RECOGNITION OF VARIABILITY IN WILD PLANTS BY INDIANS OF THE NORTHWEST AMAZON: AN ENIGMA

RICHARD EVANS SCHULTES Jeffrey Professor of Biology and Director Botanical Museum of Harvard University, Emeritus Cambridge, MA 02138

"There is evidence that herbal doctors distinguish between different varieties, anatomical parts, stage of maturity (for all of which they have a vocabulary) and times of collection . . . This information may be very significant in terms of medical effectiveness of the remedy."

Abbot and Shimazu (1985)

I.

The Indians of the northwest Amazon—that region lying in Colombia and Ecuador and adjacent areas of Brazil and Peru—have an uncanny familiarity with the plants of the ambient vegetation and with their biodynamic activity. This knowledge and skill is obviously the result of millennia of intimacy with and utter dependence upon the flora, combined with the intense curiosity about natural phenomena that characterizes these people.

One of the enigmas that botanists have not yet had much success in understanding concerns the native's recognition of "kinds" or "varieties" of many of the wild species of their useful plants. The variants are so well established in the Indians' classifications that they usually have distinguishing native names.

This skill is manifest not only to those few of the 80,000 species native to the region that are economically important but is found in the aboriginal classification of a number of plants which apparently have little or no importance as utilitarian, ceremonial, magical or mythological species.

In most cases, it is botanically impossible to discern morphological differences on which subspecific taxonomic categories might be recognized. Yet often—nay, usually—an Indian can tell at once and frequently on sight and at a significant distance, without feeling, tasting, smelling, crushing, tearing or other physical manipulation, to which category a plant belongs. The "identification" of these "kinds" is indeed a complex interdisciplinary problem, but, while it is obviously of deep significance to the anthropologist and psychologist, it is of extraordinary importance to the botanist and phytochemist.

Little research on this fascinating aspect of ethnobotany seems to have been attempted. Most of the "explanations" offered are pure conjecture. It has been suggested that these recognized named "varieties" may be simply different parts of a large plant, sundry age forms or portions growing in shade, sun or under other environmental conditions. It is very probable—especially with food, medicinal, narcotic or toxic species—that some of these "varieties" may represent chemovars. But, if so, how can a native visually identify which chemovar it is and give it the name that his language has for that variant? I have tested the perspicacity of the Indians in this respect on many occasions and have rarely found them hesitant, doubtful or in error. And Indians of different tribes and living at appreciable distances from one another will identify these variants with amazing consistency.

SCHULTES

There are no better examples of this aboriginal perspicacity than the stimulant of the westernmost Amazon of Colombia and Ecuador—*yoco*, the sapindaceous vine *Paullinia Yoco* (Schultes 1942)—and the source of the western Amazon hallucinogenic drink variously known as *ayahuasca, caapi, natema, pindé, yajé*—the malpighiaceous liana, *Banisteriopsis Caapi* (Schultes 1957).

Evaluation of field studies and studies of voucher specimens of these two major economic plants illustrate the enigma surrounding the aboriginal ability to identify "variants" of the species in their rich ambient vegetation.

The specimens cited are preserved in the Economic Herbarium of Oakes Ames and/or the Gray Herbarium, both at Harvard University, and/or in the Herbario Nacional de Colombia in Bogotá, Colombia.

П.

Paullinia Yoco R. E. Schultes et Killip in Bot. Mus. Leafl., Harvard Univ. 10 (1942) 302, t. xxvii.

Paullinia (Fig. 1) is a genus of the Sapindaceae comprising more than 180 species of lianas of tropical or subtropical America. One species, *P. Cupana* Kunth is cultivated in the Brazilian Amazon as the source of a caffeine-rich drink prepared from the seeds.

Anthropological writings and reports of travellers frequently made mention of **yoco** in the Colombian Putumayo. Material collected by the Belgian scientist Florent Claes in the late 1920s was chemically examined and found to contain caffeine. It was misidentified as *Paullinia scarlatina* Radlk., a species that does not occur in South America. In 1942, the liana was definitively identified and described as a new species of *Paullinia: P. Yoco* (Schultes 1942).

Eighty years ago, the Colombian writer Zerda Bayon reported that the Indians of the Comisarias del Caqueta and Putumayo distinguished various kinds of **yoco**, stating that "there is a **yoco blanco** ["white yoco"] and a **yoco colorado** ["red yoco"]. His specimens have long since been lost, and he did not attempt to explain the differences between these two named kinds of **yoco**.

In 1942, when the binomial *Paullinia Yoco* was published, I commented as follows on the several named and recognized variants. "During my ethnobotanical studies in the Putumayo, I repeatedly questioned natives concerning the differences between **yoco blanco** and **yoco colorado** with conflicting replies. While it is true that the sap expressed from some stems makes a light chocolate-brown mixture when added to cold water, that from other stems makes a whitish milky mixture. Both taste the same, and both are equally effective as a stimulant. The Indians do not prefer one to the other. I find it impossible to distinguish botanically the liana which gives **yoco blanco** from that which yields **yoco colorado**, but the natives can identify them immediately by slashing the bark with a machete. I have noticed that **yoco colorado** nearly always is a much stouter and apparently older plant than **yoco blanco**. It is not possible that the differences are due to seasonal or soil conditions, for **yoco blanco** and **yoco colorado** grow side by side and can be collected at the same time" (Schultes 1942).

One of the recent collections (*Pinkley 380*) reports that **totoa-yoko** ("white yoco") "has more leche (milk') than other types and is therefore the best type." Klug 1955 indicates that **huarmi yoco** is the "strongest" kind. Schultes et Cabrera sine num. notes that **yoco** de brujo has unusually large leaves.

Further studies in the field and herbaria have done little to advance our understanding of the reasons for the Indians' recognition of these named "variants." On the contrary, the problem has been complicated by the discovery that there are many more aboriginally



FIG. 1.—*Paullinia (yoco).* Drawn by the late Gordon W. Dillon, artist, Botanical Museum, Harvard University.

SCHULTES

named kinds of yoco. The botanists who have gathered the names and have associated them with collections of yoco cannot offer distinguishing characters. The named "variants" now known number fourteen: yoco; blanco yoco; canaguche yoco ("yoco of the palm Mauritia flexuosa"); huarmi-yoco; po-yoko; tigre yoco ("yoco of the jaguar"), taruco yoco; totoa-yoco ("white yoco"); verde yoco ("green yoco"), yagé-yoco or yocoyajé (" yoco of the hallucinogen Banisteriopsis Caapi"); yoco colorado; yoco-cú ("reddish yoco"); yoco de brujo (medicine-man's yoco"); yoco negro ("black yoco"). Two of these names might suggest that that kind of yoco was used with products of other plants (with chicha de cananguche, a fermented drink prepared from the fruits of Mauritia and with yajé, a narcotic drink prepared from Banisteriopsis], but that does not explain the uncanny skill of the natives in distinguishing the kind of yoco from afar.

COLOMBIA: Comisariá del Putumayo, Umbriá. "Liana. Verde yoco." January-February 1931. G. Klug 1930-Same locality and date. "Liana. Blanco yoco." Klug 1933. Same locality and date. Klug 1935-Same locality and date. Klug 1937-Same locality and date. "Liana. Yagé yoco." Klug 1946—Same locality and date. "Vine. Cananguche yoco." Klug 1947—Same locality and date. "Vine. Petals white. Strongest yoco. Huarmi yoco." Klug 1955—Same locality and date. "Vine. Taruco yoco." Klug 1957—Río Putumayo, Piñuna Negra, "Yoco, Arbusto de 1.5 m." November 20, 1940, Cuatrecasas 10708-Mocoa, "Bark used as source of stimulant drink. Large liana." December 3-7, 1942. Schultes et Smith 3045-Same locality and date. "Large woody vine. Stimulant and antifebrugal plant." Schultes et Smith 3045A—Río Sucumbiós, between Río Putumayo and Quebrada Teteye. "Yoco colorado. Extensive liana in dense forest. Sap of cambium scraped and used also as a purge before taking yajé and to expel stomach parasites." March 19, 1942. Schultes 3426—Departamento del Cauca, Río Caquetá, Puerto Limoń. "Large liana. Bark used to prepare stimulant. Whitish latex-like sap." February 28-29, 1942. Schultes 3341-"Yoco colorado. Extensive vine in dense forest. Used as a stimulant and febrifuge." May 29, 1942. Schultes 3476-Río Sucumbiós, Conejo. April 2-5, 1942. Schultes 3543-Río Putumayo, Puerto Ospina. "Extensive liana; basal diameter 3 inches; sap expressed as stimulant. Bark contains a white, latex-like sap. July 6, 1942. Schultes 4028-Mocoa. "Large forest liana." March 1953. Schultes et Cabrera s.n.-Between Mocoa and Pepino. March 1953. Schultes et Cabrera s.n.-Mocoa. "Yoco negro." March 1953. Schultes et Cabrera s.n. Near Mocoa. "Tigre voco." March 1953. Schultes et Cabrera s.n. Along road 12 km. below Mocoa. "Yoco colorado ." March 1953. Schultes et Cabrera s.n.-Pepino. "Extensive vine in forest. Yoco de tigre." March 1953. Schultes et Cabrera s.n. Rió Uchupayacu. "Yoco blanco. Flowers white. Large liana." Schultes et Cabrera s.n.— Mocoa and vicinity. "Yoco colorado." March 1953. Schultes et Cabrera s.n. - Pepino. "Unusually large leaves. Yoco de brujo." March 1953. Schultes et Cabrera s.n.-Mocoa and vicinity. "Large forest liana. Yoco yajé." March 1953. Schultes et Cabrera s.n. Río Guamues, San Antonio. "Tree 4 m. Secondary growth. Bark for stimulant and to allay hunger." September 6, 1963.-Mocoa, old road to Rumiyaco. Alt. 700-850 m. "Los indigenas lo toman en maceración en frio. Yoco." October 10, 1965. Garciá-Barriga, Hashimoto et Ishikawa 18695-Rio Putumayo Remanso. "Primary forest. Bark of stem is scraped and soaked to make a beverage which is drunk by the men early mornings while making plans for the day. Totoa-yoko ('white yoco') has more leche than other types of yoco, therefore is the best type." August 22, 1966. Pinkley 380-Buena Vista. "Po-yoko. This vine, growing wild in the jungle, can grow very tall and have a diameter as thick as 4-5 inches when old. Its flower was described as 'medio-blanco' (whitish) by Francisco. It has a seed which splits open and is red inside with a black seed in the middle. This is the most common form of yoko taken by the Siona. They scrape the inner wood and drink the juice that comes out. They drink one or two mouthfuls in

the early dawn to twist the *chambira* fibre or perform other tedious tasks." September 13, 1972. *Piaguaje 5*.

ECUADOR: Provincia Napo, Río Aguarico, Dureno. "Primary forest. Bark of stem scraped and soaked in cold water to make a beverage which is drunk by the men very early each morning. Liana. The men drink usually together in the morning while planning the day. Kofán: **Yoko-cú** ('reddish **yoko**')." January 3, 1966. *Pinkley 72*—Same locality. "Cortex of stem reddish (older than vine of no. 311). Kofán: **yoko-cú** ('reddish **yoko** ')." June 22, 1966. *Pinkley 312* [Note: no. 311 not available for study].—Same locality. "Totoa yoco ('white **yoco**')." September 6, 1966. *Pinkley 428*—Río Napo, amongst Secoya Indians. "**Yoco**." November 29, 1971. Louthian s.n.

Ш.

Banisteriopsis Caapi (Spr. ex Griseb.) Morton in Journ. Wash. Acad. Sci. 21 (1931) 485.

Banisteriopsis (Fig. 2) is a genus of approximately 100 species of forest lianas of tropical America. Several species have been reported as the source of an hallucinogenic drink prepared by Indians in South America—B. Caapi and B. inebrians Morton. Recent taxonomic research has indicated that the second binomial is a synonym of the first.

Vague references to this drug were made in missionary writings of the late 17th Century in Peru and Ecuador, but little was known about it until the mid 19th Century. In 1858, Villavicencio wrote about the hallucinogenic drink *ayahuasca* in his *Geografia del Ecuador*, but he mentioned no botanical identification beyond the fact that it was a liana (Villavicencio 1858 and 1984).

The first scientific identification of the drug was done by the British plant explorer, Richard Spruce, who in 1852 had discovered that the Tukanoan tribes of the Rio Uaupés of Brazil prepared an intoxicating drink of *caapi* from the bark of a liana. He collected botanical material and identified it as a new species of *Banisteria—B. Caapi—*now nomenclaturally known correctly as *Banisteriopsis Caapi*. The description of the species was not published until 1858, and Spruce's account of the preparation of *caapi* did not appear until 1873 (Spruce 1873, 1908 and 1970).

In 1853, Spruce met with the use of *caapi* amongst the Guahibo Indians of the upper Orinoco of Colombia and Venezuela—Indians who "not only drink an infusion . . . but also chew the dried stem." In 1857, when he travelled and collected in the Ecuadorian Andes, he found the Záparo and other Indians taking a narcotic drink called *ayahuasca*, and he reported that he considered it to come from "the identical species of the Uaupés, but under a different name" (Langdon 1985).

Since this early scientific work, many specialists and amateurs have written about the malpighiaceous narcotic of the western Amazon. We now are rather certain that it is prepared basically from the bark of one species, *Banisteriopsis* Caapi (Gates 1982). Occasionally additives may be put into the brew to alter, strengthen, change or lengthen the intoxication (Spruce 1873, 1908 and 1970). Many have been reported, but two are of importance and are widely used: the rubiaceous *Psychotria viridis* R. et P. and the malpighiaceous *Diplopterys Cabrerana* (Cuatr.) Gates (formerly known as *Banisteriopsis Rusbyana* (Ndz) Mart.). Both of these plants contain tryptamines, the first known in both families, which actually do alter and intensify the effects of the hallucinogenic β -carbolines in the basic bark of *B. Caapi* (Schultes and Hofmann 1973 and 1980).

There is no doubt that Indians in the northwest Amazon can "identify" different "kinds" of *caapi* or *ayahuasca* at a distance without feeling, tasting or smelling the liana. Sundry field studies have noted this peculiarity, and there is a long list of native names



FIG. 2.—*Banisteriopsis Caapi (ayahuasca).* Drawn by the late Elmer W. Smith, artist, Botanical Museum, Harvard University.

that are presumed to designate these numerous variants. The natives maintain that they are able to use these kinds of *caapi* or *yajé* or *ayahuasca* to prepare drinks of different strengths, for different purposes or in connection with different ceremonies or dances or magico-religious needs, or what the partaker wishes to kill in the hunt. At least 30 "kinds" are recognized and have native epithets in the western Amazon.

This aspect of ethnobotanical studies certainly requires much more intensive and interdisciplinary field research. Are these kinds different age forms, are they due to hardly perceptible soil or other ecological factors; are they the result of growing in semi-open or secondary situations, as opposed to the dense forest; are the specimens taken from various parts of the liana; are the cultivated specimens specially selected clones with varying chemical composition and, consequently, varying physiological effects, or are they chemovars? Langdon (1985) has written: "Apparently the native populations . . . recognize many different kinds of *caapi* with different hallucinogenic properties. I consider these to be chemical variants. The ease with which *caapi* can be vegetatively propagated . . . makes it possible for clones of such variants to be maintained." This statement might explain a limited few cases of cultivated plants, but it cannot satisfactorily be considered an explanation of the problem for wild lianas, nor can it in any way clear up the Indian's ability to identify these variants ocularly from a distance. Langdon (1985) further states that the western Siona of the Putumayo of Colombia, Tukanoanspeaking peoples, with whom she worked, use "finer distinctions than the botanist in classifying plants. One feature employed in their classification is botanical: length, breadth, size and leaf pattern and whether or not the plant flowers; another feature concerns the part of the plant used, another refers to phases of growth, still others are distinguished . . . on the kind and colours of the visions induced; the strength of the intoxication also enters as a factor. Other differences are taken into account: each plant has a spiritual guardian and a shaman owner, and shamans often trade kinds. Furthermore, if a shaman finds a wild liana in the forest, he will prepare a drink to ascertain its worth for inclusion in his own repertoire, especially in regard to what visions it can induce; if he takes a cutting, he will then and there name and classify it."

It is difficult for the scientist to understand or accept many of these "criteria", as real as they may be to the Indian, but native perspicacity in the finer classification of many plants—both wild and cultivated—should be critically examined for the possible practical values of some of the points of evaluation to taxonomists and phytochemists.

On the basis of extensive field work in Peru, Rivier and Lindgren report that the Sharanahua Indians distinguish three types—red, black and white "kinds", and that the distinction is based more in the differentiation in colour of the drink than in the appearance of the plant (Rivier and Lindgren 1972)

According to another field investigator, Deltgen, there are in the Colombian Vaupés six kinds of caapi, based primarily on their effects (Deltgen 1978-79).

Still another specialist, Reichel-Dolmatoff, states that there is in the Vaupés "a large series of kinds" distinguished mainly on the basis of psychoactive effects (Reichel-Dolmatoff 1975).

The most comprehensive field investigation of the Indian recognition of "kinds" of the narcotic liana is that of anthropologist Langdon amongst the western group of Tukanoans—the Siona—who live in the Colombian Comisaría del Putumayo, far to the west of the Tukanoan tribes of the Vaupés. Langdon was able to collect 18 different vernacularly named "kinds". Botanical material of almost all was collected and identified by Dr. Timothy Plowman of the Field Museum of Natural History in Chicago (Langdon 1985). Almost all are botanically referrable to a single species: *Banisteriopsis Caapi*.

Siona classification "is seen", according to Langdon, "as more complex than that of botany and depends on the conjunction of botanical features, chemical effects of the

SCHULTES

mode of preparation and cultural suggestions in the visions experienced" (Langdon 1985). It is undoubtedly true that all of these criteria are employed by the Indians for eventual "classification" of the kinds of *Banisteriopsis Caapi*, but it is still not possible for a native in the forest ocularly to identify with certainly a kind of caapi by vernacular name from such features as its chemical constituents and culturally—what he believes that the drug may induce.

The meticulous field research of Langdon has indeed produced a good start, but, in her own words, "further exploration between this conjunction of botany-chemistry-culture warrents further investigation". It is still an enigma.

COLOMBIA: Comisaría del Putumayo, Río Uchupayaco, southeast of Puerto Limón. "Yajé, Narcotic. Liana." February 27-28, 1942. Schultes 3346-Río Sucumbiós, Conejo, March 29, 1942. Schultes 3475-Mocoa, August 28, 1963. Juajibioy C. 256a-Mocoa. "Bichemia ('bejuco'), amarrón huasca ('vine of the boa')." August 28, 1963, Juajibioy C. 279-Mocoa. "Inde huasca." August 28, 1963. Juajibioy C. 280-San Antonio del Guamués. "Yajé del monte". August-September 1963. Naranjo et Wiederhold 4-San Antonio del Guamués. "Yajé sembrado." August, September. Naranjo et Wiederhold 5-Buena Vista. "Celima's wai yagé. Celimo grows it in his field. It is a tall and thick vine. It is cooked before drinking, with yage-oko added. Francisco Piaquaje said that it is another class, but he can't identify it. Luciano Piaquaje recognized it as wai' yagé." September 1972. Langdon 21-Buena Vista, "Beji yage. This yagé is cultivated in the fields. It is tall and very thick at full growth. It is cooked with yagé-oko and is supposed to be one of the strongest yagés" September 26, 1972. Langdon 23-Buena Vista "Wa'i yage or wahi-yagé collected and grown by Francisco Piaquaje. The yagé is a mata (bush) instead of a vine. It is about 1 meter tall. It is grown in their fields. The plant grows as a thick bush. This yagé is usually prepared simply by grating the stems and drunk without cooking. It is used to see the *pinta de caseria*—visions of animals. The leaves may possibly be mashed and their juice used also." September 26, 1972. Piaguaje 25-Buena Vista. "So'om-wa-wa'i yagé. Collected and grown by Ricardo Yaiguaje. This yage, which Richard grows in his field, is given its name because of the way it grows. The vine, which is about 3-4" thick at maturity, grows very, very long: so'-om-wa. To make it grow thick, Ricardo prunes the branches. This is a class of wahi-yagé and they drink it raw by grating the vine. However, they also mix it with various classes of **kwa'ku-yagé**. It shows the visions of hunting. Leonides, Ricardo's father, told him to plant only this in a field, and the yagé would be like the seed of the wild pig sese so that even though the Siona no longer drink yage, they would always have a lot of game. I asked him if this was sese yagé, and he said: 'Lo mismo'.'' September 27, 1972. Langdon 30-Buena Vista "Usebo yagé-collected by Ricardo Yaiguaje. The vine of this class of yage is very thick, about 6" in diameter. The vine grows straight up instead of twisting, until its thickness begins to diminish. This is one of the kwa'ku class and is cooked with yagé-oko." September 27, 1972. Langdon 31-Buena Vista. "Wa'i yagé. It is a bush about 1-1½ meters high." September 28, 1972. Langdon 32—Buena Vista. "Wekiyagé. Grown by Celimo Amo. It is a large vine. Is a class of kwa'-ku yagé." September 29, 1972. Langdon s.n.--Between Mocoa and Pepino. "Stout vine on trees, 45 ft. tall. Leaves membranaceous, dark green, shining above, pale green beneath. Stems boiled with chagropanga (Diplopterys Cabrerana) to make narcotic drink. Indehuasca. Yajé." July 28, 1960. Schultes 22553.

INTENDENCIA DEL GUAINIA: Río Inirida, El Remanso. August 12, 1975. García-Barriga 20805. ECUADOR: Provincia Pastaza, Río Chico, affluent of Río Pastaza, Village of Río Chico. Alt. c. 1000 m. "Shredded stem boiled with fine leaves of *Diplopteris Cabrerana (Shemluck et Ness 218)* until conc. and ca. 3 oz. taken on empty stomach for hallucinations. The day fast not absolute; bananas and salt can be eaten. *Ayahuasca*." August 1979. *Shemluck et Ness 219*.

PERU: Departamento de Loreto, Iquitos. "Ayahuasca. Woody vine. A tea brewed from the leaves and stem produces fanciful dreams. Also used as a cure for many ills and as an intoxicating beverage. A strong narcotic." August 2-8, 1929, Killip et Smith 27385-Iquitos region, Río Nanay, Picuruyacu "Ayahuasca. Vine growing near garden. Chopped vine boiled with yajé and samiruca [Psychotria viridis]." July 5, 1966, Martin et Lau-Cam 1089. Río Amazonas. "Trepadora sin flores ni frutos. Hava huasca." October 25, 1966. Torres 223. Zapote, Alto Río Purús. "Lowland forest. The stems are mashed and boiled with water during one hour with one or more additives to prepare ayahuasca." August 22, 1968. Rivier 1-Zapote, Alto Río Purús. "Lowland forest. Ramiwetsem ('yellow ayahuasca'). Culiba name" August 22, 1968. Rivier 2. Marcos, Alto Río Purús. "The stems are mashed and boiled in water for about one hour with one or more additives to prepare avahuasca. Lowland forest." August 8. 1968. M68. Rivier 3. Marcos, Alto Río Purús. Shurioshinipa ('red ayahuasca') = name in Sharanahua. August 8, 1968. Rivier 4. Rio Amazonas, Caballacocha. "Ayahuasca. El remedio. Extensive woody liana 6 ft. high with trunks to 10 cm. diameter. Cultivated in chacra near lake. Stems chopped up and boiled for 8 hours to prepare hallucinogenic beverage, mixed with chacruna leaves (Psychotria vividis)." March 22, 1977. Plowman, Schultes et Tovar 6430. Departamento de San Martín, Huahuiva. "Ayahuasca negra." July 6, 1985. Woytkowski 5045; 5074.—"Monte real. Shillinto o ayahausca amarilla. Medicinal." July 10, 1958. Woytkowski 5076-San Alejandro, Río de Loreto. "Monte real. 300 m. Ayahuasca amarilla." July 24, 1958. Woytkowski 5119-San José de Sisa, c. 550 m. "Trepador voluble (soga) cultivado. Flores rosadas. Shimba-ayahuasca." July 26, 1958. Velarde N. 6577-Tarapoto. Río Schilcayo. Alt. 350 M. "Extensive cultivated liana, 6 in. tall, growing in full sun. Sterile. Ayahuasca." May 4, 1976. Plowman 6041.

LITERATURE CITED

- ABBOTT, I.A., and C. SHIMAZU. 1985. The geographic origin of the plants most commonly used for medicines by Hawaiians. J. Ethnopharma. 14:213-222.
- DELTGEN, F. 1978-79. Culture, drug and personality—a preliminary report about the results of a field research among the Yebamasa Indians of Río Piraparaná in the Colombian Comisaría del Vaupés. Ethnomedizin 5(1,2):57-81.
- GATES, B. 1982. Banisteriopsis, Diplopterys (Malpighiaceae) in Flora Neotropica, New York Botanical Garden, New York. Monograph No. 30.

- LANGDON, J. 1985. Siona classification of yagé, Ethnobotany, ethnochemistry, visions and history. Unpubl. lecture. Congreso Internacional Americanistas, Bogotá.
- REICHEL-DOLMATOFF, G. 1975. The shaman and the jaguar—a study of narcotic drugs among the Indians of Colombia. Temple Univ. Press. Philadelphia.
- RIVIER, L., and J.E. LINDGREN. 1972. 'Ayahuasca', the South American hallucinogenic drink: an ethnobotanical and chemical investigation. Econ. Botany. 26:101-129.
- SCHULTES, R.E. 1942. Plantae Colombianae II. Yoco: a stimulant of

southern Colombia in Bot. Mus. Leafl., Harvard Univ. 10:301-324.

_____. 1957. The identity of the malpighiaceous narcotics of South America in Bot. Mus. Leafl., Harvard Univ. 18:1-56.

- and A. HOFMANN. 1973 and 1980. The Botany and Chemistry of Hallucinogens. Ed. 1 and Ed. 2 Charles C. Thomas, Publisher, Springfield, Ill.
- SPRUCE, R. 1908. On some remarkable narcotics of the Amazon Valley and

Orinoco in Ocean Highways: the Geographical Review, v. 9., no. 55 (1873) 184-193. [Ed. A.R. Wallace] Notes of a botanist on the Amazon and Andes. Macmillan and Co., Ltd. London. 2 vol. Reprinted ed. Johnson Reprint Corp., New York. 2 vol. (1970).

- VILLAVICENCIO, M. 1858. Geografiá de la República del Ecuador. R. Craigshead, New York 371. Reprinted edition: Corporacion Editora Nacional, Quito (1984).
- The Cactus Primer. A.C. Gibson and P.S. Nobel. Pp. vi + 286; illustr.; Harvard University Press, Cambridge, Mass. 1986. \$39.95.

As the authors state in their preface: "People around the world and from all walks of life are hopelessly susceptible to a condition called cactophily, the love of cacti." This interest has led to a plethora of books on the cactus family— mostly dedicated to classification or horticulturally curious specimens and their care as house plants. Here we have a different book—one that, to my knowledge, is the first to present in a single volume such a wealth of data on the biology and structure of this most misunderstood family of xerophytes.

The topics discussed span a broad spectrum: general features; early evolutionary trends; special features; chemistry; how structure and chemistry can help unravel phylogeny; and, finally, relationships of the family. The extensive glossary is a very helpful addition; the detailed index unlocks with ease much of the information in the volume. Each chapter has its own bibliography.

As a contribution of true biological value, this volume will be welcomed by botanists, horticulturists and amateur cactophiles alike, and especially by those interested in the drier parts of the world, for it is not possible to find such a mass of scattered information in one book—and amassed and expertly evaluated by two recognized specialists in the group.

Richard Evans Schultes Professor Emeritus Botanical Museum of Harvard University Oxford Street Cambridge, MA 02138