

# Adelia cinerea (Euphorbiaceae), formerly in Bernardia

ANGÉLICA CERVANTES, VICTOR W. STEINMANN, AND  
HILDA FLORES OLVERA

---

Cervantes, A. (Departamento de Botánica, Instituto de Biología, UNAM, Apdo. Postal 70-233, 04510 México, D.F., Mexico; email: anac@ibiologia.unam.mx), V. W. Steinmann (Instituto de Ecología, A. C., Centro Regional del Bajío, Apdo. Postal 386, 61600 Pátzcuaro, Michoacán, Mexico; email: steinmann@inecolbajio.edu.mx) & H. Flores Olvera (Departamento de Botánica, Instituto de Biología, UNAM, Apdo. Postal 70-233, 04510 México, D.F., Mexico; email: mahilda@servidor.unam.mx). *Adelia cinerea* (Euphorbiaceae), formerly in *Bernardia*. *Brittonia* 55: 4–9. 2003.—The new combination *Adelia cinerea* (basionym: *Bernardia cinerea*) is made. Notes on its distribution and ecology are provided, as well as a full morphological description. A discussion on the morphological and palynological distinctions between *Adelia* and *Bernardia*, and reasons for the transfer, are presented. The placement of this species in *Adelia* implies a tribal change (from Bernardieae to Adeliaeae) within subfamily Acalyphoideae. It brings the number of Mexican species of *Adelia* to six.

**Key words:** Euphorbiaceae, Acalyphoideae, *Adelia*, *Bernardia*, Mexico.

Cervantes, A. (Departamento de Botánica, Instituto de Biología, UNAM, Apdo. Postal 70–233, 04510 México, D.F., México; email: anac@ibiologia.unam.mx), V. W. Steinmann (Instituto de Ecología, A. C., Centro Regional del Bajío, Apdo. Postal 386, 61600 Pátzcuaro, Michoacán, México; email: steinmann@inecolbajio.edu.mx) & H. Flores Olvera (Departamento de Botánica, Instituto de Biología, UNAM, Apdo. Postal 70–233, 04510 México, D.F., México; email: mahilda@servidor.unam.mx). *Adelia cinerea* (Euphorbiaceae), formerly in *Bernardia*. *Brittonia* 00: 000-000. 2003.—Se propone la combinación nueva *Adelia cinerea* (basónimo: *Bernardia cinerea*), proporcionándose la descripción morfológica completa del taxon, así como notas sobre la distribución y ecología. Se discuten las diferencias morfológicas y palinológicas entre *Adelia* y *Bernardia* que justifican la transferencia. La ubicación de esta especie en *Adelia* implica un cambio de tribu, de Bernardieae a Adeliaeae, en la subfamilia Acalyphoideae. El número de especies mexicanas de *Adelia* se eleva a seis.

---

The Acalyphoideae, one of five subfamilies of the Euphorbiaceae recognized by Webster (1994), is the most diverse subfamily in Mexico, with 16 genera found in the country. With few exceptions these genera are well defined and unlikely to be confused with one another. Although the neotropical genera *Bernardia* Houst. ex Mill. (tribe Bernardieae) and *Adelia* L. (tribe Adeliaeae) are superficially similar, upon close exami-

nation they are quite distinct. *Bernardia* has been associated with *Adelia* but the pollen of *Adelia* differs markedly. Tribes Bernardieae and Adeliaeae do not appear to be closely related (Webster, 1994). Linnaeus treated them together under *Adelia*, and many taxa presently recognized as *Bernardia* were first described in *Adelia*. Also, two of the approximately 13 species currently treated as *Adelia* were initially described as

TABLE I  
MORPHOLOGICAL AND PALYNOLOGICAL DISTINCTIONS BETWEEN *Adelia* AND *Bernardia*

| Character         | <i>Adelia</i>  | <i>Bernardia</i>   |
|-------------------|--|--|
| Leaf glands       | absent   | present  |
| Filaments         | connate, at the base or into a column                        | free   |
| Pistillode        | present  | absent   |
| Anthers           | subdorsifixed versatile                                      | basifixed  |
| Male disc glands  | extrastaminal, mostly annular, rarely composed of 5 segments | interstaminal  |
| Fruiting pedicel  | well-developed, long and slender                             | absent, or short and stout   |
| Pistillate flower | solitary or rarely in 2-4-flowered racemes                   | racemose-spicate   |
| Apertures         | 3(-4)-colp(oro)idate   | 3-colporate  |
| Costa ectocolpi   | not observed   | present  |
| Operculum         | present, variable in shape and size; stratified              | absent   |
| Tectum            | almost complete and crotonoid; continuous or nearly so       | almost complete and punctate, deeply punctate or almost reticulate; mostly discontinuous |
| Margo             | absent   | present  |
| Foot layer        | very thin, almost absent                                     | thin or thicker, sometimes finely channeled  |
| Columellae        | irregular in shape and diameter, short                       | mostly uniform, as long as or slightly longer than the tectum thickness                  |

*Bernardia*. The purpose of this paper is to formally transfer one of these, *B. cinerea*, to *Adelia* and elaborate on the morphological and palynological distinctions between these two genera.

### Taxonomic Change and Discussion

***Adelia cinerea*** (Wiggins & Rollins) A. Cerv., V. W. Steinm. & Flores Olvera, comb. nov.

*Bernardia cinerea* Wiggins & Rollins, Contr. Dudley Herb. 3: 273, pl. 61, figs. 2 & 3. 1943. TYPE: MEXICO. Sonora: Mun. Guaymas, 15 mi S of La Palma, basaltic hill, 2 Sep 1941, I. L. Wiggins & R. C. Rollins 227 (HOLOTYPE: DS No. 285347; ISOTYPE: UC).

*Adelia cinerea* was described by Wiggins and Rollins (1943) from fruiting material; it was not until 1996 that staminate and pistillate flowers were collected. Therefore, a full morphological description of this species is provided below.

*Shrubs*, to 4 m tall; dioecious or monoecious; indumentum simple; latex absent. *Branches* smooth, glabrescent, unarmed; lenticels inconspicuous and rounded; bark bright brown to reddish brown. *Leaves* alternate; stipules subulate, 3-6 mm long, entire, spreading to appressed, tomentose, deciduous; petioles 0.5-2 cm long, densely to-

mentose; blades ovate to broadly ovate, 2.8-8 cm × 1.7-5.7 cm, the apex acute to rarely obtuse, the base cordate, rounded, truncate or slightly oblique, the margin dentate to crenate, velvety to the touch, adaxial surface greenish, villous hairs ca. 0.6 mm long, abaxial surface cinereous, dense villous hairs 0.6-1 mm long. *Staminate inflorescences* axillary, racemose, pedunculate, 1-1.5 cm long at anthesis, ca. 6-20-flowered, mostly with staminate flowers but rarely terminated by a pistillate flower; bracts 3-5, elliptic to triangular, imbricate, subtending 2 or 3 staminate flowers, cucullate, ca. 1.5 × 1 mm, acute. *Staminate flowers* on pedicels 1-1.5 mm long, sepals valvate, 5, narrowly triangular to elliptic, ca. 2.5 × 1.5 mm, densely pilose abaxially; petals absent; disk extrastaminal, annular, glabrous, fleshy, red; stamens 10, connate at the base, in two whorls, red to blackish purple; filaments 1.4-2.3 mm long, filiform, those of the outer whorl free above the base, those of the inner whorl connate and forming a column for ca. 1/3 to 1/2 their length; anthers bilocular, versatile, subdorsifixed, globose to elliptic, 0.3-0.5 mm long; pistillode present. *Pistillate flowers* solitary or rarely in 2-4-flowered racemes, axillary, subtended by bracts as in the sta-

minate flowers, on tomentose pedicels 8–8.5 mm long in fruit; sepals 5–6, valvate, triangular to oblong or oblanceolate, subequal, ca. 3.5–6.5 × ca. 1.5 mm, acute to obtuse at apex, densely pilose; disc annular, fleshy, glabrous; ovary subglobose, shallowly 3-lobed, densely tomentose; styles 3, united ca. 2/3–4/5 their length, 3–4 mm long, 2-parted and laciniate at the apex. *Fruit* capsular, (2–)3(–4)-lobed, 1–1.5 cm diam., densely tomentose, rugose beneath the pubescence. *Seeds* subspherical to ovoid, rounded apex and base, 5.3–7 mm diam., ecarunculate, slightly carinate on the back, testa crustaceous, chestnut-colored to nearly black, smooth but microreticulate under high magnification.

Additional specimens examined: MEXICO. **Sonora:** Mun. Guaymas, Sierra Libre, Microondas Avispas, ca. 28°28'50"N, 111°01'43"W, 250 m (this is the type locality or very close to it), 11 Aug 1985, *Felger 85-808 & Dimmitt* (ARIZ, MEXU, SD, TEX); 30 May 1996, *Steinmann 904* (ARIZ, IEB, MEXU, RSA); 2 Sep 1996, *Steinmann 971 & Varela* (ARIZ, DAV, IEB, MEXU, RSA); Mun. Guaymas, Guaymas, 1887, *Palmer 103* (US); Mun. Cajeme, Cerro La Antena, Microondas La Cubana, 27°27'45"N, 109°46'20"W, 300 m, 19 Sep 1994, *Van Devender 94-601 & Yetman* (ARIZ, CAS, MICH, MO, TEX); 5.2 mi by dirt rd. N of Rancho la Tuna, 0.1 mi by dirt rd. S of Arroyo El Cajon, E side of Presa Alvaro Obregon (about 31.2 mi by air NNE of Dam), 27°58'N, 109°44'W, 17 Aug 1983, *Reichenbacher 1463* (ARIZ).

The placement of this species in *Adelia* brings the number of Mexican species to six, nearly half of the total in the genus. The other Mexican species are *A. barbinervis* Cham. & Schltdl., *A. oaxacana* (Müll. Arg.) Hemsl., *A. obovata* Wiggins & Rollins, *A. vaseyi* (Coul.) Pax & K. Hoffm., and *A. virgata* Brandegee. Of these, all but *A. barbinervis* (southern Mexico and Central America) and *A. vaseyi* (Texas and Tamaulipas) are endemic to Mexico.

*Distribution and ecology.*—*Adelia cinerea* is a narrow endemic of west-central Sonora, Mexico, where it occurs in thornscrub and the ecotone between desertscrub and thornscrub, often on rhyolitic or basaltic outcrops (Steinmann & Felger, 1997) at 100–300 m. Although known only from four localities, it probably is not in danger of extinction because most of the localities occur in pristine and isolated rocky hillsides

that are not under pressure from agriculture or development. *Adelia cinerea* flowers from late May until September and fruits from August until at least September.

*Adelia cinerea*, *A. obovata*, and *A. virgata* have the northernmost distribution in the genus. They grow in desertscrub. The other species of *Adelia* are found farther to the south in tropical and subtropical regions.

*Morphological considerations.*—Despite their superficial similarity, *Adelia* and *Bernardia* can be distinguished by several morphological traits (Table I). Figure 1 shows differences between staminate flowers of *A. cinerea* and *B. fonsecae* A. Cerv. & J. Jiménez Ram. According to Webster (1994) and Radcliffe-Smith (2001), the other genera of the tribe Adeliaceae differ morphologically from *Adelia* by various features. In *Crotonogynopsis* Pax there are numerous staminate disc glands disposed among the stamens (vs. the possession of a distinct extrastaminal disc that is mostly annular but rarely composed of five segments in *Adelia*). In *Enriquebeltrania* Rzedowski and *Lasiocroton* Grisebach, the filaments are free (vs. connate in *Adelia*). In *Leucocroton* Grisebach the indumentum is stellate-lepidote (vs. simple in *Adelia*). The genera of Bernardiaceae differ from *Adelia* by lacking a staminate disc, possessing numerous intrastaminal disc glands, or possessing mostly septate disc glands. As mentioned above, in *Adelia* there is an extrastaminal disc that is mostly annular but rarely composed of five segments. *Adelia cinerea* has all the characteristics typical of *Adelia* so its placement in that genus is unambiguous.

*Adelia cinerea* possesses a few characteristics that are unique in the genus, for example, staminate flowers in elongated raceme-like thryses (vs. fasciculate on brachyblasts), stamens red to blackish purple (vs. yellow), and styles united most of their length and laciniate only at the apex (vs. laciniate nearly their entire length). Although the stamens in the majority of *Adelia* species are united only at the base and not arranged in distinct whorls, in *A. cinerea* there are two whorls of stamens, and the filaments of the inner whorl are united into a column (Fig. 1A). This feature also

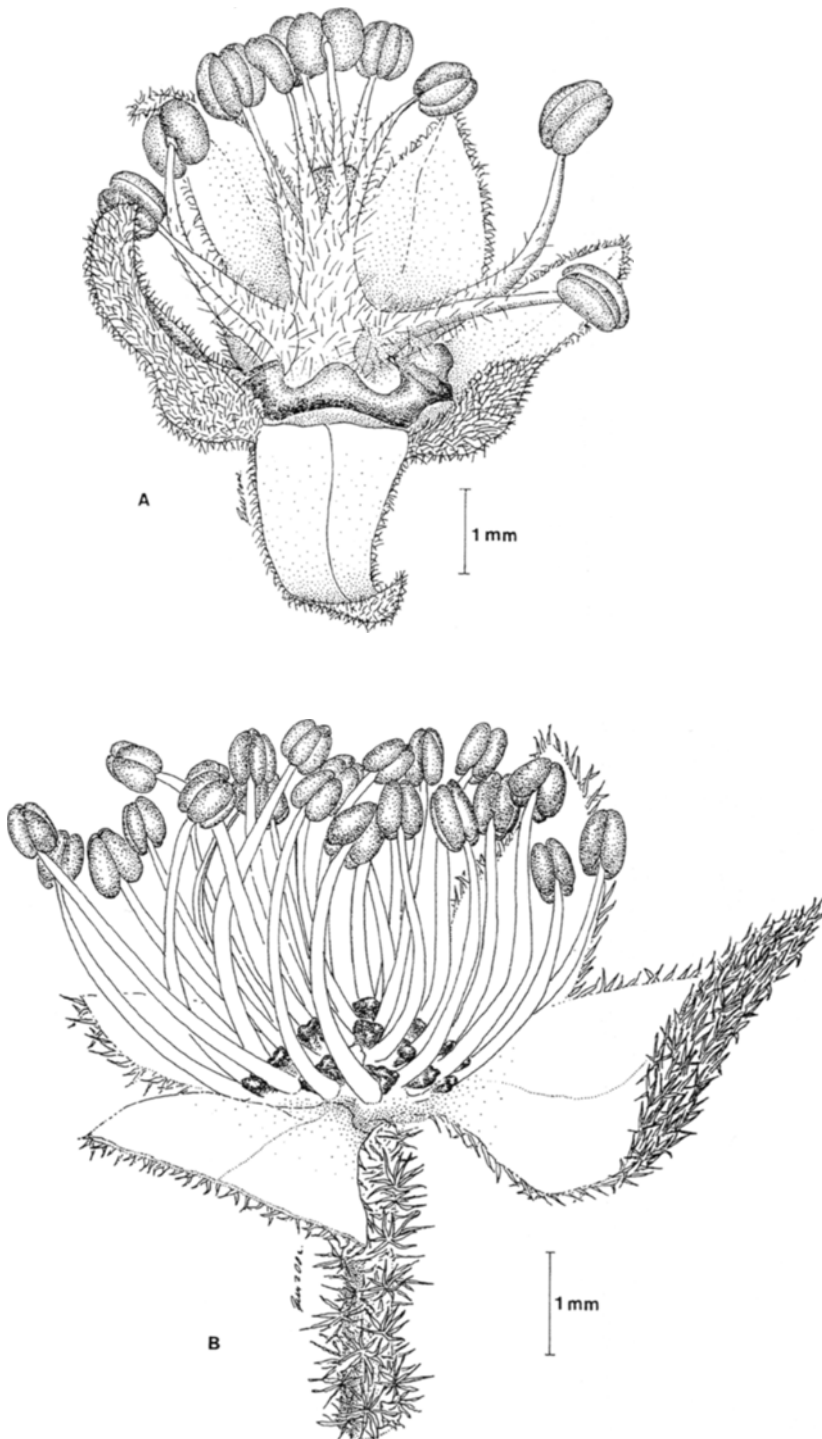


FIG. 1. Staminate flowers. **A.** *Adelia cinerea*. Flower, showing extrastaminal annular disc, connate filaments in two whorls, and pistillode (From Steinmann 971 & Varela, MEXU.) **B.** *Bernardia fonsecae*. Flower, showing intrastaminal disc glands and free filaments (From Cervantes et al. 191, MEXU.)

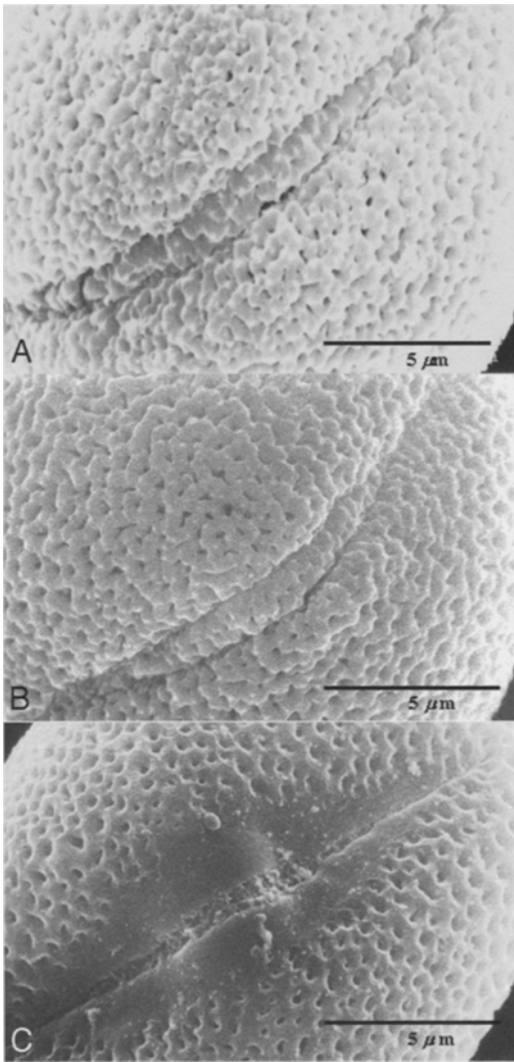


FIG. 2. SEM views of pollen grains. A. *Adelia oaxacana* (From Barajas 228, MEXU.) B. *Adelia cinerea* (From Steinmann 971 & Varela, MEXU.) Both A and B have a crotonoid tectum with the triangular elements small, and a fusiform inconspicuous operculum; lack a margo. C. *Bernardia yucatanensis*. Showing margo and punctate tectum with psilate surface; lacks an operculum (From Lira 383 et al., MEXU.)

occurs in *Adelia triloba* (Müll. Arg.) Hemsl. (Webster & Burch, 1967), a rare species of tropical rain forest in Nicaragua to Panama (Webster, 2001).

**Palynological considerations.**—*Adelia* and *Bernardia* also differ in their pollen, as was reported by Nowicke et al. (1999) and Takahashi et al. (2000). Pollen differences

between the genera are summarized in Table I. Pollen of *Adelia* is 3(–4)-colp(oro)idate, with a stratified operculum, the tectum almost complete and crotonoid, and margo absent. Pollen of *Bernardia* is 3-colporate; without an operculum; the tectum almost complete, punctate, deeply punctate, or almost microreticulate; the surface psilate; and a margo present. Pollen of *Adelia cinerea* is consistent with that of other members of *Adelia* and not with *Bernardia* by being 3-colpate; with an operculum; with a crotonoid tectum; and without a margo. Within tribe Adelleae, the pollen of *Crotonogynopsis* and *Enriquebeltrania* is distinctive in the absence of the opercula. *Adelia* shares with the *Lasiocroton* and *Leucocroton*, tribe Adelleae, the crotonoid tecta and unequivocally stratified opercula, suggesting that they are monophyletic (Takahashi et al., 2000). Figure 2 shows equatorial views of acetolyzed pollen grains from two species of *Adelia* and one of *Bernardia*. The pollen of both species of *Adelia* are similar in the shape and size of the operculum.

### Acknowledgments

We thank Erika Lira and the curators of ARIZ, CAS, DAV, IEB, MICH, MEXU, MO, RSA, and TEX for allowing us to study their material. We also thank Enrique Martínez Hernández, Sara Fuentes, and Benith Mendoza for their assistance in SEM observations and Ramiro Cruz for the illustration. Finally, we express our gratitude to Fernando Chiang, Lynn Gillespie, Geoffrey Levin, and Mark H. Mayfield for critical review of the manuscript.

### Literature Cited

- Nowicke, J. W., M. Takahashi & G. L. Webster. 1999. Pollen morphology, exine structure and systematics of Acalyphoideae (Euphorbiaceae). Part 2. Tribes Agrostistachydeae (*Agrostistachys*, *Pseudagrostistachys*, *Cyttaranthus*, *Chondrostylis*), Chrozophoreae (*Speranskia*, *Caperonia*, *Philyra*, *Ditaxis*, *Argythamnia*, *Chiropetalum*, *Doryxylon*, *Sumbaviopsis*, *Thyrsanthera*, *Melanolepis*, *Chrozophora*), Caryodendreae (*Caryodendron*, *Discoglyprena*, *Alchorneopsis*), Bernardieae (*Bernardia*, *Necepsia*, *Paranecepsia*, *Discocleidion*, *Adenophaedra*) and Pycnosomeae (*Pycnoma*, *Drocelonia*, *Argomue-*

- llera*, *Blumeodendron*, *Podadenia*, *Ptychopyxis*, *Botryophora*). *Rev. Palaeobot. Palynol.* 105: 1–62.
- Radcliffe-Smith, A.** 2001. *Genera Euphorbiacearum*. Royal Botanic Gardens, Kew. Cromwell Press Ltd, Great Britain.
- Steinmann, V. W. & R. S. Felger.** 1997. The Euphorbiaceae of Sonora, Mexico. *Aliso* 16: 1–71.
- Takahashi, M., J. W. Nowicke, G. L. Webster, S. S. Orli & S. Yankowski.** 2000. Pollen morphology, exine structure, and systematics of Acalyphoideae (Euphorbiaceae). Part 3. Tribes Epiprineae (*Epiprinus*, *Symphyllia*, *Adenochlaena*, *Cleidiocarpon*, *Koilolepas*, *Cladogynos*, *Cephalocrotonopsis*, *Cephalocroton*, *Cephalomappa*), Adeliae (*Adelia*, *Crotonogynopsis*, *Enriquebeltrania*, *Lasiocroton*, *Leucocroton*), Alchorneae (*Orfilea*, *Alchornea*, *Coelebohyne*, *Aparisthium*, *Bocquillonia*, *Conceveiba*, *Gavarretia*), Acalypheae pro parte (*Ricinus*, *Adriana*, *Mercurialis*, *Leidesia*, *Dysopsis*, *Wetria*, *Cleidion*, *Sampantaea*, *Macaranga*). *Rev. Palaeobot. Palynol.* 110: 1–66.
- Webster, G. L.** 1994. Synopsis of the genera and suprageneric taxa of Euphorbiaceae. *Ann. Missouri Bot. Gard.* 81: 33–144.
- . 2001. *Adelia*. In: W. D. Stevens, C. Ulloa, A. Pool & O. M. Montiel, editors. *Flora de Nicaragua*. *Monogr. Syst. Bot. Missouri Bot. Gard.* 85: 852–853.
- & **D. Burch.** 1967. Euphorbiaceae. In: R. E. Woodson & R. W. Schery, editors. *Flora of Panama*. *Ann. Missouri Bot. Gard.* 54: 211–350.
- Wiggins, I. L. & R. C. Rollins.** 1943. New and noteworthy plants from Sonora, Mexico. *Contr. Dudley Herb.* 3: 266–284.

### THE RUPERT BARNEBY AWARD

The New York Botanical Garden is pleased to announce that Jason Alexander, currently a graduate student in the Department of Botany & Plant Pathology, Oregon State University, is the recipient of the **Rupert Barneby Award** for the year 2003. Mr. Alexander will be studying the systematics of various species of *Astragalus* in the western United States.

The New York Botanical Garden now invites applications for the **Rupert Barneby Award** for the year 2004. The award of US\$ 1,000.00 is to assist researchers to visit The New York Botanical Garden to study the rich collection of Leguminosae. Anyone interested in applying for the award should submit their curriculum vitae, a detailed letter describing the project for which the award is sought, and the names of 2–3 referees. Travel to the NYBG should be planned for sometime in the year 2004. The application should be addressed to Dr. James L. Luteyn, Institute of Systematic Botany, The New York Botanical Garden, 200<sup>th</sup> Street and Kazimiroff Blvd., Bronx, NY 10458-5126, U.S.A, and received no later than December 1, 2003. Announcement of the recipient will be made by December 15<sup>th</sup>.

Anyone interested in making a contribution to **THE RUPERT BARNEBY FUND IN LEGUME SYSTEMATICS**, which supports this award, may send their check, payable to The New York Botanical Garden, to Dr. Luteyn.