THE pharmacological possibilities of the New World flora have as yet been investigated only superficially, but already there is ample suggestion of a wealth of still untapped material. Certain of the drugs, by reason of their action as cerebral excitants, have been extensively employed by the native population, and a halo of folklore and superstition has evolved around them. Some of them—such as mescal (peyotl)—have been regarded as sacred, and incorporated within an elaborate cult.* Ayahuasca and jagé are two other drugs of this class, belonging in addition to the category of metagnomigenic agents, or plantes divinatoires, in that they are used in the rites of augury. Both drugs are widely used among the South Americans, and white men as well as Indians are numbered among the addicts. Our knowledge of these drugs is imperfect, one reason being that the two are of somewhat similar action; moreover, they have the same geographical distribution, and are often used in combination. Our first knowledge is due to the explorers of last century, and in particular to Spruce. Since his original mention of ayahuasca no other English study has been made, most of our information being based on the work of Bayon, Villalba, Cardenas, and others. Warcollier, in 1921, was the first to acquaint the French with these drugs in his book "La Télétaphie," since when Rouhier and Perrot and Raymond-Hamat have contributed much. In Germany, Lewin, the author of "Phantas­tica," has recorded studies on these drugs.

THE PHARMACOLOGY OF AYAHUASCA.

Ayahuasca, or deadman's vine (syn.: natéma, nepé, caapi, cadasia), is a flowering shrub native to the equatorial forests of South America. We owe the first record of its existence to the manuscript notes of Spruce, made over the period 1852-57. Spruce identified the plant as belonging to the order Mal-
pighiaceae, and he named it *Banisteria caapi*. Ayahuasca grows in the hinterland of Brazil, Venezuela, Columbia, Ecuador, and Peru, on the eastern slopes of the Andes, in the basin of the Uaupés, Negro, Yapura, Ichanna, and Orinoco rivers. In these regions an elaborate ritual and tradition have developed. Amongst the tribes south of the Japura, ayahuasca is used by the initiated medicine-men only.

The lower part of the stem is chosen, the drug being taken usually in the form of an infusion; in some regions, however, the plant is also chewed. The mode of usage differs in minor respects from tribe to tribe; everywhere it is regarded with veneration, and its use is usually confined to adult males. Amongst the Zaparos it is forbidden to all except the magicians or medicine-men. These employ the drug as an aid to divination, and in this respect the cult of ayahuasca is intimately associated with that of jagé; certain tribes, indeed, take the two drugs simultaneously.

Spruce’s description of the ceremonies attendant upon the ayahuasca orgies may be quoted verbatim:

“We reached the malloca (village-house) at nightfall, just as the bututos or sacred trumpets began to boom lugubriously within the margin of the forest. . . . At that sound every female outside makes a rush into the house before the bututos emerge in the open, for to merely see one of them would be to her a sentence of death. We found about three hundred people assembled, and the dances at once commenced. . . . In the course of the night the young men partook of caapi five or six times in the intervals between the dances, but only a few of them at a time, and very few of them drank of it twice. The cup-bearer—who must be a man, for no woman can touch or taste caapi—starts at a short run from the opposite end of the house with a small calabash containing about a teacupful of caapi in each hand, muttering “Mo-mo-mo-mo-mo” as he runs, and gradually sinking down until at last his chin nearly touches his knees, when he reaches out one of his cups to the man who stands ready to receive it, and when that is drunk off, then the other cup. In two minutes or less after drinking it its effects begin to be apparent. The Indian turns deadly pale, trembles in every limb, and horror is in his aspect. Suddenly contrary symptoms succeed: he bursts into a perspiration, and seems possessed with reckless fury, seizes whatever arms are at hand . . . and rushes to the doorway, where he inflicts violent blows on the ground or the doorposts, calling out all the while: ‘Thus would I do to mine enemy . . . were he here!’
about ten minutes the excitement has passed off, and the Indian grows calm, but appears exhausted. Were he at home in his hut he would sleep off the remaining fumes, but now he must shake off his drowsiness by renewing the dance.

The pharmacological action of ayahuasca is that of a cerebral depressant with a preliminary phase of excitement. There is possibly also an aphrodisiac action. Shortly after taking the drug the subject complains of vertigo and of flashes of light and splashes of colour before the eyes. Next appears a stage of delirious excitement in which the Indian rushes here and there uttering piercing cries. During this period visual hallucinations are common, comprising "beautiful landscapes, cities, towers, animals . . . shining circles of light, many-coloured butterflies." There may be a feeling of bodily dissociation. Later, the subject staggers in his gait and experiences an overcoming drowsiness. He breaks into a sweat, becomes pale and tremulous, and complains of stiffness of the jaw. The heart's action becomes feebler, and respiration is impeded. Presently he succumbs to a sleep of exhaustion, interrupted by dreams of various kinds. On waking, intense headache is complained of.

Within the last year, ayahuasca has been introduced into Europe. Wolfers and Rumpf have isolated an alkaloid "banisterin," with the formula $C_{13}H_{12}ON_2$. The pharmacological properties are those of a motor excitant possessing a marked power of slowing the heart. According to Wolfers and Rumpf, banisterin is chemically identical with "harmin" —the active principle of Peganum harmala, a plant which grows on the Russian steppes. The seeds of this are used in the East as a stupefiant and narcotic. Today, banisterin is being tried as a therapeutic measure in cases of post-encephalitic Parkinsonism. Although encouraging reports have been published by Beringer, the drug is apparently still in the experimental stage and the manufacturers are unwilling to release supplies for use in this country.

THE PHARMACOLOGY OF JAGÉ.

Jagé (syn.: yagé, pildé, caapi-piníma) is the native term for a climbing plant or vine, which is botanically very similar to, if not identical with, the Hamadictyon amazonicum. In habitat it corresponds closely with ayahuasca. The drug is employed in the form of a decoction which is yellowish-red in colour and —like quinine—there is a distinct blue tint when viewed from certain angles.

The pharmacological action resembles that of ayahuasca and
also that of cocaine (Perrot and Raymond-Hamat). Jagé
contains two alkaloids; one, present in larger quantity, is a
substance with the formula $C_{14}H_8N_3O$. Cardenas, who first
isolated it, named it telepathene; two years later it was
independently discovered by Villalba, who named it yageine.
A second alkaloid—yagenine—was also identified. About
fifteen minutes after taking the drug blue splashes appear
before the eyes, succeeded in some cases by an hemianopia.
Various dysaesthesiae are complained of—epigastric warmth,
coldness of the spine, dry throat, tinnitus, heaviness of the legs.
At times, however, there is a feeling of levitation. A sense of
euphoria now steals over the patient, accompanied by mental
exaltation, so that there is an apparent quickening of the intel­
lectual and special sense activities. One observer read a book,
and was astonished at the ease with which he assimilated the
subject-matter. Bayon has called attention to a blue vision as
a symptom of this stage. Next there supervenes a period of
hallucinatory mania, which merges gradually into a delirious
sleep. The patient experiences vivid and extraordinary visious,
pleasant at first, but later grotesque and terrifying. The subject
imagines himself travelling in a strange and gorgeous country:
“...The imagination of the most ardent poet could not conceive
nor express in words the dreams in all their magnificence. ...;
I saw an enormous green serpent in threatening attitude, then
thickets, rivers, cascades, birds, savage beasts, immense swamps.”
Lilliputian and brobdingnagian hallucinations and curious haptic
delusions may occur: “... I was changed into a giant. My
head was above the highest buildings, and I looked down upon
the crowd of pygmies. Then little men and women came and
danced about in the dark. ... I was being chased by a little
figure with an enormous head.”
The fury of jagé intoxication is most dramatic in the Indian.
He believes himself changed into a wild animal, a tiger, cobra,
tapir, etc., and rushing into the forest he runs amok, uttering
loud cries, and attacking everyone who crosses his path. This
period of delirium is succeeded by profound sleep lasting many
hours.

Most interest, however, centres in the alleged metagnomigenic
properties of the plant, wherein lies the importance of the drug
to the devotee. Bayon was the first to emphasize these particu­
lar properties; according to him, the Zaparos take this plant on
important occasions, as, for example, when they wish to know the
whereabouts of the enemy, the location of ambushes, the
approach of strangers, the most propitious hunting areas, or the
most suitable partner in marriage. Through the medium of
jagé the uncultured Indian is said to be able to give a remarkable description of European cities and dwellings—facts concerning which he cannot have had any previous knowledge. To test the telepathic action, Bayon persuaded the Portuguese commandant of the local forces, Colonel Moralès, to experiment on himself. After taking sixteen drops, he dreamed that his father was dead and his sister ill. A month later a courier arrived with letters, informing Moralès that his father had died and that his sister was recovering from a serious illness. Although other similar evidence is on record, the considered opinion on the so-called telepathic properties of the plant is sceptical, and attributes them rather to an imagination tropicale!

Apart from this chief use, jagé is also employed by the Indians as a cure for beri-beri.