotype was presumably at Berlin (B) and lost during World War II. Therefore we here designate as a lectotype the isotype at the Orchid Herbarium of Oakes Ames (AMES).

Additional Specimens Examined: PUERTO RICO: Caribbean National Forest, El Yunque Trail, 0.2 km from summit of El Yunque, 2 Dec 1981, Sauleda et al 7013 (FTG, USF); Caribbean National Forest, El Yunque Trail, 0.2 km from summit of El Yunque, 7 Nov 1983, Sauleda et al 8532 (FTG, USF); Punta Torrecilla, 14 Nov 1979, Lioqier et al 30043 (UPR); Mt. Guilarte, 22 Jan 1980, Lioqier et al 30318 (UPR).

Plant epiphytic, rhizomatous, pendent to semi-erect, to 42 cm long; roots numerous, slender, velamentous; rhizome short, enclosed by scarious sheaths; stem basally terete, becoming flattened towards apex, usually with 1-3 short lateral branches near apex, enclosed by tubular leaf-sheaths, to 16 leaves; leaves distichous, coriaceous, articulated with the leaf-sheaths, lanceolate to linear-elliptic, obtuse to subacute, emarginate, to 8 cm long, 1.2 cm wide; inflorescence terminal, to 3.8 cm long, short spicate raceme with short peduncle, to 4 flowers, flowers non-resupinate; floral bracts conduplicate, ovate, obtuse to subacute, concealing ovary, to 1.2 cm long, 1.2 cm wide; ovary pedicellate, sessile, short and stout, to 0.8 cm long; sepals and petals green to

greenish-yellow or greenish-brown, glossy, fleshy and rigid, ringent; dorsal sepal elliptic, obtuse, to 0.8 cm long, 0.2 cm wide; lateral sepals obliquely elliptic, obtuse, to 0.8 cm long, 0.3 cm wide; petals linear, obtuse, to 0.7 cm long, 0.1 cm wide; labellum green to greenish-yellow, clawed, claw adnate to column, disc cordate, apex obtuse, basally bicallose, to 0.3 cm wide, 0.4 cm long; column short, blunt, apex dentate, to 0.2 cm long, 0.2 cm wide, anther terminal; capsule ellipsoid, to 1.3 cm long, 0.7 cm wide.

This species was first collected in Puerto Rico by Liogier in 1979 but identified as Epidendrum rigidum Jacq. It is distinguished from E. rigidum by its short pedunculate inflorescence and its branching and pendent to semi-erect stem. Epidendrum rigidum has a spicate inflorescence with a long peduncle and a simple erect stem.

Epidendrum pseudoramosum closely resembles and can be confused with E. ramosum Jacq. However, these two species can be distinguished easily by examining the flowers. The sepals, petals and apex of the labellum of E. ramosum are acute. In E. pseudoramosum, the sepals, petals and apex of the labellum are obtuse.

This species occurs in high altitude (1000-1200 m) wet forests growing epiphytically on large trees.

Additional Distribution: Greater and Lesser Antilles, Central America and northern South America (Garay & Sweet, 1974).

LITERATURE CITED

- Garay, L. A. and H. R. Sweet, 1974. The Orchidaceae,
In: R. A. Howard, Flora of the Lesser Antilles.
Arnold Arb., Harv. Univ., Jamaica Plain, MA.

ACKNOWLEDGEMENTS

We wish to thank the Directors, Curators and staff members of the herbaria cited in the text for their cooperation and help. We acknowledge the generous field assistance given by Julio Melendez of Puerto Rico and Dr. Bruce Hansen of the University of South Florida. This research was supported in part by donations from the Tropical Orchid Society of West Palm Beach, Florida.

A NEW SPECIES OF HOYA (ASCLEPIADACEAE) FROM SARAWAK

Ted Green
Green Plant Research
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Hoya meredithii Green sp. nov.

Species certe Hoya globulosa Hooker f. ex Indo-China affinis a qua differt follis multo magni et inflorescentia semiglobosa non globulosa.

Vitis terrestis vel epiphytica ramosa volubilis, ramis filiformibus, laxe foliatis, foliis patulis margo undulato obovatis apice acuminato basibus obtusis subauriculatis duris rigidis 7.5 - 18 cm. lato 12 - 30 cm. longo, glandi una in basi, petiolo crasso duro torquero 2.3 - 3 cm longo, venis pinnatiformibus insignibus obscuris viridibus venis secundis 6 - 8 ultimis reticulatis, cymi umbelliformis multifloribus, pedunculo 2 mm diametro 2.5 - 3 cm. longo perpetuis, pedicilli recti aequali, calycibus 5-fidis 5 mm diametro, foliolis calycis acutis triangularibus glabris, corolla 5-fida patulis vel reflexis 1 cm. diametro, foliolis ovatis acutis flaviviridibus, corona 5-fida 5 mm. diametro dorso plano folioso carnosofusiformi extus apice acuto intus apice obtuso viridi-albo, pollinis duobus minimis oblongoideis translatoribus brevissimus flexis, retinaculo minuto. Follicum ignotum.

Hoya meredithii Green sp. nov.

This species appears to be related to Hoya globulosa Hooker f. but differs in its much larger ovate leaves and umbel that is hemispheric rather than globose.

Epiphytic or terrestrial, branching vine with flexuous, filiform stems, sparsely rooting along stems; loosely, oppositely leaved (sometimes lacking the twin of a pair); leaf open, with undulate margins, ovate with acuminate tip, obtuse base, subauriculate, with one large gland, hard and rigid blade; 7.5 to 18 cm. wide by 12 to 30 cm. long; petiole hard and thick, 8 mm. in diameter by 2.5 - 3 cm long, twisted; leaf venation pinnate, with 8 - 12 secondary veins ending in reticulations, showy, all veins dark green against a light blade; cyme umbellate, with many pale chartreuse flowers, 1 cm. in diameter; peduncle persistent, 10 cm. long by 2 mm. in diameter; pedicels straight, equal in length creating a hemispheric umbel; calyx lobes 5, 1 1/2 mm, acutely triangular, glabrous; corolla 5 parted, lobed to half the depth, lobes flat to reflexed, ovate; corona 5 parted, fleshy, flat across the top, corolla lobes spindle shaped with inner tips blunt and outer tips acute, greenish white; pollinia paired, in 5 sets, compressed, with small flexed trans-

lators. Follicle and seed not seen.

Blooms predominately in April-May-June with the flowers lasting about 4 days. Flowers have a pleasant fragrance and exude nectar. In vegetative characters this plant resembles and can be confused with some of the tropical apocynaceous vines.

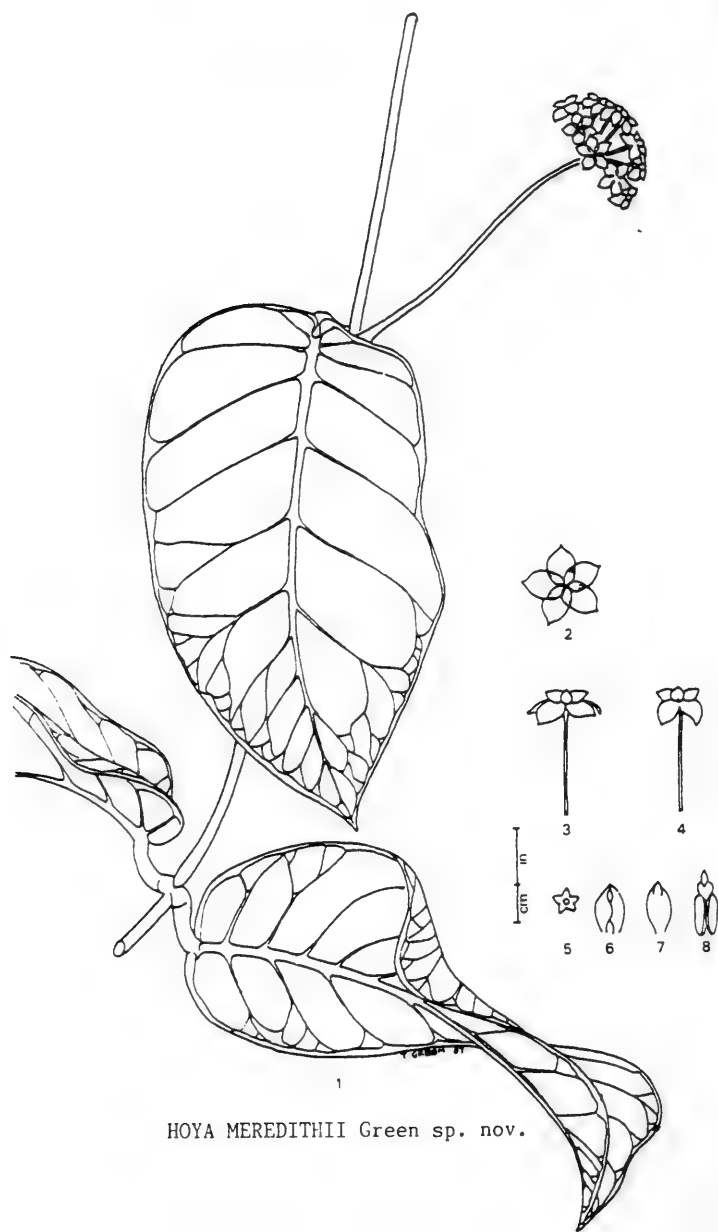
TYPE: Bau, Sarawak, Eastern Malaysia, elevation 35 m, on calcareous soils of the open, lowland forest. Not flowering July 1980. Hort. material, T. Green 'Meredith 80-05', Wallace 851980: Type Bishop Museum, Duplicate Britton Herbarium, New York Botanical Garden.

This handsomely leaved species is named for York Meredith, the plantsman, of Dee Why, Australia who discovered it.

FIGURE LEGEND

Hoya meredithii Green Sp. Nov.

Fig.1 General Growth X1, Fig.2 Flower (dorsal view) X2, Figs.3-4 Flowers (lateral view), Fig.5 Calyx X2, Fig.6 Coronal Lobe (ventral view) X6, Fig.7 Coronal Lobe (dorsal view), Fig.8 Pollinia X20.



HOYA MEREDITHII Green sp. nov.

BOOK REVIEWS

XV

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"EXPLORING OUR LIVING PLANET" by Robert D. Ballard. 1-366, 176 illustrations, 97 paintings, diagrams, and maps. National Geographic Society, Washington, D.C. 1983. \$23.95

Magnificent in its colorful illustrations, this volume is more important for the scope and clarity of its text. The theme might be expressed in the single word - "change." The world is constantly altering its face and make-up: creation and destruction seem to be rampant in all parts, so well demonstrated in the volcanic phenomena. Most emphasis in this book has been placed on the geological processes, but some biologic insights also appear. There are 5 main sections: 1) general survey of planet Earth; 2) spreading of the ocean floor and of land masses; 3) "hotspots" - protrusions through the lithosphere of heated substance from below, resulting in volcanoes, new land, fumaroles, hot springs, geysers, thermal pools; 3) slipping: the strain from movement of tectonic plates, resulting in earthquakes, landslides, etc.; 4) collision: the ocean floor plunges under the edge of a continent to produce mountains including volcanoes (ex. the Rockies and the series of volcanoes along the Pacific coast of North and South America. The work is excellent in its use of specific illustrative anecdotes and incidents.

GMH

"THE CHEMICAL FORMULARY" Volume XXV., edited by H. Bennett. ix + 435 pp., Chemical Publishing Co., Inc., 80-8th Ave., New York City. 1983. \$35.00.

Like the preceding volumes in this useful series, the first chapter "Introduction" furnishes basic information on compounding of the formulas. The ten chapters which follow present formulas of tried and true nature for various classes of preparation. The largest chapter is IV on Cosmetics, with 147 pages. The remaining chapters with formulas (totalling 177 pages) include beverages and foods, coatings, drugs, detergents and sanitizers, elastomers and plastics, metal polishes, textile specialties, and "miscellaneous." The appendix covers many diverse subjects - laws, incompatibilities, tables of measures and weights, atomic weights, first aid, trademarked names, manufacturers, and the index. This and the other volumes represent a "collection of commercial formulas for making thousands of products in many fields."

GMH

"AMPHIBIANS AND REPTILES OF NEW ENGLAND: HABITATS AND NATURAL HISTORY," by Richard M. DeGraaf and Deborah D. Rudis. vii + 85 pp., many figs. and maps, 2 tab. The Univ. of Mass. Press, Amherst, Mass. 01004. 1983. \$14.00 (cloth); \$6.95 (paper).

This excellent treatment furnishes excellent sketches and descriptions of 57 species of amphibians (salamanders, toads, frogs) and reptiles (turtles and snakes with one species of lizard). Much information on habitats, life histories, distributions, physiology, and other aspects of the organisms is included and interestingly related.

GMH

"EDIMED" de DE L'INFORMATORE FARMACEUTICO. Edizione Speciale per il Medico, ed. 3. xxviii + A1 - A882 + B1=B346 (tot. 1356 pp.). - Organizzazione Editoriale Medico-Farmaceutica SRL. 20125 Milano, Italy. 1986. 84,000 Lit. (US \$95.00).

This large card-covered volume gives much information both on Italian medical specialties and on medicinal and pharmaceutical products in general, including therapeutic groups. There are also lists of medicinal specialties which can only be sold on prescription and are nonrefillable; those which can be sold over-the-counter; a list of medicinals which must be kept at certain temperatures; a table of medicinals which must (by Italian law) be available in the pharmacy; and other reference materials, including abbreviations and acronyms. The main list of proprietaries on white paper provides manufacturer, composition, indications, packaging, etc. The catalog of pharmaceutical substances (pink paper) shows Latin and Italian names and often where (in which preparation) found. The section on medicinal plants (green) gives pertinent information on uses, etc. The section on indications arranges medicinal uses in alphabetic order with long lists of proprietaries in which indicated.

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"CADMIUM," edited by Ernest C. Foulkes. Handbook of Experimental Pharmacology, vol. 80: xiv + 400 pp., 59 figs., 69 tabs. 995 g. (wt.). Springer-Verlag Berlin, Heidelberg, New York, Tokyo. 1986. DM. 490, U.S. \$245.00 (approx.).

Cadmium, Cd, a metal related to zinc, has been known to be toxic to animal species for some time; there is no known value for health in man. Since it has a long biological life, the danger of accumulation is of special importance. Because of enhanced human activity in recent decades in such fields as mining, metallurgy, coal (combustion), and farm fertilizers used on a large scale, the problem of cadmium toxicity is a growing one. The chief objective of the present volume is to explore in depth the mechanisms of action of Cd on biological systems. There has been considerable

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research on Cd in Sweden (Friberg monograph; 1974) and Japan in recent years and specialists from these countries have collaborated in producing the present work. The subject matter of this book includes the following in succession: estimation of Cd in biological samples (Ch. 1); Cd in the environment and especially in terrestrial food crops (2); absorption of Cd (3); Chronic toxicity and the influence of the environment, etc. (4); effects of Cd exposure in the human (5); chronic Cd poisoning as manifest in nephropathy (6); effects of Cd on the cardiovascular system (CVS) (7); the role of metallothioneins on Cd metabolism (discussed below) (8); immunotoxicity of Cd (9); the effect of dietary selenium (Se) on Cd cardiotoxicity (see below) (10); and the cellular resistance to Cd (11). The theionines (not to be confused with the thionines) are sulfur-rich metal-binding proteins which have the property of absorbing various metals, such as Cd, Zn, Fe, Cu, etc. and also some non-metals, notably sulfur and nitrogen. The metallothioneins tend to accumulate in certain parts of the body, especially kidney and liver, both excretory organs. The theionines appear in many plant and animal bodies and are thought to provide a kind of detoxication material or what is referred to as cell resistance to Cd. Apparently, these compounds are synthesized as needed by the organism, that is on demand, so to speak. Cd is thought by some to have a deleterious effect on the heart, producing a cardiomyopathy (or deterioration of the heart muscle), with such manifestations as hypertension and ischemic heart disease. Cd is also damaging to the immune system of the body being related to the production of antibodies. Cd affects the behavior of macrophages which partially explains the harm to the immunity process. The importance of this to cancer development is obvious. Much experimentation is being carried out with cultured cells in an effort to determine the responses of the cell to Cd. In summary, there can be little doubt that on the whole, Cd plays a negative or actually harmful role in the body. It is thus important to know what average intakes of the metal are, and what amounts can be regarded as relatively harmless, that is, the accepted daily intake (ADI) amounts. (Compare RDA (recommended daily allowance) for vitamins and other dietary materials; however these represent minimum amounts, whereas ADI sets maximum quantities). Prof. Foulkes, the Editor, is active at the University of Cincinnati College of Medicine and 12 other Americans are contributors to the text; with an additional seven from four other countries. Without question, this volume of the Handbook is the definitive reference volume on the subject and obviously will be on demand in any collection on toxicology, environmental matters, medicine, chemistry, pharmacology, and medicine.

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"THE TECHNICAL EDITOR'S AND SECRETARY'S DESK GUIDE," by George Freedman and Deborah A. Freedman. xxxviii + 547 pp., many figs. and tabs. McGraw-Hill Book Co., New York, St. Louis, etc. 1985. \$29.95.

This is practically a complete guide to the preparation and production of manuscripts, reports, technical documents, articles, books, proposals, etc. It is aimed at those in the scientific and engineering areas. Editors, typists, secretaries, and professional writers, whether working for concerns or free-lance, will find the book a welcome key in solving many problems which come up in the writing trade. There are many references to the languages of chemistry, physics, mathematics, electronics, and technology in general. It furnishes aid in such various ways as spelling, capitalization, symbols, abbreviations, signs, notation's prefixes, suffixes. Both the table of contents and the index are very useful, quite in contrast with many such aids to content. This is a writer's guide which can be sincerely recommended.

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"NEUROHEMAL ORGANS OF ARTHROPODS: Their Development, Evolution, Structures, and Functions," edited by A.P. Gupta. xvi + 629 pp., many figs. and tabs. Charles C. Thomas, Publisher, Springfield, Ill. 1983. \$74.50.

Neurohemal organs (NHO) are sites where hormones secreted by the endocrine organs of arthropods are stored, synthesized, and released. They are made up of neurosecretory cells of the brain or other ganglia of the nervous system. They play an important role in controlling most of the functions of the animal body and are closely associated with the circulatory system (hence name). A great volume of information is conveyed through the combined efforts of 23 contributors (incl. the editor) in 20 chapters. The text has 3 chief divisions: 1) development and evolution; 2) organs found in Crustacea, Arachnida, Myriapoda, and 3) in the Insecta.

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"COMPENDIUM OF PEA DISEASES," edited by Donald J. Hagedorn. v + 57 pp., 110 col. pls. 16 figs., 4 tabs. Published by The American Phytopathological Society, 3340 Pilot Knob Road, St. Paul, MN. 1984. \$17.00.

Interesting and graphic delineation of both biotic diseases (bacterial, fungal, viral, nematode) and abiotic diseases (freezing, fertilizer, and others) are furnished in the large pages of this manual. Included is a guide to identification of diseases in the field, a glossary, and index.

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"TERATOGENESIS AND REPRODUCTIVE TOXICOLOGY," edited by E.M. Johnson and D.M. Kochhar. Handbook of Experimental Pharmacology Vol. 65; xvi + 372 pp., 69 figs., tabs. Springer-Verlag Berlin, Heidelberg, New York. 1983. DM. 290.-- (ca US \$120.00).

Developmental toxicology is that division of the field of reproductive toxicology which considers the effects of untoward extrinsic substances or factors which affect the product of conception (the embryo or fetus) (the conceptus). One of the results of such toxic action is teratogenesis or the development of monstrosities or congenital anomalies. The subject field is very complex one since it involves phases of developmental and molecular biology, pathology, pharmacology, toxicology, pediatrics, neonatology, and epidemiology, as well as such specialties as perinatal physiology and postnatal behavior. In the present volume, there are chapters relating to detection and assessment of potential hazards to the unborn in the workplace (ex. iodine deficiency) and the pharmacokinetics of the maternal/placental/fetal complex as related to development of birth defects. Studies were made with compartmented models and with particular investigation of the placenta which plays such an important role in pregnancy serving as it does as a combination gastro-intestinal and genitor-urinary tract, lung, liver and endocrine organ for the fetus. Genetic differences in drug metabolism are explained in an effort to explain some types of birth defects. The second largest section of the text is concerned with the mechanisms (either known or possible/probable) involved in teratogenesis. These include viruses, abnormalities of cell membrane development (closely identified with lipid composition), the closely related receptors of the cell membrane which may be defective and result in somatic malformations (ex. testicular feminization, cystic fibrosis, and others). The role of mutagens (producing mutation or changes in genetic foundations) in teratogenesis seems to be important. (There is also a well established link to carcinogenesis). A table presents many examples of the relationship of various compounds to both teratogenesis and mutagenesis. Thus, for instance, benzene is shown to produce both effects while aspirin is sometimes implicated in teratogenesis but is not a mutagen. Section 3 of the volume is concerned with the adverse effects of prenatal contaminants on the postnatal individual. Some specifics are detailed. Thus, amphetamines taken by the mother animal resulted in disorders of the catecholamine balance of offspring and then was mirrored in unusual animal behavior. (The practical implication of this may be understood when we realize that in the U.S. alone some 570,000 women of child-bearing age are users of amphetamines for purposes of weight reduction). The well-known tragedy of thalidomide use resulting in offspring deformities is included here. Examples of deficiencies of the pituitary, gastrointestinal, hemologic, genito-urinary, and cardiovascular systems resulting from drug usage are included. The last section deals with methods

now in use for rapid detection of environmental hazards to the unborn. This book should be important to a broad audience - toxicologists, industrial plant managers, physicians, public health officials, pharmacologists, and others. There are 24 contributors (all in the United States), including the 2 editors, who both are associated with the Jefferson Medical College at Thomas Jefferson University, in Philadelphia, Penna, along with 6 others. Four authors are from the National Institutes of Health, 3 from Dow Chemical, and 2 from the University of Washington Medical School in Seattle. Needless to say the text of this German-published book is all in English!

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"CASSINI ON COMPOSITAE," collected and arranged by Robert M. King and Helen W. Dawson. 3 vols.: v. 1: xxxix + 636 pp., 14 pls. incl. 1 portr.; v. 2: pp. 637-1330; v. 3: 1331-1963; I-XXXVII; cloth bound. Trainpower, POB 1255, Vienna, Va 22180. (orig. Oriole Editions, New York). 1975. \$100.00. (special at \$35.00).

The original text in French represents the entire collection of H. Cassini's writings published in Cuvier's "Dictionnaire des Sciences Naturelles" (ed. 2) which was published between 1816 and 1830. Cassini's contributions are scattered throughout the 30 volumes with 898 entries on the Compositae and the closely related Calyceraceae (Boopidées). The Dictionary is very rare now due in part to the small size of the edition. All entries are arranged in alphabetic order. The volumes divide the alphabet as follows: v. I: A - L (Abrotanoides to Lampote); v. 2: L - P (Lampourde to Podolèpe); v. 3: P - Z (Podosperma to Zyégée). Following the alphabetic sequence there is a methodical table (pp. 1907-1945 (with notes) and an alphabetic table (pp. 1945-1963). Following this is the valuable index of botanical names prepared by the compilers. There is an interesting introduction with biobibliographic information on Cassini (1781-1832). This is a very important book for students of the Compositae (Asteraceae), and should be available in science/botany libraries everywhere.

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"ELEMENTS POUR UN ATLAS DES PLANTES VASCULAIRES DE L'AFRIQUE SECHE. Vol. I." par J.P. Lebrun. Institut d'Élevage et de Médecine Vétérinaire des Pays Tropicaux, 10, rue Pierre-Curie, 94700 Maisons Alfort, France. Etude Botanique No. 4: 265 pp.; 51 maps; 1977.

In this work covering 50 plant species taken as examples of the vascular flora of dry Africa, the known distributions have been carefully noted by means of herbarium specimen citations, journal articles, and books. For each species, dot locations have been used on a map of Africa and in order to identify the specific phytogeographic division(s) represented, an overlay map

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on transparent paper is provided. For each species, there are given in the text the botanical names, citations, basionyms where applicable, synonyms, and brief descriptions, along with ecological information (esp. soils), geographic distribution, and references, these arranged by the countries of Africa where found. The value of this work is all the more important because of the paucity of studies of the area covered. Only the facts have been recorded; no effort has been made to make any explanations or to spin theories. Perhaps one day this work may form part of an atlas of the vascular plants of Africa, similar to several atlases of areas in Japan, the Pacific, n.w. Europe, and Belgium/Luxembourg.

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"SEA VEGETABLES: harvesting guide and cookbook, by Evelyn McConnaughey. 239 pp., 44 figs., 12 tabs. Naturegraph Publishers, Happy Camp, Cal. 96039. 1985. \$7.95.

The great free source of food available to all is the plant life of ocean and sea. This volume furnishes us with the complete story from history to classification to foraging and preparation of the finished culinary product. Roughly half the text is taken up with recipes for the preparation of imitation quiche, rolls, pizza, salad, pie, and others. Space is given to discussing the hygienic values of sea plants. At least 17 genera are considered as food sources of which the most important seem to be Alaria, Nereocystis, and Porphyra. For anyone living near the seacoast, this is a most valuable guide and an inspiration.

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McGRAW-HILL DICTIONARY OF BIOLOGY. xi + 384 pp.
McGRAW-HILL DICTIONARY OF CHEMICAL TERMS. vii + 470 pp.
McGRAW-HILL DICTIONARY OF PHYSICS. xii + 646 pp.
McGraw-Hill Book Company, New York (etc.). 1985. Each vol. \$15.95.

These sturdy paperback volumes contain the texts originally published in the single-volume "McGraw-Hill Dictionary of Scientific and Technical Terms" (ed. 3; 1984) and are intended to provide more convenient use to workers in various fields—biology, chemistry, and physics, and the specialties which border on each of these. The definitions are clear-cut, and rendered in the simplest language consistent with accuracy. Besides the regular special terms of the field, synonyms, acronyms, and abbreviations are included in the same alphabetic sequence. The 15,000 terms defined include an indication of the special field to which respectively applicable. The chemical dictionary bears over 6,800 terms and applies to many sub-fields of chemistry. The physics compilation includes about 11,200 terms, from 18 specialties. These hand dictionaries are additional to several others, mostly in the fields of engineering and computer science. They are contemporary in including many terms not to be found easily in other dictionaries. However, a few terms were found lacking, such as

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adaptogen, anamorph (fungi), anti-feedant, nothomorph, enterocyte, allozyme, spodogram, Spirulina, electron microscope, Coniferae (however, Coniferales, Coniferophyta defined), starch blockers. These smaller volumes are handy economic books for the individual laboratory or shop worker.

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"DICTIONARY OF SCIENTIFIC, TECHNICAL, AND ECONOMIC ABBREVIATIONS AND ACRONYMS," compiled by Jean Murith. viii + 408 pp., Technique et Documentation - Lavoisier, 11, rue Lavoisier, Paris Cedex 08, France. 1984. 320 FF. (US \$35.00 approx.).

This "Dictionnaire des Abbreviations et Acronymes" follows up the compilers' earlier work "Dictionary of Acronyms and Abbreviations" (1982), which was especially strong in acronyms for various organizations, publications, etc. The present work is geared more to general terms, such as for instance GSH for "growth stimulating hormone" (as an acronym) and d for "density" (as an abbreviation). Somewhat more attention has been given to English/American terms than in the other compilation. The foreword is rendered in both French and English. Thirty-three thousand abbreviations/acronyms are included: almost twice the number (17,000) in the other work. The two works are complementary and there is almost no duplication of abbreviations. Sometimes abbreviations earlier used commonly but now rarely are included. Abbreviations/acronyms not found in either work include these: FP (family practice); PMS (premenstrual syndrome); AUC (concentration time curve); HA (honorary alumnus, alumna); CDI (Criminal Intelligence Department, India); APB (all points bulletin, police depts.); CIO (Congress of Industrial Organizations, USA); AFL (American Federation of Labor); FBI (Federal Bureau of Investigation, USA); NAACP (National Association for the Advancement of Colored People, USA); HEW (Health Education and Welfare, U.S. Department); MIT (Massachusetts Inst. of Technology); IRA (individual retirement account, USA); PDQ (pretty damned (darned) quick, US slang); POW (prisoner of war); PC (post cibum (L), after meals); ac (ante cibum, before meals); MPD (multiple pulmonary (?) disorders). It can definitely be said that both of these books are very useful and dependable books for the determination of abbreviations and acronyms in the scientific (including medicinal) and other fields.

"QUIMICA DE LAS PLANTAS CHILENAS USADAS EN MEDICINA POPULAR I," by P. Pacheco, M.T. Chiang, C. Marticobena, and Mario Silva. iii + 287 pp. Universidad de Concepcion, Departamento de Botanica, Casilla 2407, Concepcion, Chile. 1977.

This work on the folk medicinal plants of Chile was motivated by the growing interest in the world to know the applications of such materials. Pteridophytes and Phanerogams are covered. The useful information included under each plant taxon is: scientific and popular names; uses; chemical studies. Under

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the latter are included not only data from the literature but also studies carried out in the natural products chemistry laboratory of the Central institute of Biology. These include detection of alkaloids, terpenes, sesquiterpenes, flavonoids, coumarins, anthraquinones, steroids, glycosides, sugars, and others. Anti-microbial and antitumor studies are also reported for many of the drugs. A comprehensive index is provided. This is a very useful book for a geographic area lacking in such literature.

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"McGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS," 3d. ed. with Sybil P. Parker (Editor). xv + 1781 + 65 (A), 3000 figs. McGraw-Hill Book Co., New York. 1984. \$70.00.

Since the publication of the first ed. (1974) (see *Phytologia* 40: 285-7; 1978) of this outstanding reference work, a number of important changes and improvements have been made: there are 7500 new definitions; additional figures (photos, drawings, diagrams, graphs, and others), 185 pages added, and of course definitions added to, upgraded, and modernized. The definitions cover many fields of science, hence cannot be considered comprehensive for every area. The text is printed on a thin but strong grade of paper, the printing is clear and the entry words are used in bold face to differentiate from the text of the definition. Besides an editorial staff of 11 people, there are 28 consulting engineers (mostly from the faculties of universities), and nine contributing editors (specialists in various areas of science). Besides the many improvements in the text proper, the appendix has been more than doubled (from 27 pages to 65). The following additions have been made to the appendix: the Periodic Table; specialized abbreviations and acronyms (a most commendable addition, covering 11 pages); a classification of living organisms (17 pp.), and an annotated listing (biographies) of eminent scientists. A section on the taxonomy of bacteria was dropped, only appearing in part in the classification of organisms. This omission may have been related to the considerable differences of opinion on classification of these organisms. It would have been helpful to have included in the appendix a scheme demonstrating the hierarchy of classifications of plants and animals. Among the terms not found in this edition are the following: alkanol (chemistry: a general term); allozyme, analplerotic pathway; anthochlor pigments (chalcones) (or chalkones); barachois (ecology); Chironix (toxic animal); cooperativity; cryonics; epiplem; epilithion; epithet; golden seal; isbelline (color); nothogamy; nothomorph; (o)enology (science of wines); openings (oak), octets (plant ecology), perigone (perianth, floral envelope); ramets; registrate; section (systematic biology); sigmoidicity; teosinte; tribe (biol. classification); castor oil fish; capoeira (woods, Brazil); chemism (chem. reaction properties); colethophores; cytomixic; diagraph; dianetics (-1950-); feculae (insects); liman (physiography; estuaries which have spits (separating them from the sea); monstrose (monstrous); monopsids (plant group); phene-

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tic; potentiator; quaaludes; tofu, (Jap. soy product); recombinant DNA; diapositive; "Dias" (transparency slides (term used in Germany)); phyton; phytomer(e). It seems likely that some of these terms are too highly specialized for this kind of dictionary. The work is of much value undoubtedly and should share the important reference shelf in any library with Webster's Dictionary, Roget's Thesaurus, and other valuable compilations. It covers more than 100 fields of science and technology and in this edition extra emphasis has been given to computer science.

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"SYNOPSIS AND CLASSIFICATION OF LIVING ORGANISMS," Vols. I and II, by Sybil P. Parker (Editor-in-Chief). v. I: xix + 1-1166 pp. 87 pls. many figs. (s.n.) - v. II: vii + 1-1232; 54 pls., many figs. McGraw-Hill Book Co., New York, St. Louis. 1982 (recd. 1983). \$149.50 (for 2 vols.).

This large heavy 2-volume work covers four kingdoms of living organisms, viz., Virus; Monera, (Bacteria and Cyanophycota); Plantae (Thallobionta = Thallophyta and Embryobiota, the balance of the plants form the Bryophyta up); and Animalia. Much more space has been devoted to the animals (1739 pp) than to the first 3 kingdoms (488 pp) or a ratio of about 3.4 to 1 in favor of the animals. The first three kingdoms occupy a bit over one-third of the first volume, the balance of vol. I and all of vol. II being taken up with the animal kingdom. The descriptive texts of the various groups is followed in vol. II by a synoptical classification of all groups down to families. This very valuable classification compilation occupies 46 pages (3-columned). A condensed and simplified scheme with only a few pages and showing kingdom to phyla and classes or maybe to orders would have been very helpful for obtaining a kind of bird's eye view of the realm of living beings. The index which follows, covering 112 pages (4-columned) is a very great benefit indeed and most useful. It is unfortunate that the index does not refer to the classification scheme. Thus, for the Leptostomaceae (mosses), the reference in the index is to the descriptive entry (v. I: p. 315); it would have been very useful to also refer to p. 1078 of the classification synopsis. In the text, more common names would have been useful. There are running headlines to the larger groups; it would have helped to insert smaller subdivisions as well; thus on p. 366, the heading "Magnoliophyta" would have more reference value if the order (Nymphaeales) had been also inserted after it. In the index, a range of pages would often have been very handy. For an instance, the Bryophyta cover pp. 271-336 (106 pp.) but the index refers only to p. 271. The text was written by a large number (173) of contributors, of whom 30 were specialists in botany (or closely related fields); however, many of the people in biology, microbiology, environmental sciences, & museum studies might also have been included in the total for botanists. In the textual portion, there are monographic descriptions of each phylum, class, order, and family (sometimes also of subclass),

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with occasionally mention of an individual genus and even species, mostly exemplary. References are frequent. Descriptions include brief but essential facts on morphology and histology, distribution, etc. - In a world of such enormous magnitude, this work will be a very useful guide to an understanding of relationships between organisms as well as to give opportunity to comprehend the nature of the organisms themselves. This reference book should be available in any important collection of books on biology or branches and also of general science. Its appeal is well nigh universal.

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"HISTORY OF THE SOUTH DAKOTA UNIVERSITY COLLEGE OF PHARMACY 1975-1982: a chronology". by Kenneth Redman xi + 95 pp., many figs. & tabs. Published by author, Brookings, So.Dak. 57007. 1983.

This history is complementary to a previous history of the school (Eidsmoe, Clark, for the period 1887 - 1974). Two chapters cover the more important events of the period, with following chapters on the Pharm. Building, accreditation, retrospect, a conclusion. An appendix lists awards, prizes, etc. A good sound review of the subject. The author was recently deceased.

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"COMPARATIVE VERTEBRATE ANATOMY: AN OUTLINE TEXT" by Frances M. Rogers PhD. ix + 126 pp., many figs. Charles C. Thomas, Publisher, Springfield, IL 1983. \$12.75 (spiral bound, card cover).

This outline covers all organisms likely to be studied in a course in comparative anatomy of the Vertebrata. Occasionally reference is made to group (fish, bird, reptile, mammal) but generally the treatment is generalized. This should furnish an excellent orienting guide to students in this field.

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"HALLUCINOGENIC PLANTS" by R.E. Schultes, Golden Press (Western Publishing Co, Inc.), Racine, Wisconsin 162 pp., many col. figs.; 1976, \$1.95.

This number of the Golden Nature Guide series, presents the essential information on many hallucinogenic plants and drug materials derived from them. Following a scientific but for the layman fully intelligible introduction, the hallucinogens are discussed in detail under two main headings - Old World (with 14 items) and New World (with 34 items). The descriptive texts vary in length considerably - from less than one page to several pages. Frequently details of preparation and usage are given rather fully, thus for Cannabis and peyote. There is only passing reference to several minor or pseudo-hallucinogens, such as cinnamon, nutmeg, and Cataria (catnip). Rather surprising are

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such reputed hallucinogens as Calamus, Coleus, Petunia, and Galanga. This handy pocket book should be of considerable utility not only to the layman but also to physicians, officers of the law, and others. It is reasonably priced at \$1.95.

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SCHWARZ, E., SPIER, H.W. (deceased), and STUETTGEN, G. (Editors). Normale and pathologische Physiologie der Haut II. Handbuch der Haut-und Geschlechtskrankheiten. Ergaenzungswerk. Band I. Teil 4 A. XI + 606 pp., 196 figs. (incl. 3 col.), 80 tabs; 1979 DM 580,--(\$319).

The structure and function of the skin are studied in the context of the development of the skin's epidermis and its various biochemical and physiological functions and properties. Keratinization including the pathological cornification (callosity formation) resulting from the special situation of epidermal metabolism and the fat spreading from the sebaceous glands allows recognition of the epidermis as a functional unit. The projection of the secretion of perspiration from a neurophysiological viewpoint is presented as a diagnostically important clinical method. The energy transmitted by light to the skin and its biological and pathological reactions which are followed by characteristic results round out the volume as a comprehensive description of the skin. Treating the skin as a boundary separating the outside world develops the special aspects of its protective function to include molecular biological mechanisms. Thus this volume furnishes a basis for the following volume "B" with its presentation of the sweat glands and their secretions as explained by the physiological and biochemical parameters of permeation and the closely related pharmacology of microcirculation. There are chapters on the regulators of the epidermal cell cycle (cyclic nucleotides, prostaglandins, chalcones) with a discussion of psoriasis as the result of a "derailed" cell cycle regulation; characteristic features of the working physiology of the horny layer (corneum) of the epidermis; the lipids of the skin surfaces (sebaceous gland lipids, lipids originating in the epidermis); neurophysiology and neuropathophysiology of sweat secretion. The text is entirely in the German language. Both of the surviving editors and most of the eight other authors are from Berlin. This large encyclopedic work came out in 23 volumes (1927-1934) (bound in 41 volumes) the *Ergaenzungswerke* (Supplements) have been appearing since 1959 in 8 volumes, each volume with from one to four parts (Teilen). In Volume I, parts 1 and 2 are concerned with the normal and pathological anatomy of the skin, parts 3 and 4 with the normal and pathological physiology of the skin. Vol. I, part 3 came out in 1963. (Vol. II concerns inflammatory dermatoses; vol. III takes up non-inflammatory dermatoses; Vol. IV, infectious diseases of the skin (virus diseases, rickettsioses, bartonellosis; dermatophyte, yeast, mold, actinomycete, and other

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fungal diseases); Vol. V (1) Therapy of skin and sexual diseases; (2) radiation therapy of skin diseases; Vol. VI sexual (venereal) diseases; syphilis, ulcus molle (chancroid), fertility disturbances in man; Vol. VII: inheritance of skin diseases; Vol. VIII: The foundations and bordering spheres of dermatology). (In this volume, there appears to be considerably more orientation to chemical explanations and theory than in earlier volumes). A synopsis of the various parts of the Handbook would be very useful to the reader if incorporated in each volume of the work. The present volume is solid and well printed and bound: a delight for the book lover.

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"ADJUVANT CHEMOTHERAPY OF BREAST CANCER", edited by H.J. Senn. Vol. 96 of Recent Advances in Cancer Research": XIII + 243 pp., 98 figs., 91 tabs. Springer-Verlag Berlin, Heidelberg, New York, Tokyo, 1984. DM. 124.--(US \$50) appr.

Adjuvant chemotherapy (ACT) is the term in current use for describing the therapeutic use of chemicals following surgery (with partial or total removal of the breast(s) with the object of preventing the spread (metastasis) of cancer to other parts. Use of ACT started apparently in 1958. Its success has been checkered, often with disappearance of the cancerous process, sometimes with no happy conclusion. A previous work in this series appeared in 1982 (v. 80 "Adjuvant therapies of cancer", edited by G. Mathe', G. Bonadonna, and S. Salmon). The present work consists of the texts of 30 papers authored by 98 contributors (including the editor, Hans-Joerg Senn of the Cantonal Hospital at St. Gallen, Switzerland). The text is divided into six sections: as follows: scientific basis of ACT in breast cancer; clinical results from nonrandomized trials with historical or matched surgical controls; clinical results from randomized trials without surgical controls; other problems of ACT; and conclusion with outlook. The authorship naturally is international; thus, the first paper is by a group from the Southern Research Institute, Birmingham, Ala., USA. and the last clinical paper is from the Inst. for Med. Oncology of Bern, Switzerland. Very frequently mentioned in many papers is the CMF course, which consists of a combination of cyclophosphamide, methotrexate, and fluorouracil, with some degree of value. Less effective was L-PAM (L-phenylalanine mustard). Various combinations were also tried. The value of the various therapies was gauged by RFS (relapse-free survival) and DFI (disease-free intervals). The conclusion from this meeting was not particularly encouraging. ACT is still an experimental treatment and there is need for the trial of new medicaments and new combinations. It was felt that "only a minority of patients will profit" from ACT.

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"MANUFACTURING PROCESSES FOR NEW PHARMACEUTICALS", by Marshall Sittig. XX, 1-612, Noyes Publications, Park Ridge, NJ 1983, \$84.00.

In this work, detailed processes are given for some 500 new pharmaceutical agents which in 1983 were being considered by the Food and Drug Administration for approval. The information presented here was obtained from that very valuable source bank-U.S. Patents. Most of the names are generic and arranged in alphabetic order--thus from Aclarubicin to Zopiclone. Trademarked names are not yet available. The practical procedures are given for each of these compounds. Most of the compounds are synthetics but there are a number of such natural products as antibiotics (ex. pepsinostreptin (from *Streptomyces ramulosus*), alkaloids (cepharanthine from *Stephania sasakii* Hayata), papaverin monophosphadenine.

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"RADIOCONTRAST AGENTS," edited by Milos Sovak. - Vol. 73 of "Handbook of Experimental Pharmacology". XVI + 609 pp., 189 figs., 99 tabs. 1.39 kg. (wt.). Springer-Verlag Berlin, Heidelberg, New York, Tokyo. 1984. DM. 490. -- (ca \$US 195.00) (Prepublication price 20% off).

This book deals from every possible angle with radiographic contrast media (CM). The evolution of improved CM is impressive. Fifty years ago, a number of opaque ions were used, including iodine, bromine, (both water-and oil-soluble compounds), barium (as BaSO_4), and thorium (as ThO_2). Radiology (roentgenology) has now dropped most of these except for iodine. The insoluble BaSO_4 is not metabolizable and thus may linger in the tissue with considerable possibility of difficulty for the body. ThO_2 is radioactive, hence dangerous. Even bromine, with many of the characteristics of iodine, would result in hazardous radiation at high opacifying levels. The perfect CM would be completely inert, not physiologically active, and would be excreted without any difficulty. Since there is yet no perfect CM, a knowledge of the pharmacology of these compounds is mandatory. CM members are being used to an increasing extent since diagnosis is becoming so important in medical practice, what with computed tomography (cat scans), digital radiography, etc. Since the earlier history of CM has been rather thoroughly covered for the period from 1895 (when first used) until ca. 1971, the present work is concerned with developments in the art and science of roentgenography for the period following the latter date as well as with furnishing a corpus of knowledge on the methodology and physiology of this group of agents, with maximum emphasis on the research aspects. Thus the book fits a niche not occupied by other publications available and makes a unique contribution to our knowledge. The methods used in special areas, such as arthrography (of joints) have not been taken up since these are covered so thoroughly in

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other available books. Following a brief introduction, there are fourteen chapters, of which 13 are devoted to CM and the other (fourteenth) is an Appendix. The long (125 pp) Chap. I deals with the chemistry of the CM used today. Ch. 2 is concerned with what is one of the most important fields of X-ray use - urology - and deals in detail with urographic CM. Other chapters deal with the CVS (3,4), CNS (5), neuroradiology (6), bile tract (7,8), and lymphatic vessels & lymph nodes (9). There is next a chapter (10) on CM in computed tomography, while the following 2 chapters give information on harmful or possibly harmful effects of CM (including the mutagenic linked with the possibility of producing tumors). While CM in solution form is chiefly used today in radiography, there are certain applications where solid particles (particulate suspensions) are superior for the purpose and these are treated in Chap. 13. - The Appendix (Ch. 14) deals with the principles of anesthetic use in experimental animals (important in the study of CM). The volatile or inhalation agents, such as cyclopropane, ether, halothane, etc., are discussed, as well as muscle relaxants which include curare alkaloids, tubocurarine, and gallamine triethiodide. Included is a section on euthanasia as applied to dogs, pigs, and rabbits (the animals most useful in the study of CM). For this purpose, there are recommended concentrated solutions of KCL IV to give myocardial paralysis, of large volumes of air IV, the barbiturates being considered too expensive for such use. The 15 contributors include the Editor (who wrote the introduction and 4 chapters as well as co-authoring a fifth), 12 from the USA, and 3 from Scandia (Sweden, Finland). Four of the American authors are employees of a firm outstanding in the area of CM (Mallinckrodt). - Since effective diagnosis is so essential to adequate treatment, the value of the contents of this volume is indubitable.

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"TOXICOLOGY OF INHALED MATERIALS: General Principles of Inhalation Toxicology." - H.P. Witschi and J.D. Brain (editors). Handbook of Experimental Pharmacology Vol. 75: XCII + 553 pp., 80 figs. 51 tabs. - Springer-Verlag, Berlin, New York, Tokyo. 1985 DM. 490.-

The animal body is subject to contamination in three ways - by inhalation, by ingestion, and by skin/mucosa direct contact. In this volume, attention is centered on the first mode of passage, which has become in recent years of paramount importance. This importance is manifest from the fact that lung cancer is now the chief form of cancer lethal to males and the second most lethal to females. The serious respiratory diseases of emphysema, chronic bronchitis, fibrosis, etc., have greatly increased over the past decade so that chronic obstructive pulmonary diseases now affect some ten million persons in the US alone, with 59,000 deaths per annum. These non-neoplastic diseases are increasing so rapidly that it is estimated they will become the nation's fourth or even third leading cause of death by

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the year 2,000. The chief cause of these diseases is the inhalation into the lung of gases and particles, particularly of tobacco, but so subtle is the onset that they are particularly dangerous to the individual. One can learn how important the lungs are as an area of contamination by considering that an adult human processes ten to twenty thousand liters of air a day through the lungs. - The scientific basis and methodology of inhalation toxicology by which experimental animals are exposed to gases or particles is described and the special devices and procedures are detailed in Chapters 1 and 2. The determination of amounts of inhaled materials retained in the respiratory system is told about in Chap. 3. The animal response to such inhalation is measured by various technics (see Chap. 4). The merits and drawbacks in the use of 13 different animal species are considered; attention is then turned to human studies of the epidemiology of toxic inhalants (Chap. 5). A more scientific approach to animal pathology is seen in the use of isolated perfused lungs employing various animals (Ch. 6), also pulmonary cell and tissue cultures as recently developed (Ch. 7). One chapter (8) is devoted to considering broncho-alveolar lavage with saline, using excised lungs or lung tissues or in some cases with the lungs in situ or even using the lungs of a living large animal. As a matter of fact, in humans the same procedures are used as a therapeutic measure to remove unwanted secretions, etc., from the airways of the lung. The same method is used analytically to determine the presence or content of various cells of substances and the assessment of exposure to toxic agents, etc. Under "Morphologic techniques" are discussed methods of both gross and microscopic pathology. Detailed procedures are furnished (Ch. 9). The morphometry (or conversion of the 2-dimensional profile of structures or tissues to 3-dimensional measurements) is carried out in the alveolar regions of the lung (Ch. 10); both light and electronic microscopy is used for such studies. - The remainder of this volume (approx. half) is concerned with biological and biochemical analyses of states following toxic inhalation. Included are treatments of the cellular kinetics (cytokinetics) of the lung (Ch. 11) which concerns the movement or change of cells as a reaction to inhaled substances. This change is of course a continuing process in the body in which for instance dead or dying cells are replaced by living healthy cells. This cell turnover can be measured by the use of radiography involving the use of radioactive isotopes, or by other methods, such as "metabolic arrest" (using colchicine injections). The mucous secretion of the lung is considered in detail with the many types of specialized cells occurring in the epithelial layers. The source and composition of the respiratory secretions, the functioning of the cilia along many parts of the respiratory tract, and the proper functioning of the mucociliary transfer of mucus and debris is examined (Ch. 12). Obviously this function

plays a very large role in the removal of inhaled pollutants. Ch. 13 is engaged with the general enzymology of the lung, with a survey of research at a high level. The substrates, composition, and mode of action of several enzymes is considered. In the succeeding chapter, the oxidase system of the lung is studied. Since the lung is so different in tissue composition from other parts of the body and is so complex (containing perhaps 40 different kinds of tissue), it is obvious that a mixed enzyme function is requisite for responding to a variety of substrates. (The unspecificity is indicated from the fact that the substrate requirements are lipophilic, and relatively non-ionized). In Ch. 15, the surfactant system of the lung is taken up: these substances used to reduce surface tension in the respiratory passages are now known to be extremely important ("a matter of life and breath") especially in the new born. Some inhaled toxicants reduce this surfactant potency. The last chapter (16) deals with the effect of pneumotoxins (here applied to any agent poisonous or harmful to the lung) on the lung connective tissues, including collagens, elastins, etc., with consequent fibrotic processes that are harmful to the organism. Such fibrotic agents as bleomycin, paraquat, radiation, silica, and asbestos, are mentioned, which produce in the human being emphysema and pulmonary fibrosis. The authorship of this volume is all American (19 contributors) and Canadian (3 contributors). The editors are both Americans (Witschi from Oak Ridge, Tenn. and Brain from Harvard Univ.). This excellent treatise is an eyeopener to the breadth and complexity of the subject.

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"TRADE NAMES DICTIONARY:" edited by Donna Wood. Ed. 4. 2 vols. I: A-K: 766 pp.; 1985. II: pp. 767-1589 (822 pp.); 1985. Gale Research Co., Book Tower, Detroit, MI 48226, \$265.00 1985 (1984).

These two large volumes with "ledger" sized pages furnish us with a truly formidable multitude of trade names. The sub-title is informative: "a guide to approximately 194,000 consumer-oriented trade names, brand names, product names, coined names, model names, and design names, and names and addresses of their manufacturers, importers, marketers, or distributors. Covers: apparel, appliances, automobiles, beverages, candy, cosmetics, decorative accessories, drugs, fabrics, food, furniture, games, glass products, hardware, jewelry, paper products, pet supplies, tobacco products, toys, and other consumer-oriented items." For individuals who require such information (scientists, inventors, copyright/trademark attorneys, businessmen, manufacturers, producers, merchants, brokers, pharmacists, retailers, wholesalers, importers, exporters, governmental department personnel, and just laymen with serious interests this guide will be most serviceable. The list appears to be much more complete than the list of trademarked names in Thomas. An excellent feature in this directory is the listing in a single alphabetic sequence of product names and manufacturer's titles and

addresses. This makes for great convenience. The alphabetic sequence does not follow in strict order, thus Coffee Mill does not follow Coffeematic but is grouped with other words with "coffee". Hyphenated words are counted as made up of two separate words. Thus, Coffee-Mate lies with other coffees and does not directly precede Coffeematic. A strict alphabetic sequence would arrange words in strict ABC order regardless of separation of words. No doubt there is pro and con for both methods of arrangement. A list of book sources precedes the listing, with such organizations as the Amer. Pharm. Assn. (book on over-counter drugs). The Red Book (Drug Topics) is listed but not the "Blue Book" (American Druggist). The "Green Book" is no doubt the successor of the useful work of that name published by OPD in years gone by. --A check was made for various product names and manufacturers or dealers. Publix is listed but not Publix Theaters (Seattle, formerly at least); Crown Zellerbach Paper Co., (S.F.) is given but not its predecessor, Crown Willamette Paper Co. For their historic interest, old names and former manufacturers have been continued, of course with proper explanations. Thus, under "Aspirin," it correctly states that the term in the US and Canada is now generic; but abroad in many areas it is still a registered trademark which must not be infringed upon. One now expired exclusive name is not listed: Vesuvium (in use in A.D. 79) for a brand of wine; I suppose there must be limits. Not listed was Keri-Lotion (Westwood Pharmaceuticals, Inc., Buffalo, N.Y.), a very popular preparation for dry skin. RD Hair dressing (Raymond Research Corp., Union, N.J.) isn't listed but there is RD Men's Hair Coloring (L.T. Laboratories), products in some way related perhaps. Sulfasuxidine (TM. name of Sharp and Dohme) is not listed nor is the manufacturer (now Merck Sharp & Dohme). This product, succinylsulfathiazole, does not seem now to be marketed. Green Fields a spray mist of Helen Rubinstein, Inc., was not found, but Oriental Jade (Men's Cologne) was listed. All in all this reference work is reasonably complete, certainly up to date, and accurate in its listings. -The publishers have apparently made a very great effort to check on the accuracy of names of products and manufacturers with proper current addresses. -Cascarets must surely be one of the oldest proprietary names in use; it was advertised to "kill yellow fever germs in the bowels" back in 1897 and is still marketed by Knoll Corporation. --Some items not found: Akrodin; Cera Menda; Chichester Pills; Medicated Arnica Soap.

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