The Amazonian Travels of Richard Evans Schultes

Chapter I. Sacred Plants of the Putumayo

By Brian Hettler and Mark Plotkin

April 8, 2019

The following text is from the interactive map available at the link:

banrepcultural.org/schultes

Soon after completing his Ph.D. at Harvard, Schultes ventured to Colombia for the first time on a quest to find indigenous arrow poisons, then showing promise as muscle relaxants in surgical procedures. He also hoped to determine the botanical identity of *yoco*, a fabled stimulant employed by local tribes that had been mentioned in several historical accounts, but never fully described for science. As the young ethnobotanist entered the Amazon rainforest for the first time, he was immersed in an extraordinary world of shamans and their sacred, mind-altering plants.

> "My own acquaintance with the promise of ethnobotanical conservation began in 1941, when I first went to the Amazon Basin. I had just earned my Ph.D. at Harvard, and I had been offered two jobs. One was as a biology master at a private school in New England; the other was a ten-month grant from the National Research Council to go to the Amazon region to identify the plants employed in the many kinds of curare the Indians use for hunting. I decided on the Amazon—which is fortunate, because otherwise I would probably still be a biology [teacher]!"
>
> -Richard Evans Schultes

Through the Emerald Door

In September 1941, twenty-six-year-old Richard Evans Schultes arrived in Bogotá, Colombia for the first time. The adventure commenced on his very first day when—on a lark—he took the Bogotá trolley to the southern end of the line.

[Caption] Bogotá trolley, 1940s

View Map of the Bogotá Trolley System

Turning east, he followed a stone staircase up to the foot of the lush, forested mountains that border the eastern edge of the city. Soon, he noticed a tiny yellow-cream orchid nestled in moss at the base of a tree (Schultes 1020 Ames). Gently, he plucked the delicate specimen, which measured less than half an inch from root to blossom. Lacking collection equipment, he pressed the specimen inside his passport for safekeeping (Plotkin, pers. Communication). The orchid would prove to be new to science. It would later be named *Pachyphyllum schultesii* in his honor, one of more than 120 species that would eventually bear his name.

[Caption] Schultes' specimen of *Pachyphyllum schultesii* (Schultes 1020, AMES) link

[Caption] Botanical illustration of *Pachyphyllum schultesii (Williams, 1941, p. 16)*

After a brief stay in Bogotá and a quick trip to the northern Colombian state of Santander, Schultes boarded a train bound for Neiva, a small Andean city in southern Colombia. Leaving Neiva, Schultes cut west across the Andes to Popayán, and then turned south to Pasto, a town located at the base of the towering Galeras volcano. From Pasto, Schultes followed a winding, mountain road east to the headwaters of the Putumayo River, his target area of study.

View Map of the Putumayo Watershed

The Putumayo River is a major Amazonian tributary that begins in the towering Andes of southern Colombia and then flows east through verdant rainforests, crossing the equator roughly halfway through its course before emptying into the Solimões River (as the upper Amazon is called in Brazil), 750 miles (1,200 km) north of the bustling river port of Manaus. The Putumayo is the only navigable river in southern Colombia and forms the international border between Colombia and Peru for much of its length.

The Páramos of the Sibundoy Valley

Schultes' entry point to the Putumayo was the remote Sibundoy Valley, a bowl-shaped depression at 2,200 meters above sea level on the eastern edge of the southern Colombian Andes. The roughly circular valley is surrounded on all sides by steep mountains, and is usually covered by clouds and inundated by heavy rains that are funneled into the valley, forming the headwaters of the Putumayo River.

Schultes reached Sibundoy in December 1941. Setting off from the Catholic Mission, he wandered up the mountains on the northeast side of the valley, climbing through patches of forests of low, gnarled trees laden with many species of mosses, orchids, ferns and epiphytic bromeliads. The thick vegetation gave way to a wet and windswept grassland ecosystem dominated by tussock grasses and low shrubs.

[Caption] Frailejones (*Espeletia schultesiana*) on the páramo above Sibundoy

He had emerged into the **páramo**, an ecosystem with vegetation uniquely adapted to the cold temperatures, excessive moisture, overcast skies and strong winds found above the tree line in the high Andes, typically around 3,000 meters.

View Map of Páramo Ecosystems

In the páramo of Tambillo, Schultes noticed a unique variety of the genus *Espeletia*, an unusual relative to the sunflower that gives the páramo an otherworldly appearance. *Espeletia* are commonly known as *frailejón* in Spanish, a reference to their resemblance to the silhouette of a friar (*fraile*) shrouded in the fog. The species he collected was new to science and would later bear his name: *Espeletia schultesiana.*

[Caption] Schultes on the páramo

Espeletia has a thick trunk with a spiraling pattern of dense, hair-covered leaves that hang down after dying, acting as insulation. The succulent, hair-covered leaves help capture water vapor from the near-constant cloud cover, transferring it through their roots into the soil. The highly organic soils of the páramo support water retention, creating a layer of thick, waterlogged soil similar to peatlands.

[Caption] Frailejon

[Caption] Schultes' specimen of Frailejon

These high altitude wetlands are important water regulators in the health of the river systems, providing clean, naturally filtered water. Today, the páramos in Colombia cover less than two percent of the national territory, yet produce 85 percent of its drinking water. Páramos are also considered to be evolutionary hot spots for plant diversity.

The incredible plant diversity around Sibundoy can be partly explained by its unique geographic context. Located in the extremely biodiverse Andean-Amazon transition region just a few degrees above the equator, Sibundoy also sits just 100 miles from the point where the central Andean cordillera (mountain range) of Ecuador divides into the three Andean cordilleras of Colombia, placing it squarely in the center of both long-term migration routes and evolutionary processes.

Map of the Geographical Context of the Sibundoy Valley

Sibundoy is also located in the narrowest stretch of the Andes, marking the shortest distance between the Amazon rainforest and the Pacific Ocean. The relatively accessible terrain and comfortable valley would have made Sibundoy a natural trading route for ancient cultures who were known to have participated in a complex network trade from east to west and also south into the Carchi plateau of Ecuador.

The Sibundoy valley is believed to have served as both a crossroads and sanctuary for plants: as ancient travelers carried rare varieties of plants and seeds, species that were valued for medicinal purposes by the tribes of Sibundoy were saved and propagated. As Schultes discovered, these natural and human factors gave Sibundoy the highest concentration of psychoactive plants in South America, if not the world.

The Inga and Kamentsá Indigenous Groups

[Caption] An Inga man in Aponte

Two indigenous ethnic groups inhabit the Sibundoy Valley: the Inga and the Kamentsá. The two tribes speak distinct languages and have different mythology and origin stories, but are nearly culturally identical in terms of social organization, lifestyle, modes of subsistence and worldview.

The Kamentsá say their ancestors are the original inhabitants of Sibundoy and speak a language isolate. The Inga are more recent arrivals to the valley and speak a dialect of Quechua, the official language of the Inca Empire still widely spoken throughout the Andean regions of Peru, Ecuador and Bolivia.

There are several hypotheses as to how the Inga arrived in Sibundoy: some trace their lineage to groups relocated by the Inca, or to *yanaconas*, an indigenous bureaucratic order brought by the Spanish from Quito to serve as interpreters and intermediaries. Some Inga describe a historical migration from lower Amazonian regions near the Napo River and the Ucayali River in Peru.

[Insert Graphic] Historical map of the Sibundoy Valley

In the late 17th century, led by the charismatic *cacique* (chieftain) Carlos Tamoabioy, the Inga and Kamentsá of Sibundoy reached a political unification that endures to this day (Bonilla, 1972, p. 109). Under this unification, the Inga-Kamentsá territory was defined by the high peaks around the valley: Patascoy, Bordoncillo, Aponte, Juanoy and Portachuelo.

View Map of Inga-Kamentsá Ancestral Territory

Schultes' guide and teacher in Sibundoy was Salvador Chindoy, a Kamentsá shaman (or *taita*, as they are known in the region) skilled in traditional plant remedies employed by both Inga and Kamentsá groups. Chindoy was a well-known healer who traveled to public markets from Bogotá to Quito sharing his knowledge about medicinal plants and selling barks, roots and herbs that he had grown or collected.

[Caption] Salvador Chindoy, a Kamentsá shaman who shared much of his ethnobotanical knowledge with Schultes

Chindoy claimed that he learned how to use plants for medicinal purposes from the plants themselves. He would consume *yagé* or another hallucinogen plant concoction, *borrachero*, and have a young apprentice record his vision-induced insights throughout the night, which the apprentice would share with the shaman the next morning.

Pedro Juajibioy, a young member of the Kamentsá tribe, worked closely with Chindoy (as an apprentice) and Schultes (as a guide and translator). Heavily influenced by Capuchin missionaries as a youth, Pedro was initially a devout Catholic who discovered the power of plants through his travels with Chindoy and Schultes, eventually becoming a renowned botanist and healer himself, and embracing traditional beliefs and practices.

[Caption] A Kamentsá youth on the páramo of Tambillo, February 1941

After exploring the area north of the valley, Schultes ascended the southwest slopes to reach the páramo of San Antonio. Farther west of the valley, Schultes collected on the páramo of Bordoncillo overlooking the Laguna de la Cocha, a beautiful highland lake that forms the headwaters of the Guamués River. On subsequent trips, Schultes climbed the slopes of Cerro Portachuelo southeast of the valley, and also collected plants in various places along the tortuous mountain road between Sibundoy and Mocoa.

Traveling and working together was a bonding experience, and Salvador and Pedro shared detailed knowledge of plant healing secrets with the young ethnobotanist. Schultes raced to record the knowledge in his field notebooks, taking detailed notes on myriad plant medicines, including an astounding array of hallucinogenic plants used by local healers.

Inga & Kamentsá Plant Use

Schultes's field notebook and later academic papers reveal an abundance of plant medicines described to him by Chindoy: leaves were heated with smoke and placed on the forehead to relieve headaches; orchid bulbs were chewed on long trips to provide energy (Schultes, Field notebook 1942, pp. 6-8).

Indigenous healers also treated more serious afflictions. For chest and throat pains, shamrock-like leaves (*Oxalis lotoides)* were collected and boiled to create a decoction that was gargled (Schultes, 1978, p. 8). A tea was prepared from bluish-purplish fruits (*Cestrum ochraceum)* that provoked intense sweating and helped to relieve rheumatic pains. Some of these plants were both powerful and potentially poisonous: the shaman warned that too much of the latter tea could provoke delirium (Schultes, Field notebook 1942, pp. 6-8).

Other plants were employed to treat injuries. The Kamentsá chewed *Selaginella*—a small creeping moss with a scale-like texture—with tobacco before mixing it with urine to create a paste that was used to dress wounds (Davis 1996, p. 173). Painful ant bites were relieved with a poultice of pepper plants (Davis 1996, p. 173).

Inga and Kamentsa healers made use of a variety of plants to relieve digestive and urinary ailments. The roots of the weedlike *Rumex obtusifolius* produced a strong laxative that expelled parasites (Schultes, 1978, pp. 4-5). Flowers from a species of *Begonia* genus were boiled with sugar to create a diuretic (Schultes, Field notebook 1942, p. 12).

As Schultes traveled through the road between Sibundoy and Mocoa, he encountered two species of white orchids with widely different uses by local groups. One was packed around sore teeth to relieve pain. Leaves from the second variety, mashed and ingested with sugar, were thought to cure a broken heart (Schultes, Field notebook 1942, pp. 14-16).

In the Inga and Kamentsa worldview, certain powerful plants had rules for how they could be collected. Salvador and Pedro told Schultes of a plant from the *Clusia* genus, from which local *curanderos* collected leaves only on nights with a full moon. These leaves were later heated over smoke and applied to the legs and feet to warm the limbs and relieve aches and pains from strenuous work (Schultes, Field notebook 1942, pp. 5-7). He was also informed that one plant of the *Datura* genus was so powerful that it could not be approached directly; the shaman had to pass by the plant quickly and pull off a few leaves as he went by.

On the ascent to the páramo of Tambillo, Schultes examined a shrub with dark green, holly-like leaves, bearing bright white berries and bright red tubular flowers with yellow tips. The plant was known locally as *borrachera de páramo*, and its leaves were boiled to make a tea that induced dreams and visions said to help the shaman diagnose illnesses (Schultes, 1977, p. 100). Schultes identified the plant as *Desfontainia spinosa.*

Schultes noted that local healers were unusually reluctant to discuss this plant, perhaps owing to its special use in ceremonial and medical practices. He also realized that traditional knowledge of *D. spinosa* was quickly disappearing, and urged continued and urgent study of the plant (Schultes, 1977, p. 100).

In the Inga village of San Pedro, Schultes' attention was drawn to a shrub with brilliant scarlet trumpet flowers that was cultivated abundantly in the gardens of local shamans alongside other narcotic plants. The plant was known locally by many names, including *borrachera* (intoxicant), *arbol de campanilla* (little bell tree), *flor de quinde* (hummingbird flower) and *borrachera andake*. He later identified the plant as *Iochroma fuchsioides*, from the *Solanaceae* family, a group rich in psychotropic alkaloids (Schultes, 1977, p. 45).

This plant was employed for a wide variety of medicinal uses. The roots were rasped and eaten raw with salt to relieve internal injuries following a severe blow. The roots were also mixed with other unknown plant ingredients to combat heart weakness and to stimulate labor in difficult cases of childbirth. *Iochroma* was also used to treat colic, stomachache and other digestive problems (Schultes, 1977, pp. 46-47). Schultes was also told that the leaves of this plant and other related species were sometimes heated and applied to bedsores that were not healing.

After many years of research, Schultes determined that the plant was used as a narcotic, but only in cases of especially difficult diagnosis, prophecy or divination, when all other *borracheros* had failed. In these cases, a handful of bark was rasped from the freshly gathered stem and mixed with an equal amount of fresh leaves; this was subsequently boiled in water to make a tea. When cooled, one to three cups were consumed over a three-hour period (Schultes 1977, p. 47).

Chindoy informed Schultes that the plant has previously been widely employed, but its usage was decreasing, likely due to the physical impact of the plant on shamans, who commonly fell ill for up to a day after taking the tea. To hasten the shaman's recovery, a special tea was prepared from a highland páramo shrub (*Heyosmum translucidum*) (Schultes 1977, p. 47).

Borrachero: The Tree of the Evil Eagle

[Caption] A Kamentsá youth with a Borrachero flower

On February 16, 1942, while collecting with Salvador Chindoy in Sibundoy, Schultes learned of an unusual variety of plant known as *borrachera culebra*, meaning "drunken snake". According to local shamans, the effects were so deeply transformative that a dose could put a person to sleep for four days. The plant had a variety of other uses as well: the leaves and flowers were heated in water to create an infusion that was used to relieve tumors, swollen joints, and persistent chills and fevers.

Borrachero culebra was one of many medicines derived from shrubs and trees of the genus *Brugmansia,* rich in tropane alkaloids and highly psychoactive. These plants were also referred to by some South American tribes as "the tree of the evil eagle" and were grown and used by indigenous cultures from Colombia south to Chile—but no place harbored more varieties than Sibundoy.

[Caption] A native drawing of the Tree of the Evil Eagle

Schultes was astonished to note that no fewer than eleven variants of *borrachero* were employed in Sibundoy. The rarest versions were typically cultivated in gardens near the houses of the most powerful and accomplished healers. Some of the species were dramatically different, highly atrophied forms with thin or deformed leaves, likely the result of centuries of cultivation by the shamans of the Sibundoy.

Another of the most formidable of the atrophied *Brugmansia* species was said to induce strong visions for up to five hours. Its leaves were so deformed that they looked as though they had been eaten by caterpillars, and thus the plant was referred to as *munchiro borrachero* ("drunken caterpillar") by local indigenous groups. Varieties also were named after water ("*buyé"*), the hummingbird, the deer, and the boa (Bristol 1965, p. 275). However, *Borrachero culebra* was considered the most powerful and potent of the local medicines and the most favored hallucinogen of Kamentsa *payés* (shamans) for both prayer and divination.

[Caption] ***Borrachero culebra***

[Caption] Schultes with Salvador Chindoy in the 1960s

Borrachero culebra appeared so dramatically different from other *Brugmansia* or *Datura* varieties that Schultes classified it within a novel genus: *Methysticodendron amesianum*, named in honor of his botanical mentor Oakes Ames. This classification has been debated, with some suggesting that the atrophied appearance was the result of a viral infection or the mutation of a single gene. Today the plant is most commonly referred to as *Brugmansia aurea (Hybrid) culebra*, a classification that Schultes agreed with later in life as genetic research helped elucidate the relationships between different varieties and species of plants.

[Caption] ***Brugmansia aurea***

Borrachero culebra was (and remains) extremely rare, found by Schultes only in the gardens of Salvador Chindoy and a handful of other shamans. Drolly, with awareness of Sibundoy's complicated colonial legacy, Schultes planted cuttings of this powerful shamanic hallucinogen around the garden of both the local Catholic Church and Seminary.

[*Brugmansia aurea* botanical illustration 1]

[*Brugmansia aurea* botanical illustration 2]

Down the Andes

In February 1942, Schultes descended the precipitous, cloud-soaked forests of the eastern Andes along the road from Sibundoy to Mocoa, a particularly dangerous stretch known as the "springboard of death" due to the high rate of accidents as the narrow, single lane road twists and descends some 2,000 meters to the Amazonian lowlands.

Schultes would come to learn this dangerous road well, and was once forced to drive the truck himself after finding the driver completely drunk (Bristol, personal communication).

Arriving in Mocoa,Schultes collected plants north of town and then continued south beyond modern-day Villagarzon (later founded in the 1950s) before stopping at the Inga community of Uchupayaco on February 21, 1942. From there, he ascended a small north-south tributary of the Putumayo, the Uchupayaco River (Uchupayaco meaning "River of Ashes" in Colombian Quechua), arriving near the headwaters on February 26.

[Caption] A small creek in the upper Caquetá

Schultes then cut west to Puerto Limón along the Caquetá River, where he was able to observe the wide variety of plants consumed by local Inga people. He found many varieties of cacao—the source of chocolate—both cultivated and collected from the wild (Schultes, 1942, p. 22). A large tree (*Pourouma cecropiifolia*) was cultivated in the gardens and bore a delicious fruit, similar in appearance and taste to grapes but with much larger pits (Schultes, 1942, p. 25). The milk from a species of *Ficus* was consumed as a beverage (Schultes, 1942, p. 24).

Schultes arrived at Puerto Asís on March 10, 1942 and remained there for several days to collect before descending the river to Puerto Ospina, a military base at the mouth of the Sucumbíos River. There he met Colonel Gómez-Pereira, a Colombian officer who offered to mount an expedition up the Sucumbios after hearing of Schultes' wish to explore the headwaters (Davis 1996, p. 219).

The Sucumbíos, or San Miguel as it is more widely known in Colombia, forms part of the international border between Colombia and Ecuador. Colonel Gómez-Pereira and his gunboat, the *Mercedes*, had been assigned to patrol the country's borders to prevent entry by the Brazilians, Ecuadorians and Peruvians into a region that was still disputed in the early 20th century (Davis 1996, p. 219). On March 27, 1942, the *Mercedes* set off up the Sucumbíos.

Into the Land of the Kofán

[Caption] Kofán shaman holding a spear

As the *Mercedes* worked its way up the Sucumbíos River, Schultes was entering the territory of the Kofán, a tribe that had remained largely isolated from the outside world in the 1940s with the exception of a few missionaries and rubber traders. The Kofán were known for the variety and toxicity of their arrow poisons, and Schultes hoped these might yield to new discoveries of medicinal plants. The Kofán were also avid consumers of *yoco*, Schultes' other botanical mission on the Putumayo.

At the time of the Spanish Conquest, the Kofán were a numerous tribe that successfully resisted Huayna Capac and his Inca empire (Davis 1996, p. 220). By the 17th century, disease and enslavement had reduced their population to some twenty thousand individuals from a much larger number. Several waves of epidemics introduced by missionaries in the 20th century further reduced their numbers to fewer than a thousand by the time of Schultes' visit (Davis 1996, p. 220).

View Map of Kofán Ancestral Territory

On March 29, 1942, Schultes arrived at the Kofán village of El Conejo, where he was greeted by an elder Kofán shaman dressed in a traditional blue *cusma* (a type of long shirt) with layers of necklaces made from peccary tusks, seeds, and shells. The shaman's face was adorned with intricately painted red lines from achiote berries and a macaw feather jauntily inserted sideways in his pierced nasal septum.

[Caption] Kofán shaman

Schultes visited when Kofán contact with the outside world had been mostly brief and fleeting. Here were an extremely isolated people, living as their ancestors always had in close contact with—and dependent on—the pristine and diverse rainforests that surrounded them. Their territory covered an enormous altitudinal gradient from the Andean cloud forests in the west to the Amazonian lowlands in the east, and contained exceptionally high levels of plant diversity.

[Caption] A Kofán woman with a tame tapir

Schultes stayed at Conejo for several days before paddling up the Sucumbíos, reaching the village of Santa Rosa on April 6. Returning to Conejo and using it as a base, he then crossed south overland to the Aguarico River in Ecuador and later poled up the Quebrada Hormiga, crossing over to the Guamués River (Davis 1996, pp. 226-227).

[Caption] The Kofán poling up Quebrada Hormiga

Schultes determined that the Kofán had more shamans relative to population size than any other tribe in northwest Amazonia. He described them as "deeply knowledgeable men with unusual intelligence and imposing personality." By reputation, they were experts in manipulating spiritual forces to prescribe cures for illnesses and even sometimes solve socio-political problems. Several Kofán shamans claimed the ability to turn themselves into jaguars and roam the rainforest at night while in a plant-induced trance.

[Caption] A Kofán elder

Schultes and his student Homer Pinkley—who later continued Schultes' ethnobotanical research with the Kofán after Schultes' departure—encountered a cornucopia of new plants and novel plant uses, including the use of at least 80 plant species to treat 27 different ailments (Pinkley 1973, [INITIAL]; cited in Schultes 1988, p. 3).

Kofán plant use

The Kofán had a variety of remedies for injuries suffered: an epiphytic yellow orchid (*Oncidium pusillum*) was used to prepare a wash to treat lacerations (Schultes 1980, p. 6). Stems of *Cayaponia* species were burned and the ashes applied to external sores (Schultes 1980, p. 42), while ashes from small flowering perennials (genus *Cuphea*) were applied to treat sores of the mouth (Schultes 1980, p. 28). The aromatic leaves and stems of *Peperomia serpens* were crushed and applied to relieve painful sting of the large conga ant (*Dinoponera grandis*) (Schultes 1980, p. 8).

A variety of inconspicuous orchids—not typically associated with medicinal uses—provided relief for a number of ailments. A delicate purple orchid (*Dichaea muricata*) was used to prepare a wash to treat eye infections (Schultes, 1980, p 6). An orchid with light-green, drooping flowers (*Phragmipedium ecuadorense*) was boiled in water to make a tea taken for stomach issues (Schultes 1980, p. 7).

For the Kofán, plants also provided a variety of practical uses. Leaves from a plant known as *ojo de venado* (*Mucuna pruriensis*) were used to dye clothes black (Schultes Field notebook 1941, p. 76). Leaves of another species (*Cyphomandra endopogon)* were used to dye clay pots black (Schultes, 1980, p. 35).

Another intriguing lead was the discovery of plants used to improve hunting accuracy and effectiveness. Schultes observed the Kofán feeding their dogs a combination of red *Datura* plants and tobacco leaves, intoxicating the animal while reputedly improving its hunting prowess (Schultes Field notebook 1942, p. 44). Homer Pinkley later reported the Kofán collecting a variety of Amazonian lily *(Eucharis amazonica*), then boiling the entire plant to prepare a tea. Pinkley

was informed by the Kofán that "this insures greater accuracy in using the blow gun while hunting monkeys" (Schultes, 1980, p. 5).

Barbasco: Fish Poison

[Caption] Kofán preparing *barbasco*

With the Kofán, Schultes observed a novel method of fishing where his hosts scraped the bark of a liana and mashed it to a paste while soaking in water. This material was thrown into shallow creeks, after which bountiful fish floated to the surface where they were easily caught.

Known as *barbasco* in Spanish-speaking America, *timbo* in the Brazilian Amazon and *neku* in the Guianas, Amazonian fish poison is derived from the bark of the genus *Lonchocarpus*, a vine of the bean family often readily identifiable by both a cucumber-like odor and a relatively bright yellow wood.

[Caption] Siona preparing *barbasco*

The phrase "fish poison" is a bit of a misnomer, because the active compound, rotenone, only stuns fish. The chemical enters the fishes' gills and interferes with their ability to intake oxygen, causing them to rise to the surface where the Indians wait with bows and arrows drawn. Traditional fishing expeditions are often followed by major tribal celebrations and feasting.

Today, in the industrial world, rotenone is employed as a biodegradable pesticide.

Curare: Flying Death

Schultes had ventured to Kofán territory to document their renowned mastery of deadly arrow poisons, known locally as *curare*. Early scientific explorers described indigenous peoples covering the tips of their arrows and blowgun darts with curare and then hunting their prey with lethal precision, noting that the unsuspecting victims suffered from asphyxiation from the poison with just a glancing blow. Early scientific experiments showed the poison paralyzed the muscles around the respiratory system, leading to suffocation.

[Caption] A Kofán with blowgun

This novel property—later determined to be the result of curare blocking signal transmission between nerves and muscles—led to groundbreaking medical discoveries:

> Modern medical technology has acquired a valuable drug from one of the curares of Colombia, Ecuador and Peru. The active principle resides in the bark of a gigantic forest liana known botanically as *Chondrodendron tomentosum*. In the 1930's, the active constituent in this plant—an alkaloid called tubocurarine—became important in modern surgery as a skeletal muscle relaxant for treating myasthenia (abnormal muscular fatigue) and certain neuropsychiatric conditions (Schultes, 1991, p. 265).

Schultes and others believed that the study of curare varieties and their admixtures could simultaneously lead to both new medicines and a better understanding of the human nervous system. In Kofán territory, Schultes was among the most knowledgeable curare masters in the Amazon rainforest.

The Kofán had an intricate cultural system built around the manufacture of curare from local plants. Certain shamans specialized in curare production and knew the correct times to collect bark, the proper part of a liana to use, and the means of preparing the plants. This knowledge was passed from one generation of *payés* (shamans) to the next, following a long and difficult training period beginning with an apprenticeship at an early age.

[Caption] A Kofán collecting bark to make curare

Traditionally, certain practices had to be followed for the production of curare for special purposes, and the Kofán shamans observe strict fasting from certain foods when making curare. The intricate mixing of plants was accompanied by chanting, believed to maximize the toxicity of the plants; poison intended for use on large animals or humans required the chanting of two shamans.

[Caption] A Kofán preparing poison-tipped arrows

Schultes would eventually identify and document more than 70 species of plants used to make curare. The most common varieties consisted of highly poisonous plants belonging to either of the genuses *Chondrodendron* (of the *Menispermaceae* or moonseed family) or *Strychnos*. Schultes collected no fewer than ten varieties of *Strychnos* employed to make curare, each with its own cultural significance to the Kofán (Schultes, 1942, pp. 78-79). Often, curare poisons were comprised of as many as 15 plant ingredients, while other varieties were prepared from a single species (Schultes, 1991, p. 265).

[Caption] A Kofán preparing poison-tipped arrows

While in Santa Rosa, Schultes saw the Kofán utilizing a shrub with bright orange fruits to make curare. Later identified as *Schoenobiblus peruvianus*, the fruits and bark of the root were used to produce a poison with no admixtures that was used only to hunt birds (Schultes, 1990, p. 453). The Kofán are the only indigenous group known to use a species from this genus for these purposes (Schultes, 1990, p. 453).

[Caption] A Kofán preparing poison-tipped darts

There were also many non-toxic plants that the Indians believed served as poison amplifiers. Of particular note was the Kofáns' use of the root bark of a small tree of the soursop family—*Unonopsis veneficiorum*—which had only been reported once as an arrow poison, by the German explorer Karl Friedrich Philipp von Martius (Schultes, 1969, p. 136).

[Caption] A Kofán with blowgun

Several other surprising plants were added to curare mixtures: Schultes observed the Kofán employing the sap of a tree of the *Virola* family when producing certain curare poisons; the sap was a known hallucinogen (Schultes, 1988, p. 298). Many years later, his student Homer Pinkley documented the Kofán along the Colombia-Ecuador border making curare from a relative of the cinnamon family, *Ocotea venosa* (Schultes, 1979, p. 210).

Perhaps most surprisingly, Schultes observed the addition of plants from both the black pepper and the red pepper families, including both *Piper umbellatum* and species of the *Capsicum* genus (Schultes, 1980, p. 7). These plants, while not toxic themselves, were later shown to increase the rate at which the poison toxins were absorbed into the bloodstream, thus hastening the onset of paralyzing effects.

View Map of the Distribution of Curare in South America

Schultes lamented how little western science understood the complex plant mixtures utilized by indigenous people in the poison. He believed the key to unlocking the true medicinal potential of curare and other forest medicines was through close collaboration with local indigenous peoples whose cultures had observed and used these plants for millennia.

> Notwithstanding the extraordinary amount of research that has gone into the study of curares or arrow poisons in the last half century, I believe that our understanding of the vegetal constituents and admixtures of the often complex recipes is still embryonic. This incomplete knowledge is probably nowhere more in evidence that in our inability to explain the role of many of the additives employed together with the active plants. Which of these additives increase the toxicity of the main ingredient, which enable the poison to adhere to the darts, which may facilitate easier penetration of the bioactive principles into the blood, which may be acting synergistically, which are added for magic or superstitious reasons? (Schultes, 1988, pp 398).

Ayahuasca: Vine of the Soul

While living and collecting with the Kofán people along the Guamués/Sucumbíos River, Schultes watched them prepare their most sacred remedy: *yagé*, also known as ayahuasca, or the "vine of the soul". Ayahuasca may refer to either the base vine of the remedy, or the combination of this vine with other plants, all of which have long been essential to many tribes of the Amazon for healing, prophetic and divination purposes.

[Caption] Cultivated yagé vine

Among the Kofán, this ritual hallucinogenic brew was consumed at least once a week, and at times, entire villages would participate. When invited to participate in the ensuing ceremony, Schultes always accepted:

> I have tried several of the Indian hallucinogens, in part because the Indians consider them sacred plants, and it would have been an unpardonable rudeness to refuse them when the Indians were kind enough to offer them to me during a ceremony (Schultes, 1994, p. 30).

Schultes had first taken ayahuasca with the Kamentsá shaman Salvador Chindoy in the Sibundoy Valley. With the Kofán, he was among some of the most knowledgeable ayahuasca shamans in the region, renowned by the surrounding tribes for their powerful yagé preparations and healing acumen. The Kofán were able to distinguish between varieties of yagé with indiscernible physical differences and added a variety of seemingly unrelated, non-psychotropic plants that nevertheless augmented the formula's power.

[Caption] Yagé plant

Ceremonies typically began late in the evening, with the shaman drinking a small cup of yagé before inviting participants to drink. The effects might include visions, blurred colors, and a sense of detachment.

[Caption] Salvador Chindoy treating a patient.

As he traveled down the Putumayo and had his first experiences with yagé, Schultes wrote the following in his field notebook:

> Yage is taken often (weekly) by some, infrequently by others. It is a most violent purge & often acts as a vomitive. Extremely bitter. Some say aftereffects are an exhilaration and feeling of ease and well-being; others that it is a day of discomfort and headache. The bark of yage is scraped off, and small pieces are heated in water. This water is drunk. People take it alone or in small groups in houses, often with a sick person who is to be cured. The curandero takes yage to <u>see</u> the proper herb or herbs the sick man needs. Often it is taken to locate lost articles. (Schultes, Field notebook 1942, p. 27)

Yagé is considered a sacred plant and remedy by tribes throughout the northwest Amazon, and the vine and its frequent adjuncts would prove to be a central focus throughout Schultes' travels. Each indigenous group had their own unique ceremonial traditions and oral histories on the origins and importance of the central vine.

[Caption] Tribes reported to use *Malpighiaceous* Narcotics

View Map of Tribes That Use Ayahuasca in the Northwest Amazon

Schultes' participation in yagé ceremonies was a key part of his understanding of the indigenous cultures of the region. At times, he would be invited to a yagé ceremony the first night after arriving in a village, and his participation helped to earn the trust of the community, opening the doors to learning from their shamans and other elders.

[Caption] Yagé ceremony, Rio Popeyaca

Schultes witnessed a variety of methods of preparing the yagé brew. In some regions, pieces of the vine's woody trunk and crushed bark were boiled, at times with the leaves and stems. Other tribes prepared the yagé "raw", by soaking the vine in cold water for an extended period.

[Caption] Makuna shaman collecting yagé with youth

The key component of the brew is *Banisteriopsis caapi*, a vine first collected by Schultes' hero Richard Spruce that contains mind-altering beta-carboline alkaloidal compounds (Schultes, 1969, p. 129). The standard ayahuasca brew almost always contains *Psychotria viridis*, widely known in the western Amazon as *chacruna* (Schultes, 1994, p. 205). This shrub is a member of the coffee family (the *Rubiaceae*) and is rich in tryptamines, a highly hallucinogenic class of compounds (Schultes, 1994, p. 205).

[Graphic] Botanical illustration of *Banisteriopsis Caapi*

Many other plants may be added to the brew depending on the shaman and the illness that he or she is diagnosing and treating. While in Puerto Limón on the Caquetá River, Schultes observed the addition of the bark of another vine, known as *chagropanga* or *oco yaje* (*Diplopterys cabrerana*), which is closely related to *Banisteriopsis caapi* but with a thicker vine. (Schultes, 1942, p. 27; Schultes, 1994, p. 205)

The combination of these plants strengthens the psychedelic effects and lengthens the period of the visions. Schultes often marveled that indigenous peoples were able to find such potent combinations of two or three relatively inconspicuous plants in a forest with thousands of species.

[Caption] Yagé plant near Mocoa

[Graphic] Schultes' specimen of *Banisteriopsis Caapi*

Down the Mighty Putumayo

[Caption] Canoes at Tres Esquinas

Schultes remained with the Kofán on the Sucumbíos for several weeks before heading west towards Puerto Ospina. Eager to deposit his Kofán plant collections at the herbarium in Bogotá, he caught a military flight to Tres Esquinas on the Caquetá River, and then another to Bogotá (Davis, 1996, p. 227).

[Caption] Koreguaje longhouses near Tres Equinas, Caquetá River

From Bogotá, Schultes flew to Puerto Leguízamo, a military base on the Putumayo River, south of Puerto Ospina. There, Schultes met up with Nazzareno Postarino, a young Italian from Mocoa whom he hired to serve as an expedition assistant (Davis, 1996, p. 227). Schultes spent several days collecting on the Río Caucaya before heading down the Putumayo on May 19, 1942 aboard the *Ciudad de Neiva,* a three-story, wood-burning paddle wheeler (Davis, 1996, p. 227).

[Caption] Ciudad de Neiva on the Putumayo River

On May 21, 1942, Schultes and Nazzareno arrived at the mouth of the Cará Paraná, a large north-south flowing tributary of the Putumayo River, whose name means "river with canoes" due to its navigability. They disembarked from the *Ciudad de Neiva*, and paddled north up the Cara Paraná by canoe, reaching El Encanto on May 23, 1942.

[Caption] Trees with vines, El Encanto, Cará Paraná River

As they ascended the Cará Paraná, Schultes felt an aching fever, the first signs of a malarial attack that forced them to remain in a rain-soaked campsite for three days (Schultes, 1961, p. 2). After his recovery, they continued by cutting east, following an overland trail leading to the the other major tributary of the Putumayo, the Igará Paraná; its name means "river without canoes", a reference to the many rapids.

[Caption] Overland path

[Caption] Bridge on the overland path

On the Igara Paraná, Schultes and Nazzareno spent several weeks collecting plants at La Chorrera before setting off downriver, arriving at the mouth of the Igará Paraná on June 17, 1942.

Continuing down the Putumayo, they stopped to collect plants at Puerto San Salvador, a village between the Igará-Paraná and Yaguas rivers, and again at Puerto Remanso before arriving in the town of Tarapacá on June 26, 1942.

[Caption] Schultes departing La Chorrera

After waiting a week, with time passed playing chess with the Colombian Major Gustavo Rojas Pinilla (who would go onto become President of Colombia) (Krieg, 1966, p. 89), Schultes boarded the amphibious plane the *Catalina,* bound for the military base at Puerto Ospina.

[Caption] The Catalina

The Murui-Muinaɨ (Witoto)

As Schultes and Nazzareno descended the Putumayo River, they entered the ancestral lands of the Murui-Muinaɨ (commonly known as the Witoto or Uitoto) and related Bora, Andoke, Muiñane, Miraña, Resígaro and Ocaína peoples.

The Murui-Muinaɨ were once an exceptionally numerous tribe: whereas most Amazonian tribes numbered in the hundreds or low thousands, the Murui-Muinaɨ were estimated to have a population of about 50,000 at the beginning of the 20th century, inhabiting a lowland territory ranging from modern-day Colombia to Peru.

[Caption] Area Inhabited by the WItotos, Boras and Muiñanes

View Map of Lands Inhabited by Murui-Muinaɨ and Related Bora, Andoke and Ocaína Peoples

There are many subgroups and a wide variety of dialects among the Murui-Muinaɨ, collectively referred to as the Huitoto language family. In the local language, Murui-Muinaɨ (their endonym) describes two groups: the Murui, the people of the headwaters, and Muinaɨ, the people of the river mouth.

Descending the Igará Paraná in early June, Schultes arrived in La Chorrera, the former headquarters of the infamous Casa Arana, named after the early 20th century rubber baron who inflicted unspeakable cruelties on the local indigenous peoples. In La Chorerra, Schultes spoke with older Indians who had their ears and fingers lopped off for being just a few pounds short in their latex collection.

[Caption] Weighing rubber at Casa Arana, La Chorrera, 1912

Schultes later said: “The Witoto tribe [on the Putumayo] numbered around 15,000 in 1900. By 1914, when the atrocities were ended by the collapse of the rubber trade, there were only 2,000

Witotos left in the Putumayo" (Kreig, 1966, p. 88). (For more information on the Casa Arana, see Chapter 3: World War II and Rubber.)

Despite the traumatic history of this region, Schultes found that the Murui-Muinaɨ had retained many aspects of their indigenous culture, including extensive ethnobotanical knowledge.

Manguaré Drums

At dawn in Witoto territory, Schultes often heard the sounds of *manguarés*, large drums fashioned from tree trunks hollowed out with burning stones and charcoal. Each drum has a narrow opening running lengthwise, with larger openings at the top and bottom. The drums are struck with drumsticks tipped with wild rubber, with blows to either side of the opening producing distinct sounds.

[Caption] Manguare drums

The Witotos used the giant drums to create musical rhythms during elaborate ceremonies and to communicate messages over long distances through a system of percussion-based information transmission.

Read more about *Manguarés* and Murui-Muinaɨ Dances

Manguarés are suspended from the rafters of *malocas* (longhouses) and employed both as musical instruments for ceremonial occasions and for communicating over long distances to announce festivals or summon council meetings. The *manguarés* hold special symbolic significance within the communities of the Witoto, who believe that the souls of deceased village inhabitants are contained within the drums (Preuss, 1994, p. 71).

Manguarés are engineered to exploit natural bio-acoustic properties, with the low-pitch percussion frequencies passing through large vegetation, allowing the sounds to be propagated over great distances. *Manguarés* have been reported to have an audible range of up to 20 km (12 miles), depending on the size of the drum and the surrounding topography.

The Murui-Muinaɨ and related groups have developed a system of percussion-based information transmission using manguarés. Early 20th century American explorer Walter Hardenberg described *manguarés* as a "sort of wireless telegraph...a code is arranged, based upon the difference of tones and the length and number of blows struck, so that all kinds of messages can be exchanged." (Hardenburg, 1912, p. 159)

Using a fairly rigid structure or syntax of drum beats, they are able to communicate an astounding variety of messages—such as the return of a chief, the results of non-alcoholic drinking

competitions, and the departure or return of fishing or hunting expeditions—and to call on neighbors to bring coca for toasting or chewing (Seifart, 2018, pp. 6-7). The related Bora group have a unique system that represents their complex-two tonal language, in both tonal contrasts and rhythmic structure (Seifart, 2018, pp. 6-7).

The Sacred Dances of the Murui-Muinaɨ

Manguarés play an important role in Murui-Muinaɨ dance festivals, providing the melody and rhythms for dances that last for days at a time, fueled by *ambil* and coca. These ceremonies are considered essential to the spiritual management of Murui-Muinaɨ territories and the well-being of their communities.

Early ethnographic research in the early 20th century described a myriad of Murui-Muinaɨ dances, each with an intricate oral history often full of lunar imagery. The drums themselves were associated with the dark phase of the moon, and the ceremonies were closely connected with lunar cycles and agricultural patterns (Preuss 1994, p. 3).

The Murui-Muinaɨ believed that the Okima dance (the "dance of yucca and the ancestors"), allowed them to work their gardens and eat yucca (Preuss, 1994, pp. 186-187). During the ceremony, combat-like dances symbolized the triumph of the new moon over the old moon. The dancers first gathered in a semi-circle, slowly adding more dancers to create a full circle, representing the transition to a full moon (Preuss, 1994, pp. 189). Later, pairs of flute players danced and played their instruments in intervals, reflecting the duality of the moon (Preuss, 1994, pp. 189). Preparations for this festival took two weeks and included the creation of yucca balls wrapped in leaves that could only to be eaten following the completion of the ceremony (Preuss, 1994, p. 188).

The manguarés themselves had an associated dance required for their creation. In order to create a manguaré, the communities first sang and danced for an entire night, forming long lines with their hands locked together (Preuss, 1994, p. 199). As the sun rose in the morning, the women sang and the men ventured into the forest to cut down a tree from which the manguarés would be sculpted (Preuss, 1994, p. 199).

One of the most fascinating Murui-Muinaɨ dances (that is still practiced today) is the "dance of the Yadico" or "dance of the anaconda" (Preuss, 1994, p. 199). For this ceremony, a long and narrow tree is cut down and inscribed with grooves until it became flexible (Preuss, 1994, p. 195). The tree is then decorated to resemble a boa ("*yadico")*, covered with butterflies and with the face of a woman on one end and a caiman on the other (Preuss, 1994, p. 198). The *yadico* is rested on two tree trunks, with the earth underneath excavated to create a gap. The men dance on top of the tree, stomping it into the ground and producing a loud sound, while the women dance to the side (Preuss, 1994, pp. 196). The dance is said to recognize the creation of the world (Preuss, 1994, p. 198).

Plant Use by the Murui-Muinaɨ

Schultes observed a wide variety medicinal plants being used to treat sores and wounds, and the white latex from a Ficus tree being used to cure athlete's foot. To treat severe eye infections, the dried thick leaves of *Souroubea pachyphylla* were mixed with animal fat and applied to the eyes (Schultes, 1980, pp 25).

Schultes wandered through the gardens at La Chorrera, documenting the local names for the many crops consumed by the Murui-Muinaɨ: sweet and bitter cassava, white and black corn, palm fruits, and yams.

One of the staple foods of the Murui-Muinaɨ was pineapple, a fruit native to the Amazon rainforest. In La Chorrera, Schultes observed some ten varieties of pineapple in cultivation, ranging in color from bright yellow to golden orange and even a variety with a deep red-purple hue. He described the distinct flavors of each variety, noting the extreme sweetness, and watched the Witotos prepare a pineapple drink, first heating the whole fruit over a fire, before quickly plunging it in cold water and then squeezing out the juice (Schultes, 1942, pp. 67 - 72).

Ambil: Tobacco Paste

Schultes witnessed the Witotos preparing *ambil* by mixing tobacco leaves and salt-like minerals extracted from other plants, and then cooking them down into a thick black paste. The tobacco paste was periodically placed between the cheek and gums, providing stimulation and suppressing appetite. Often, the *ambil* was stored in a hollowed-out cacao pod.

[Caption] Witoto preparing *ambil*

While many there were many varieties of cultivated plants in Murui-Muinaɨ gardens, one was of particular importance: the coca plant.

[Caption] Witoto *ambil* cacao pod

Coca: The Sacred Masticatory

While with the Murui-Muinaɨ, Schultes noticed the constant intake of a green powder known as *mambe* or *ipadu*. Made from the leaves of the coca plant*, mambe* was and is consumed in enormous quantities throughout the day and late into the evenings, comprising an essential part of Murui-Muinaɨ social life.

[Caption] A Koreguaje youth next to a coca plant, Rio Caquetá, 1942

Coca (*Erythroxylum coca)* is a three-foot to six-foot bush or small tree. In the northwest Amazon, coca is typically cultivated in small gardens solely devoted to this plant and is always planted separately from cassava. Unusually, because most of their agriculture is carried out by women, *mambe* is cultivated exclusively by the men. It is propagated from stem cuttings that are simply inserted into a freshly cleared field. Coca leaves are usually ready for harvesting about 18 months after planting, with some ready for harvesting after just three months.

[Caption] A Witoto collecting coca leaves in a basket

[Caption] A Witoto toasting coca leaves

Coca leaves are collected in brown handwoven baskets and hauled back to the roundhouse, where they are carefully spread out and toasted on a large flat clay or iron plate.

[Caption] A Witoto preparing *mambe*

The dried leaves are then placed into a hollowed-out tree trunk that serves as a mortar, and then are pulverized with a large wooden club. Schultes recounted his nightly experience of village coca preparation:

> The dull, rhythmic thumping which begins when darkness falls and may continue until nine o/clock is one of the hauntingly agreeable sounds that remains uppermost in my memory of many years of residence in the great *malocas* (Schultes, 1981, p. 49).

[Caption] A Makuna grinding coca leaves

Meanwhile, other men burn leaves of a common and widespread tree of the *Cecropia* genus, known locally as *yarumo* (Schultes, 1981, p. 49). The leaves are added to the coca powder to provide an alkaline substance that facilitates the release of alkaloids. Indigenous peoples also mix in the leaves or the leaf ash of several others plants to fortify the effects of the *ipadu* and/or to impart a desired flavor.

[Caption] Cecropia or yarumo tree

[Caption] Burning cecropia leaves.

The *ipadu* powder is stored in a hollowed-out calabash and scooped out with a spatula made from the legbone of a peccary or tapir. About a teaspoon of the powder is placed between the cheek and gum and molded into a quid, which is not chewed but allowed to gradually dissolve and be swallowed.

[Caption] Consuming mambe (powdered coca) using a spoon made from an animal bone.

The coca initially imparts a somewhat bitter taste and its first effect is slight numbing, followed by general stimulation, improved endurance and hunger suppression. These qualities make coca an essential element of many aspects of indigenous life, helping sustain people through multiday ceremonies and over the course of long hunting or canoe trips. Schultes experienced this directly:

> "I naturally learned to chew…toasted coca leaves and, finding it to be a most helpful custom when one must work hard and there is little food." (Kreig, 1966, p. 72)

Coca has many other medicinal values, helping to soothe stomach disorders, toothaches, headaches, sore throats, wounds, and eye irritations (Plowman, 1984 p. 102). Coca also contains minerals, vitamins and proteins that make it an important dietary supplement for some Amazonian peoples. It has even been shown to positively impact metabolism by regulating blood-sugar levels, a vital adaptation in difficult living conditions with carbohydrate-rich diets like the Andean highlands (Bolton,1976, p. 633).

[Caption] Erythroxlyum coca botanical drawing

Amazonian coca (*Erythroxylum coca* var. *ipadu)* is consumed throughout the northwest Amazon, from the upper Amazon in northern Peru to the middle and lower sections of the Putumayo and Caquetá watersheds in Colombia, and as far north as the Vaupés River in the headwaters region of the Rio Negro in Colombia and Brazil (Plowman, 1984 p. 68).

View Map of Coca Distribution

Beyond the Amazon, coca leaves are commonly chewed by indigenous peoples throughout the Andes from Bolivia to southern Colombia, and even on the Caribbean coast of northern Colombia. Timothy Plowman, one of Schultes' students at Harvard, continued Schultes' coca research in the 1970s, elucidating four different species of coca and documenting their cultivation and use.

[Graphic] Plowman's and Schultes' specimen of *Erythroxylum* coca var. *ipadu*

Varieties of Coca

Erythroxylum coca var. *coca*, also known as Huánuco or Bolivian coca, is related to the Amazonian variety and is cultivated in regions of moist, montane tropical forest along the eastern slopes of the Andes from northern Peru to Bolivia. It is widely consumed throughout the Andean highlands (Plowman, 1984, p. 64).

E. novogranatense var. *Truxillense* is cultivated in the river valleys along the north coast of Peru and the upper Marañón River valley. This variety of coca is highly resistant to drought and has a unique wintergreen flavor that has made it valued in the production of the soft drink Coca-Cola. About three-quarters of all Trujillo coca is exported to the United States, to be used both in the industrial production of Coca-Cola and for pharmaceutical cocaine research (Plowman, 1984, p. 69).

E. novogranatense var. *novogranatense* is found in the inter-Andean valleys of the Colombian Andes and in the Sierra Nevada de Santa Marta along Colombia's Caribbean coast. This variety is typically grown between 1,000 and 2,000 meters above sea level; plants growing at the upper limit of the cultivation range having a higher concentration of stimulants. In contrast to the Amazonian context, in the Colombian mountains coca is picked exclusively by women and children (Plowman, 1984, pp. 70-71).

Pre-Columbian ceramics and artwork indicate the long and important history of coca chewing, often displaying people with bulging cheeks full of coca leaves. The earliest archaeological evidence of coca consumption dates back to 3,000 BC among the Valdivia culture in southwestern Ecuador (Plowman, 1984, p. 72). Amazingly, the four varieties of coca are believed to have all been domesticated independently in each of their respective cultivation ranges, and in each geographic area where coca is chewed (Plowman, 1984, p. 64), indigenous groups have devised ingenious ways to release the alkaloids through the addition of an alkaline substance (Plowman, 1984, pp. 94-100).

In the 1967, Schultes returned to the Amazon aboard the Alpha Helix research vessel, accompanied by several other eminent scientists. Schultes and his colleagues walked into a Witoto village, where they were met by two local women. Speaking Spanish, the women welcomed the visitors and asked them the purpose of their visit. In fluent Witoto, Schultes replied that what he really wanted was some coca powder. Taken aback by his language prowess, the women squealed and laughed, and brought the coca. (Plotkin, personal communication)

The Search for Yoco

Thin and exhausted after nearly six months of nearly continuous fieldwork, Schultes was eager to rest and treat his wounds. In his near-full descent of the Putumayo River—including explorations of its three major tributaries—Schultes had made significant discoveries of curare admixtures and had his first experiences with ayahuasca, coca, and a myriad of other sacred Amazonian plants. However, Schultes was disappointed that he had been unable to find a mature specimen of *yoco* with fruits and flowers suitable for a scientific description.

Schultes had observed *yoco* in use throughout his explorations of the Putumayo watershed. Indigenous people consumed *yoco* in a beverage made by scraping off the bark of a woody vine and pressing the milky sap into cold water (Schultes, 1942, pp. 322-323). *Yoco* served as an integral part of their morning rituals: they would rise at dawn, rinse their mouths in the river, and drink a gourdful of *yoco* before consuming any food. The first gourd was followed by another about a half an hour later, with even more ingested for hunting or fishing trips (Schultes, 1942, p. 313).

[Caption] Inga preparing *yoco*

Ingestion alleviates hunger and fatigue, often allowing Indians to go for up to two days without food while also providing a sense of focus and overall well-being (Schultes, 1942, p. 324). A chemical analysis reveals that beyond its other active ingredients, *yoco* bark yields about 3% caffeine, stronger than coffee (Schultes, 1942, pp. 323-234). Several Kofán communities insist the consumption of *yoco* also helps prevent malaria (Plotkin, pers. comm.) and relieve malarial fevers (Schultes, 1942, p. 324).

[Caption] *Yoco* bark

A slow-growing woody vine, *yoco* was said by the Indians to be almost impossible to cultivate and was therefore collected only in the rainforest. Schultes noted that indigenous people were able to distinguish nine varieties of *yoco*, each of which had different qualities in terms of taste and or impact (Schultes, 1988, p. 397). Most indigenous households kept a ready supply of *yoco* stems, and the Indians preferred never to depart for the forest without carrying the stem for making a stimulating tea (Schultes, 1942, pp. 321-322). *Yoco* was so important to that they would move their village to another location when local supplies had been depleted (Schultes, 1942, p.322).

[Caption] *Yoco* stem

The plant served as a dietary staple of indigenous groups living in western Caquetá and Putumayo in Colombia and in adjacent Ecuador and Peru (Schultes, 1942, pp. 314-321).

View Map of the Extent of Use of *Yoco* in the Northwest Amazon

[Graphic] *Yoco* map

Yoco had been in use for hundreds if not thousands of years and was mentioned repeatedly in early Spanish chronicles. Early botanists had described the plant has a forest liana in the genus *Paullinia*, but the lack of fruits and flowers in early specimens meant the species could not be adequately described nor identified (Schultes, 1942, p. 309). The precise botanical identity of the plant remained a mystery that Schultes was eager to solve.

[Caption] A Kofán preparing yoco

Schultes described his quest for *yoco* in his field notebook:

> Many a liana had I cut down, only to find it flowerless and, in this condition, without value for taxonomic study. All the Indians of the upper Putumayo River knew of my quest. In June, when the rivers rose, flooding all the forests, I decided to end my trip and return to Bogotá. My legs were covered with ulcers from walking through the swamps and … when I arrived at the Colombian naval base on that river, the clean bunk which the commander of one of the river gunboats offered me pending the arrival of an aeroplane felt regal.
>
> Three days before the arrival of the plane, an Indian came paddling down with the news that he had located a flowering *yoco*. He assured me it was only four hours' walk through the forest. I hesitated. The pains in my legs, I confess, nearly won out. But, finally, I agreed to go, half expecting to find just one more flowerless liana.
>
> It was a terrible pilgrimage of six or seven hours on foot, most of the time knee-deep in water and mud. On arrival, I saw an enormous liana, the tiny flowers of which were strewn far and wide on the forest floor. We had to fell seven trees before the treasure would fall into our laps…that collection not only enabled us to identify an interesting drug but provided me with a species new to science (Schultes, 1952, p. 58).

Finally, Schultes had found the botanical treasure he had been looking for throughout his descent of the Putumayo. He collected a century set of *yoco* (100 specimens) to be sent out to various herbaria; the species was later described as *Paullinia yoco*. Exhausted, Schultes boarded a military plane bound for Bogotá.

The Amazonian Travels of Richard Evans Schultes

Chapter I. Sacred Plants of the Putumayo

By Brian Hettler & Mark Plotkin

April 8th, 2019

The preceding text is from the interactive map available at the following link:

banrepcultural.org/schultes

This work is based on the writings, photographs and ethnobotanical records of Richard Evans Schultes. All photographs are property of the Schultes family unless otherwise indicated.

The Amazon Conservation Team would like to give a special thanks to Dr. Wade Davis, whose book One River was essential in reconstructing details of Schultes' travels for this map. For more information on Dr. Schultes, we highly recommend *One River* and *Lost Amazon: The Photographic Journey of Richard Evans Schultes* by Dr. Davis.

Bibliography

Bisset, Norman G. “Curare - Botany, Chemistry, and Pharmacology.” *Acta Amazonica*, vol. 18, no. suppl. 1-2, 1988, p. 257.

Bolton, Ralph. “Andean Coca Chewing: A Metabolic Perspective.” *American Anthropologist*, vol. 78, no. 3, 1976, pp. 630–634.

Bonilla, Víctor Daniel. *Servants of God or Masters of Men? The Story of a Capuchin Mission in Amazonia*. Penguin, 1972.

Bristol, Melvin L. “NOTES ON THE SPECIES OF TREE DATURAS.” *Botanical Museum Leaflets, Harvard University*, vol. 21, no. 8, 1966, pp. 229–248.

Bristol, Melvin L. “THE PSYCHOTROPIC BANISTERIOPSIS AMONG THE SIBUNDOY OF COLOMBIA.” *Botanical Museum Leaflets, Harvard University*, vol. 21, no. 5, 1966, pp. 113–140.

Bristol, Melvin Lee. *Sibundoy Ethnobotany*, 1965.

Bristol, Melvin L. “TREE DATURA DRUGS OF THE COLOMBIAN SIBUNDOY.” *Botanical Museum Leaflets, Harvard University*, vol. 22, no. 5, 1969, pp. 165–227.

Davis, Wade., et al. *The Lost Amazon: the Photographic Journey of Richard Evans Schultes*. Chronicle Books, 2004.

Davis, Wade. *One River*. Simon and Schuster, 1997.

Hardenburg, et al. *The Putumayo, the Devil's Paradise; Travels in the Peruvian Amazon Region and an Account of the Atrocities Committed upon the Indians Therein*. T. F. Unwin, 1912.

Kreig, Margaret. *Green Medicine: the Search for Plants That Heal*. Rand McNally, 1964.

McDowell, J. Holmes. *Sayings of the Ancestors: The Spiritual Life of the Sibundoy Indians*. Lexington, Ky.: University of Kentucky Press, 1994.

McDowell, J. Holmes. *So Wise were our Elders: mythic narratives from the Kamsá*. Lexington, Ky.: University of Kentucky Press, 1994.

Plowman, Timothy. “Ethnobotany of Coca (Erythroxylum spp., Erythroxylaceae).” *Ethnobotany in the Neotropics: Proceedings (Advances in Economic Botany)*, Bronx, N.Y., U.S.A: New York Botanical Garden, vol. 1, 1984, pp. 62-11.

Preuss, Konrad Theodore. *Religión y mitología De Los Uitotos: recopilación De Textos y Observaciones Efectuada En Una Tribu indígena De Colombia, Suramérica*. Colcultura, 1994.

Schultes, Richard Evans. “Aganisia Cyanea: Jewel of the Jungle.” *American Orchid Society Bulletin,* vol. 30, 1961, pp. 558-562.

Schultes, Richard. “Burning the Library of Amazonia.” *Sciences*, vol. 34, no. 2, 1994, p. 24.

Schultes, Richard Evans. “COCA IN THE NORTHWEST AMAZON.” *Botanical Museum Leaflets, Harvard University*, vol. 28, no. 1, 1980, pp. 47–60.

Schultes, Richard Evans. “Ethnopharmacological Conservation: A Key to Progress in Medicine.” *Acta Amazonica*, vol. 18, no. suppl. 1-2, 1988, pp. 393–406.

Schultes, Richard Evans. *Field Notebook: Colombia, 1941*, 1941.

Schultes, Richard Evans. *Field Notebook: Colombia, 1942 December-January 1943*, 1943.

Schultes, Richard Evans. *Field Notebook: Colombia, 1942 February-April*, 1942.

Schultes, Richard Evans. *Field Notebook: Igara Paraná River, Colombia, 1942*, 1942.

Schultes, et al. *The Healing Forest: Medicinal and Toxic Plants of the Northwest Amazonia*. Dioscorides Press, 1990.

Schultes, Richard Evans. “THE IDENTITY OF THE MALPIGHIACEOUS NARCOTICS OF SOUTH AMERICA.” *Botanical Museum Leaflets, Harvard University*, vol. 18, no. 1, 1957, pp. 1–56.

Schultes, Richard Evans. “Indícios Da Riqueza Etnofarmacológica Do Noroeste Da Amazônia” *Acta Amazonica*, vol. 9, no. 1, 1979, pp. 209–215.

Schultes, Richard Evans. “A New Hallucinogen from Andean Colombia: Iochroma Fuchsioides.” *Journal of Psychedelic Drugs*, vol. 9, no. 1, 1977, pp. 45–49.

Schultes, Richard Evans. “A New Narcotic Genus from the Amazon Slope of the Colombian Andes.” *Botanical Museum Leaflets, Harvard University*, vol. 17, no. 1, 1955, pp. 1–11.

Schultes, Richard Evans. “PLANTAE COLOMBIANAE II.” *Botanical Museum Leaflets, Harvard University*, vol. 10, no. 10, 1942, pp. 301–324.

Schultes, Richard Evans, et al. “DE PLANTIS TOXICARIIS E MUNDO NOVO TROPICALE COMMENTATIONES III: PHYTOCHEMICAL EXAMINATION OF SPRUCE'S ORIGINAL COLLECTION OF BANISTERIOPSIS CAAPI.” *Botanical Museum Leaflets, Harvard University*, vol. 22, no. 4, 1969, pp. 121–132.

Schultes, Richard Evans. “DE PLANTIS TOXICARIIS E MUNDO NOVO TROPICALE COMMENTATIONES IV.” *Botanical Museum Leaflets, Harvard University*, vol. 22, no. 4, 1969, pp. 133–164.

Schultes, Richard Evans. “DE PLANTIS TOXICARIIS E MUNDO NOVO TROPICALE COMMENTATIONES X: NEW DATA ON THE MALPIGHIACEOUS NARCOTICS OF SOUTH AMERICA.” *Botanical Museum Leaflets, Harvard University*, vol. 23, no. 3, 1972, pp. 137–147.

Schultes, Richard Evans. “DE PLANTIS TOXICARIIS E MUNDO NOVO TROPICALE COMMENTATIONES XV: Desfontainia: a New Andean Hallucinogen.” *Botanical Museum Leaflets, Harvard University*, vol. 25, no. 3, 1977, pp. 99–104.

Schultes, Richard Evans, et al. “DE PLANTIS TOXICARIIS E MUNDO NOVO TROPICALE COMMENTATIONES XVII: Virola as an Oral Hallucinogen among the Boras of Peru.” *Botanical Museum Leaflets, Harvard University*, vol. 25, no. 9, 1977, pp. 259–272.

Schultes, Richard Evans. “DE PLANTIS TOXICARIIS E MUNDO NOVO TROPICALE COMMENTATIONES XXIII: ETHNOPHARMACOLOGICAL NOTES FROM NORTHERN SOUTH AMERICA.” *Botanical Museum Leaflets, Harvard University*, vol. 26, no. 6, 1978, pp. 225–236.

Schultes, Richard Evans. “DE PLANTIS TOXICARIIS E MUNDO NOVO TROPICALE COMMENTATIONES XXVI: ETHNOPHARMACOLOGICAL NOTES ON THE FLORA OF NORTHWESTERN SOUTH AMERICA.” *Botanical Museum Leaflets, Harvard University*, vol. 28, no. 1, 1980, pp. 1–45.

Schultes, Richard Evans. *Plants of the Gods*. Healing Arts Press, 2001.

Schultes, Richard Evans. *Vine of the Soul: Medicine Men, Their Plants and Rituals*. Synergetic Press, 1992.

Schultes, Richard Evans. *Where the Gods Reign: Plants and Peoples of the Colombian Amazon*. Synergetic Press, 1988.

Schultes, Richard Evans, and Alec Bright. “A NATIVE DRAWING OF AN HALLUCINOGENIC PLANT FROM COLOMBIA.” *Botanical Museum Leaflets, Harvard University*, vol. 25, no. 6, 1977, pp. 151–159.

Seifard, Frank, et al. “Reducing language to rhythm: Amazonian Bora drummed language exploits speech rhythm for long-distance communication.” *Royal Society Open Science*, vol. 5 no. 4, 2018.

Serna Torroba, et al. *Álbum De Fotografías: Viaje De La Comisión Consular Al Río Putumayo y Afluentes: Agosto a Octubre De 1912*. Primera edición. ed., Programa De Cooperación Hispano Peruano : Centro Amazónico De Antropología y Aplicación Práctica ; Grupo Internacional De Trabajo Sobre Asuntos Indígenas ; Tierra Nueva ; Agencia Española De Cooperación Internacional Para El Desarrollo, 2013.

Williams, Louis O. “NOTAS SOBRE ALGUNAS ORQUIDACEAS DE COLOMBIA.” *Caldasia*, vol. 1, no. 3, 1941, pp. 13–16.