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The Hunt Institute for Botanical Documentation, a research division of Carnegie Mellon University, specializes in the history of botany and all aspects of plant science and serves the international scientific community through research and documentation. To this end, the Institute acquires and maintains authoritative collections of books, plant images, manuscripts, portraits and data files, and provides publications and other modes of information service. The Institute meets the reference needs of botanists, biologists, historians, conservationists, librarians, bibliographers and the public at large, especially those concerned with any aspect of the North American flora.

Hunt Institute was dedicated in 1961 as the Rachel McMasters Miller Hunt Botanical Library, an international center for bibliographical research and service in the interests of botany and horticulture, as well as a center for the study of all aspects of the history of the plant sciences. By 1971 the Library's activities had so diversified that the name was changed to Hunt Institute for Botanical Documentation. Growth in collections and research projects led to the establishment of four programmatic departments: Archives, Art, Bibliography and the Library.

REVUE
DE
MYCOLOGIE

Publication paraissant 5 fois par an

publiée et dirigée par

ROGER HEIM

Membre de l'Institut Académie des Sciences

Directeur du Muséum National



LABORATOIRE
DE CRYPTOLOGIE
DU MUSÉUM NATIONAL D'HISTOIRE NATURELLE
12, RUE DE BUFFON, PARIS - VI.

Procyon (San Cristobal
Log Casas)

Prof. Francisco
Santiago Rosales

Thinks that all contem-
porary maya students have
misinterpreted the maya
language. This includes
Moley and Thompson.
This is the proper trans-
lation of Procyon.

TEONAHUICATL

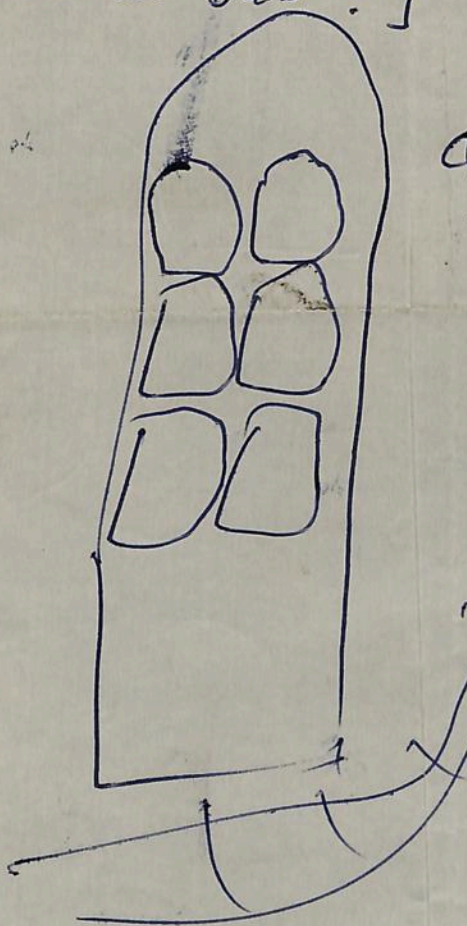
ESPIRITU

DIOS

CASA

casa de Dios espiritual

= [carne de Dios ?]



QUIRIGUA

EXIDIA
MAYA

Werner Brosh.

sas y largas. Hay otros de éstos que tienen las hojas redondas, pardillas y verdes, son medianas, no ahijan, son bajuelos, la fruta de éstos es redonda como *tzapotes*. Hay otros árboles de éstos, cuyas tunas son moradas obscuras, y redondas como *tzapotes*; hay otros cuyas tunas son blancas, que tiene el hollejo grueso y acedo; pero el meollo es dulce. Hay otros árboles de éstos que son muy espinosos, pues tienen las espinas agudas y largas; las tunas agrias y blancas, tienen los hollejos acedos y gruesos que hacen dentera, cómense crudas, y también cocidas el meollo tiénenle pequeño y dulce.

Hay otros árboles de éstos silvestres, que se llaman *tenopalli*; se crían en los riscos, en las montañas y cabañas; el fruto que en ellos se hace, se llama *zacanochtli*, tienen los hollejos agrios, son pequeñas estas tunillas, cómense cocidas. Hay otros árboles de estos silvestres, cuya fruta se llama *azcanochtli*, son de muchos colores, unas blancas, otras coloradas, y otras moradas, son muy dulces, y redondillas, tienen los granillos menudos.

Hay otros árboles de éstos, cuyas tunas tienen los hollejos muy gruesos; el nombre propio de tuna es *nochtli*.

9º—De las raíces comestibles

Las raíces del árbol que se llama *quauhcamotli*, son comestibles como está dicho. Hay otras raíces buenas de comer, que se hacen como nabos de la tierra, a las cuales llaman *camotli*; estas batatas de esta tierra, cómense cocidas, crudas y asadas.

Hay otras raíces que se comen crudas, a las cuales llaman *wicama*, son blancas, dulces, y matan mucho la sed. También hay otras de éstas que se llaman

cimatli, cómense cocidas, pues si se toman crudas hacen daño, son de suyo blancas, y cuando se cuecen hácese amarillas. Hay otras que se comen crudas y cocidas, que llaman *tocimatli*, son redondillas y blancas, y después de cocidas son amarillas. Hay otra raíz que es como *wicama*, llámase *cacapon*; otras hay que también se comen, se llaman *cacomitli*, tómanse cocidas, tienen cáscaras y hojas casi como de cebollas, el meollo es blanco y comestible, tienen sabor de castañas, también el de las raíces de las espadañas suele comerse cocido y crudo. Hay otras raíces que llaman *atzatzamolli* que también las comen; hácese en el agua dulce, y son como fruto de unas yerbas que se crían en el agua; tienen las hojas anchas como plato que hacen unas rosas blancas. Hay otra raíz que se llama *cacatextli*, es redonda y pequeña como un grano de maíz, cómese cocida y es sabrosa. Hay otra que se llama *cuecuesqui*, nace en tierra caliente, cómenla cocida; otra hay de una yerba que se llama *xaltomatli*, es comestible cruda, cocida y asada, es agridulce.

CAPITULO VII

En que se trata de otras yerbas

1º—De ciertas yerbas que emborrachan

Hay una yerba que se llama *coatli woxouhqui*; y cría una semilla que se dice *ololiuhqui*, esta semilla emborracha y enloquece, dánla por bebedizos para hacer daño a los que quieren mal, y los que la comen paréceles que ven visiones y cosas espantables; dánla a comer o a beber los hechiceros que aborrecen a algunos para dañarlos. Esta yerba es medicinal, y su

semilla úsase para la gota moliéndola y poniéndola en el lugar donde está. Hay otra yerba como tunas de tierra, se llama *peyotl*, es blanca, hácese hacia la parte del Norte, los que la comen o beben, ven visiones espantosas o irrisibles; dura esta borrachera dos o tres días y después se quita; es común manjar de los Chichimecas, pues los mantiene y da ánimo para pelear y no tener miedo, ni sed ni hambre, y dicen que los guarda de todo peligro.

Hay otra yerba que se llama *tlápatl*; es como mata, cría unas cabezuelas sin espinas como limones, tiene la cáscara verde, las hojas anchuelas, las flores blancas, la semilla negra y hedionda, quita la gana de comer a los que la toman, emborracha y enloquece perpetuamente. Esta semilla es buena contra la gota, untando con ella donde está el dolor; también el olor de ella es dañoso como la misma semilla.

Hay otras yerbas de éstas que se llaman *tzintzin-tlapatl*, llámase así porque tienen las cabezuelas espinosas, y producen las mismas operaciones de la de arriba dicha. Hay otra que se dice *mixitl*, es pequeña y parrada, verde, y tiene semillas; es buena contra la gota poniéndola molida donde está el dolor; no se come ni se bebe, pues provoca a vómito, aprieta la garganta y la lengua, y si se come o bebe no da mal sabor ni gusto; pero luego quita todas las fuerzas del cuerpo, pues si tiene abiertos los ojos el que la toma no los puede más cerrar, y si los tiene cerrados no los puede más abrir, si está enhiesto no se puede más doblar ni bajar, y pierde la habla; el vino es contra esta yerba.

Hay unos honguillos en esta tierra que se llaman *teonanacatl*, críanse debajo del heno en los campos o páramos; son redondos tienen el pie altillo, delgado y redondo, comidos son de mal sabor, dañan la garganta y emborrachan; son medicinales para las calentu-

ras y contra la gota; hanse de comer dos o tres no más; los que los comen ven visiones y sienten bascas en el corazón, a los que comen muchos de ellos provocan a lujuria, y aunque sean pocos.

Hay otra yerba ponzoñosa que se llama *tochtetepo*, tiene las hojas menudas como las del árbol del Perú y las raíces blancas, y si alguno la come o bebe, luego muere porque le hace pedazos las tripas, y si esta yerba la echan en el pulcre o en el agua, aunque la saquen luego, deja la ponzoña y muere el que la bebe; esto se dice de los hechiceros que enhechizan con esta yerba. Hay otra que se llama *atlepatli*, críanse en las orillas de la agua y cerca de las ciénegas, es mortal: el que la come o bebe de los animales luego muere, hace ampollas como el fuego si la ponen en la carne, es contra la lepra que se llama *xiotl*.

Hay una yerba que se llama *aquiztli*, tiene las ramas largas y delgadas, es como mata, y tiene esta propiedad, que si alguno la mea o escupe, luego se le hincha la cara y todo el cuerpo, y si toca a éste, luego hace ampollas; es contra las viruelas, bebido el zumo de ellas échalas fuera. Hay otra yerba que se llama *tenxoxoli*, tiene las hojas como espadañas delgadillas, la raíz de esta yerba provoca a vómito y también hace salir sangre.

Hay otra yerba que se llama *quimichpatli*, es como mata, es mortal; esta yerba mata a los ratones mezclada con alguna comida que ellos acostumbran; puesta esta yerba en las llagas podridas, come toda la podredumbre de ellas, y descubre la carne viva.

2º—De las setas

Las setas (hongos o manacatl) hacen *genus campestre* en los montes, son buenas de comer; cuécen-

se para esto, y si están crudas o mal cocidas provocan a vómito o cámaras y matan; para remedio de esta corrupción que causan las setas, es bueno el unguento que se llama *axin* echado por tristel o lavativa. Hay unas de estas setas que se llaman *tzontecomananatl*, son grandes y redondas; hay otras que nacen juntas en un pie, unas altas y otras bajas.

Hay otras setas que son anchas y redondas a manera de platos; todas éstas son comestibles, pero han de ser muy cocidas. Hay otras que son blancas y redondas; no son recias de cocer, presto se cuecen y también se asan en comales, y son muy sabrosas. Hay otras que son altas de pie y lo tienen delgado, son redondas y llanas, cuécense de presto y son muy buenas, hácnense en los páramos cuando comienzan las aguas; hay otras que son buenas de comer, asadas y cocidas.

Hay una raíz que se llama *cimatl*, la yerba de esta raíz se llama *quauecoc* y también *cimatl*; esta yerba hace unas habas que son como frijoles grandes y son éstos, pero silvestres. Esta yerba echa las ramas largas y parradas sobre la tierra; la raíz de ella si se come cruda o mal cocida, provoca a vómito o a cámaras y mata; contra este daño es el unguento amarillo que se llama *axin* echado por tristel. Para comer estas raíces es menester cocerlas dos días, y que hierban consecutivamente.

Hay una yerba que se llama *amolli*, tiene las hojas como espadañas chicas, y el tallo blanco, la raíz de esta yerba es como jabón para lavar la ropa, y con las delgadas lavan la cabeza, y también son como marga para emborrachar los peces, y si alguno bebe de esta raíz, o muere o recibe mucho daño, y si alguno ha bebido alguna sanguijuela y la tiene en el cuerpo, bebiendo el agua de esta raíz la mata.

Hay una raíz que se llama *tecpatl*, es pegajosa

como liga, y de la manera de la raíz del jabón, es medicinal para las quebraduras de huesos, y también usan de ella como liga para tomar aves; untan con ella pajas largas, y pónenlas donde comen o beben, y con esto las toman. También llaman a esta liga *tlacali* porque es muy pegajosa, y también *tecpaolotl*. Hay otra yerba que se llama *yiamolli*, en ella se hacen unas manzanitas negras y son muy amargas, son medicina para la caspa de la cabeza.

3º—De las yerbas comestibles cocidas

Una de las yerbas que se comen cocidas se llama *huauhquilitl*, que son bledos, es muy verde, tiene las ramas delgadas y altas, y las hojas anchas, los tallos de esta yerba se llaman *huauhtli*, la semilla se dice de la misma manera; esta yerba se cuece con sal para comer, sabe a cenizos; exprímese del agua en que se cuece para comerse; hácnense tamales de ella, los cuales se llaman *quiltamalli*, y también se hacen tortillas, es muy común y cómenla mucho, es como los cenizos de España. Otra yerba se come, cocida llámase *quiltomilli*, tiene las hojas anchuelas; cuando es pequeña esta yerba es comestible, y cuando ya es grande llámase *petzicatl*, cuécese con salitre (es decir, *tequiquiltl*), exprímese del agua para comerla; esta yerba cría una semilla negra que se llama *pitziatl*. Hay otra yerba que se come también cocida que se llama *itzmiquilitl*, es parda, tiene ramas grandes, las hojas redondas y llanas.

Las flores de las calabazas llaman *ayoxochiquilitl*; cómenlas también cocidas, son muy amarillas y espinosas, mónanlas para cocer quitando el hollejuelo de encima; los grumos o las extremidades de las ramas de la calabaza, se comen también cocidas. Hay

A Simple Field Test for Alkaloid-Containing Plants¹

ROBERT F. RAFFAUF

In recent years, the interests of the phytochemist, the chemotaxonomist and the medicinal chemist have served to broaden the search for new alkaloid-bearing plants. Often this search must be conducted in areas otherwise poorly explored and generally far removed from laboratories well equipped for routine plant analysis. There exists, therefore, a real need for a simple direct field test by which alkaloids can be detected in plants under the most primitive conditions with rapidity, reliability, and a minimum of equipment.

A potential method has been known for a number of years. Munier and Macheboeuf (1) had modified the classical Dragendorff reagent for spot-test techniques. A recent example of the use of this modification in plant screening is given by Reichstein's survey of a number of plants of the Apocynaceae (2).

However, a few years earlier Coitinho-Bulhões reported that a more sensitive reagent could be prepared by dilution of the Dragendorff reagent with the Munier-Macheboeuf modification in proportions of 1:2. After a little experience, we preferred a ratio of 1:3. For convenience, the preparation of the reagent as used in our Laboratories is given in terms of the original constituents.

A solution of 0.85 g. of bismuth subnitrate in 10 ml. of glacial acetic acid and 40 ml. of distilled water is mixed with a solution of 8 g. of potassium iodide in 20 ml. of distilled water. One volume of the mixture, stored in brown bottles, is diluted before use with 2.3 volumes of a mixture of 20 ml. of glacial acetic acid and 100 ml. of distilled water. This reagent is stable for several weeks when protected from light—a decided convenience in field work.

In practice, a small drop (0.025 ml.) of an alkaloidal solution is spotted onto filter paper (Whatman No. 1 or equivalent), al-

lowed to dry, and treated with a droplet of the reagent. A red spot on a yellow ground indicates the presence of alkaloids. The depth of the color is roughly proportional to the concentration of the alkaloid in the test drop. A standard solution containing 0.4 mg./ml. of yohimbine in 5% acetic acid gave a detectable positive test by this procedure.

The method usually used in our Laboratories* for alkaloid assay involves the extraction of 20 g. of dried, ground plant material with hot ethanol. The residue remaining after removal of the alcohol is partitioned between 5% aqueous ammonia and ether and, by suitable subsequent manipulation, tests for both quaternary and non-quaternary bases are made with Mayer's reagent. Quantitative estimations are based on a visual comparison of precipitates produced by equal volumes of standard alkaloid solutions ranging from 0.4 mg./ml. (+) to >4.0 mg./ml. (+++++) in concentration.

To evaluate the spot-test technique, 100 plants, chosen entirely at random, were analyzed by this method. Each of the samples was then re-assayed as follows: Two grams of the dried powdered plant material in a test tube were covered with ethanol, 2-3 drops of ammonia solution were added, the test tube was stoppered and the mixture was allowed to digest overnight at room temperature. It was then filtered directly into one-half of a 6 cm. Petri dish, the marc was washed with alcohol and the filtrates were evaporated to dryness over a warm water bath. The resulting residue was triturated with 0.5 ml. of 5% aqueous acetic acid which was then spotted onto a 2 x 2 cm. square of Whatman No. 1 filter paper. After drying, the spot was treated with a small drop (0.2 ml.) of the test reagent. The following results were obtained:

Estimation	Spot-Test	Lab. Test
Positive (+ or better)	5	7
Negative	83	85
Doubtful or traces	12	8

¹ Contribution from Smith Kline and French Laboratories, Philadelphia 1, Pa.

Received for publication June 25, 1962.

*This method was developed by Dr. J. H. Pachter and will be reported in detail elsewhere.

The five clearly positive results with the spot-test technique were positive by the laboratory test; two of the positives noted in the latter were judged as "weak," i.e. one-plus, and had been recorded by the spot-test method as "doubtful." One of the doubtful spot tests was recorded as a trace and nine as negative tests by the laboratory procedure. Seven plants recorded as "trace" by the laboratory procedure (i.e., less than 0.01% alkaloids) were missed by the spot-test technique.

We concluded, therefore, that the method was accurate enough to detect alkaloids in dried plant material provided they were present in a concentration of over 0.01% (dry weight basis). This represents a low practical limit for consideration of a plant for extraction, isolation and study of its alkaloids. It seemed reasonable to suppose that a drop of the sap expressible from freshly cut surfaces of leaf petioles, twigs, bark, fruit and many seeds of alkaloid-bearing plants would give a test by this method sufficiently reliable for field work.

During a recent collecting trip, 100 species were tested in this way and the results recorded in the field notes accompanying the herbarium material. At the same time, samples of the same plants were taken and their alkaloid content was confirmed by a simple adaptation of the laboratory method. Approximately 10 g. of fresh plant material (root, bark, leaves and twigs, etc., were tested separately) was finely chopped with a pocket knife and allowed to digest overnight at room temperature with ethyl alcohol containing a few drops of ammonium hydroxide. The alcohol and washings were then decanted into one half of a 10 cm. Petri dish and allowed to evaporate to dryness. The residual film was triturated with ca. 1 ml. of 5% acetic acid and the resulting solution was saturated with solid sodium chloride. A small amount of filter aid was added and the mixture was filtered, with slight pressure, through a plug of absorbent cotton. The clear filtrate was then tested with Mayer's reagent. A comparison of the results obtained by the two methods follows:

Estimation	Spot-test	Confirmatory Test
Positive	58	47
Negative	5	32
Doubtful or trace	37	21

The eleven "false positives" occurring in

the 58 original spot-tests were found among plants occurring in latex-bearing families, e.g., Apocynaceae, Asclepiadaceae, Moraceae. In this series a large number of "doubtful" field tests were recorded because of error due to colored plant juices or those easily oxidized on exposure to air to reddish or brown materials which interfere with visual evaluation of the spots. Twenty-one of these, by the confirmatory test, contained alkaloids in trace amounts only and thus would not have been suitable candidates for large-scale collection. No clearly positive plants were missed by the field assay.

The equipment necessary for the spot test consists of no more than a small dropping bottle capable of delivering a drop of ca. 0.025 ml. of the reagent and a box of filter paper squares or strips. The method described for the confirmatory assay of fresh plant material can also be used in the field. It requires only very commonly available reagents such as alcohol, ammonia, acetic acid and salt, a few Petri dishes and containers for the digestion of the plant material with alcohol. For this purpose, we have used small plastic vials with friction tops of approximately 30 ml. capacity. Reagents sufficient for several weeks' testing were carried in polyethylene bottles of 15 ml. capacity having an orifice capable of delivering small drops. One of these bottles served as a very convenient pressure filter.

Obviously, neither the spot test nor the test using fresh plant material distinguishes between quaternary and non-quaternary bases. While it is true that these two types are most often associated in the same plant, we have assayed a large number of plants in which the only bases determined were those not extractable by ether from aqueous ammonia solution. Quaternary salts (e.g., aspidospermine methiodide, magnoflorine iodide) give positive tests, as do aspidospermine N-oxide, colchicine, β -phenyl ethyl amines, arecoline, carpaine and other simple compounds, some of which do not give precipitates with Mayer's reagent.

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BOTANICAL MUSEUM LEAFLETS

HARVARD UNIVERSITY

CAMBRIDGE, MASSACHUSETTS, MARCH 9, 1966

VOL. 21, No. 5

THE PSYCHOTROPIC BANISTERIOPSIS AMONG THE SIBUNDOY OF COLOMBIA

BY
MELVIN L. BRISTOL

I

THE malpighiaceous psychotropic drugs of northwestern Amazonia have long fascinated numerous native peoples of that region, but it was not until about a century ago that their existence became more widely known. Villavicencio (44) wrote of the Záparo in eastern Ecuador, in 1858, saying, "They take a vine called Aya huasca (death or soul vine) from which they make a light decoction and the Indian drinks it . . . and in a few moments it begins to produce the strangest phenomena". Spruce (41) collected botanical specimens in 1852-53 of large forest lianas in the Río Uaupés drainage in Brazil which were used by the Tukano to alter consciousness during festive communal dances. He named the lianas as a new species of the genus *Banisteria* of the Malpighiaceae; Morton (24) transferred them to an allied genus, and today they are known as *Banisteriopsis Caapi* (Spruce ex Griseb.) Mort.

During the century following the early discoveries, many other travellers in the Amazon basin recorded their experiences and observations of the hallucinogens variously known as caapi (e.g., capí; 10), yagé, ayahuasca, etc., but the literature that accumulated was extremely

REVISTA DE LA SOCIEDAD MEXICANA DE HISTORIA NATURAL

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RAFAEL MARTIN DEL CAMPO

LA ANATOMIA ENTRE LOS MEXICA

Para el amigo Bernard
Lowy, con un recuerdo
afectuoso de Rafael Campo

LA ANATOMIA ENTRE LOS MEXICA

RAFAEL MARTIN DEL CAMPO
Instituto de Biología, U.N.A.M.

Poco nos ha llegado acerca de los conocimientos anatómicos reunidos por los antiguos pobladores de nuestro suelo. Aun se ha dicho que no sabían gran cosa de esta materia.

Se admite que no practicaban la disección con fines de estudio. Cosa cierta, seguramente, pero no exclusiva de nuestros antepasados históricos, ya que en Europa, en esa época, no sólo no se permitía disecar cuerpos humanos, sino que estaba penado el hacerlo: a Leonardo da Vinci se le trató de brujo por estudiar el cuerpo humano, y Vesalio, más tarde, se vió precisado a saquear tumbas recientes, a la medianoche, con la finalidad de obtener subrepticamente material para sus estudios. Excepciones fueron la Escuela de Salerno y la Universidad de Padua, ambas en Italia. La práctica regular de la disección se instituyó en Europa mucho tiempo después del descubrimiento de América.

Se dice que únicamente los *teopixqui* o sacerdotes, por tener a su cargo el sacrificio de las personas consagradas a las divinidades, pudieron haber reunido algún conocimiento anatómico, pues que desollaban los cuerpos de las víctimas, los cortaban y daban fragmentos entre los presentes en calidad de comunión ritual. Debe recordarse que también había carniceros cuyo gremio era importante en el mercado y que, para expender su mercancía, debieron haber tenido cierto léxico anatómico que, por rudimentario que se le suponga, trascendió a la población. Finalmente, sería imprudente tratar de ignorar que los médicos —no tan imprevistos y empíricos como vulgarmente se cree—, poseedores de un verdadero tesoro farmacológico que administraban para el tratamiento de muy variadas enfermedades, conocieran por lo menos lo esencial de la anatomía humana para el ejercicio de su profesión. Los nombres

SOME OBSERVATIONS ON THE HALLUCINOGENIC MUSHROOMS
OF MEXICO¹

B. Lowy

During the past two decades, with the advent of new techniques in the investigation of many branches of science, a new emphasis has been placed on the study of phenomena as diverse as the origin of galaxies and the structure of the DNA molecule. Molecular biology, still in its infancy, has already in the past decade, made some remarkably long strides and is on the threshold of discovering some of the secrets of the organization of protoplasm. So on a cosmological scale as well as on a molecular scale, great advances are being made. While man is taking his first steps toward the control of outer space some equally challenging problems on the micromolecular level seem imminent of solution.

But you may ask what relationship this has to the topic I am to discuss this evening. It is really not as remote as it seems, because it is precisely within the framework of the expanding horizons of science, that I wish to present some reflections on a subject about which relatively little is known at present. While the physical sciences have surged forward with astonishing speed during the past few decades, other areas of study must still be considered as terra incognita, where the disciplines of the mycologist, chemist, psychiatrist and anthropologist meet.

¹ Translation of an illustrated lecture given at the Instituto Biológico, Sao Paulo, Brasil, April 29, 1966. Original in Spanish.

I want to direct your attention then, to a science which before 1957 did not exist and which is now known as ethnomycology, the study of the ways in which the knowledge of fungi has affected the behavior of civilizations past and present.

The more spectacular aspects of the discoveries at Huautla de Jimenez in Mexico by the Wassons, beginning in 1953, have been sufficiently publicized and are well enough known. The rediscovery in that mountain community of a cult wherein some mushrooms are considered as having divine properties, as the Nahuatl word "teonanacatl" (meaning God's flesh) indicates; the curious mixture of Catholicism and Paganism employed in the solemn mushroomic ceremonies; the chant of the curandera; the liberation of the spirit of the participant and his subsequent entry into a strange new world of hallucinations (in color) following the eating of species of Psilocybe; all of this will hardly require additional comment to this audience.

I would like to outline, however, some of the problems that have been raised by ethnomycology and to indicate some of the conclusions that have been reached, by way of suggesting what remains to be done. For this purpose it is convenient to present my remarks under the following headings:

- I Mycological investigations
- II Chemical investigations
- III Psychological and Psychiatric research
- IV Anthropological research

I MYCOLOGICAL RESEARCH

The first and most obvious problem concerning the hallucinogenic mushrooms was a mycological one, namely, the identity of the species being used in the ceremonies at Huautla. One of the earliest documents in which the use of mushrooms

by the Aztecs is mentioned was published in 1591 by the Franciscan monk Bernardino de Sahagun in a book entitled "Historia de las cosas de Nueva Espana". He reported that inebriating mushrooms were used by Moctezuma and his court during festive occasions, perhaps celebrating some military success or conquest. He describes in some detail the revelry which took place and the hallucinations that were induced by the mushrooms. These observations are the first known references to the psychic effects of hallucinogenic mushrooms. Although it has been known since the time of the Conquest that certain mushrooms played a significant part in the religious lives of many Mexican Indians, the pertinent facts, quiescent for centuries, were rediscovered by anthropologists only in 1939. More recent studies have shown that peoples outside Mexico have also been profoundly influenced by mushrooms. These include communities in Borneo, New Guinea, and Siberia.

It was not until the early 1940's that the hallucinogenic mushrooms used in the religious ceremonies of the Mazatec Indians were identified by a mycologist. This was done by Rolf Singer, now of the Universidad de Buenos Aires but at that time, a curator of the Farlow Herbarium at Harvard University. It is not desirable at this time to enter into the question of priority which has left some animosity in its path, but it is correct to state that just as the first identification of the mushrooms as members of the genus Psilocybe was that of Singer, it is equally certain that the elucidation of the uses of the mushrooms belongs to V. P. and R. G. Wasson, the founders of the science of ethnomycology.

At present about twenty species of mushrooms belonging predominantly to the genus Psilocybe have been identified as having hallucinogenic properties, and you

will find the list among the mimeographed papers distributed to you. A number of these mushrooms have been grown in pure culture, mostly by the French mycologist Roger Heim, and their mycological and chemical characteristics studied. I shall speak briefly of the present uses for these compounds in a moment.

Psilocybe is a small genus of violet to dark-spored mushrooms closely related to the better known genera Panaeolus, Stropharia and Nemaetoloma. Among the species most commonly used in the divinatory ceremonies in Oaxaca Mexico, are Psilocybe mexicana and Psilocybe mazatecorum. These and related species were previously unknown to science although probably used for centuries by the Indian population. Dr. Heim deserves special mention here because he did the first mycological work in the field in Mexico, as well as in the laboratory, while his collaborator Mr. Wasson, devoted himself to the anthropological — now more correctly called ethnomycological details. Later, Singer and his American colleague Smith made additional studies of some of these fungi.

II CHEMICAL AND PSYCHIATRIC RESEARCH

For our purposes, chemical and psychiatric studies may be considered together since the findings of the chemists were made use of almost immediately by the medical profession. When it became known that the mushrooms used by the Mazatec Indians of Oaxaca had hallucinogenic properties, it was decided to analyze them chemically to determine the compounds responsible for their special physiological effects. The chemist Albert Hofmann and his colleagues of the Sandoz Laboratories in Basel, Switzerland, published the first work on the nature of

the hallucinogenic substances in 1958. Two related compounds were identified as indoles and given the names psilocin and psilocybin. By consulting the mimeographed page, it may readily be seen that the major chemical difference between them is that psilocybin contains a phosphorus group while psilocin is the dephosphorylated form. The chief physiological effect of these compounds while poorly understood, at present, seems to be to temporarily break down some of the synaptic junctions in the brain and allow for a continuous period of stimulation of the central nervous system. The subsequent history of these substances and their use in psychiatric medicine, as well as the use of related compounds such as LSD-25 (d-lysergic acid diethylamide) by individuals without qualifications to administer them, is a topic of considerable interest but one which I have time to mention only in passing. The medical profession became interested in the therapeutic use of psilosibin and psilocin chiefly for treating chronic alcoholism and in cases of schizophrenia. On the basis of evidence gathered here and elsewhere, while spectacular results have not been achieved, a guarded optimism may be warranted. At the same time, an ill-advised if not unscrupulous use of these drugs was made by some individuals who were interested only in the sensational character of the compounds and the hallucinogenic effect produced by them. Such a group, for example, was formed in Mexico in 1963, under the leadership of Timothy Leary, who had been expelled from Harvard University for similar activities on campus. Since the drugs are powerful stimulants and are effective in doses as small as one hundred micrograms, an overdose may cause serious damage to the nervous system. According to a California psychiatrist, Sidney Cohen, LSD "can kill you by making you feel that you are walking on water or can fly." Obviously dangerous illusions, howsoever interesting.

IV ANTHROPOLOGICAL RESEARCH

In some ways, the anthropological aspects of this topic are the most provocative; certainly they are the least understood today and in need of further elucidation. In general, our understanding of the habits, ways of thinking, social behavior...in a word, the culture of diverse civilizations or groups lags so far behind our understanding of the mechanical world, that it would not be an exaggeration to say that compared with the mastery of our physical environment, we are still near the level of barbarism in our collective relationships with each other as nations and civilizations.

But returning more directly to our topic, it is a phenomenon worthy of note to find a contemporary culture in which some species of mushrooms constitute a significant link between a people and their deity. The Mazatecs today use Psilocybe spp. as the vehicle which enables them to approach their God. It is unknown how far back into antiquity this custom reaches. As indicated earlier, it is certainly pre-Columbian, and in recent years some evidence has been uncovered which is very tantalizing. This interesting, though enigmatic line of evidence, takes the shape of what archeologists call "mushroom stones". Since I shall project slides of some of these objects shortly and speak about them, I shall limit myself only to the comment that contemporary anthropologists consider them to be mushroomic symbols. By the use of the carbon dating technique, it has been determined that the oldest of these artifacts goes back to about 1500 BC and the most recent to about 900 AD. The critical question is: what function did they serve? The theory generally offered today

is that the mushroom stones may have been used as objects of worship by earlier civilizations among the Mayan and pre-Mayan peoples. It is perhaps not entirely a coincidence that the distribution of the mushroom stones corresponds closely to the localities where hallucinogenic mushrooms have been found. Most of these artifacts have been uncovered in Guatemala, which is somewhat enigmatic since a mushroom cult is unknown in that country today. A few mushroom stones have been found in El Salvador and in Mexico, but only in Mexico, to the best of our knowledge, are the mushroom rites practiced in our time.

With this brief review, I would now like to present some color slides with comments relating to mushroom stones and to the mushroom cult as practiced in Mexico today.

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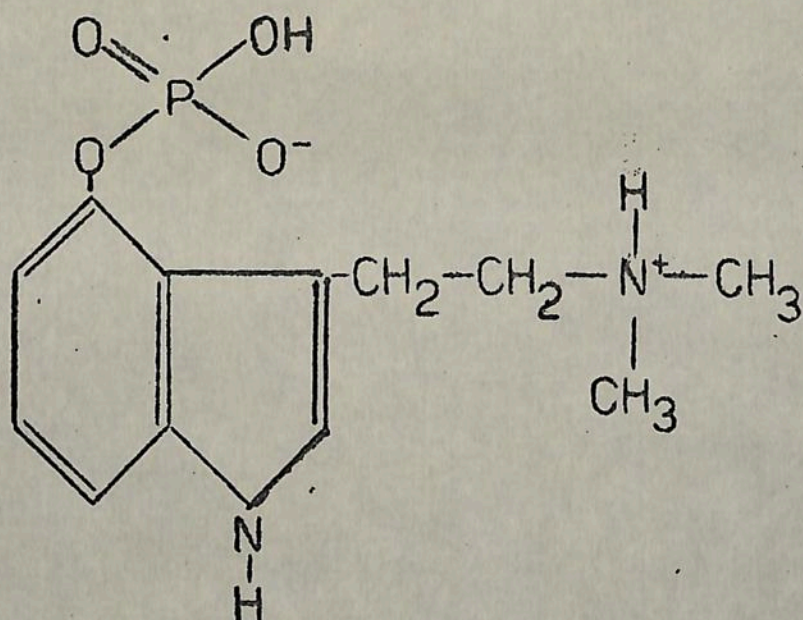
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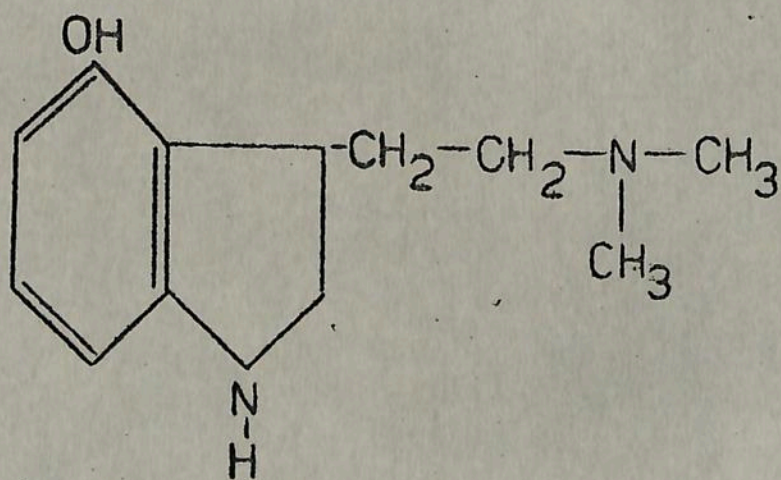
List of genera and species of hallucinogenic mushrooms in Heim and Wasson. Les champignons hallucinogènes de Mexique. 1958.

1. *Conocybe siliginoides* Heim
2. *Panaeolus sphinctrinus* Fries
3. *Psilocybe acutissima* Heim
4. *P. aztecoeum* Heim
5. *P. caerulescens* Murr.
6. *P. caerulescens* Murr. var. *mazatecorum* Heim
7. *P. caerulescens* Murr. var. *nigripes* Heim
8. *P. cordispora* Heim
9. *P. P. hoogshageni* Heim
10. *P. mexicana* Heim
11. *P. mixacensis* Heim
12. *P. semperviva* Heim and Cailleux
13. *P. wassonii* Heim
14. *P. yungensis* Sing. and Smith
15. *P. yungensis* var. *deconica* Sing. and Smith
16. *P. zapotecorum* Heim
17. *Stropharia cubensis* Earle

STRUCTURAL FORMULAS OF MUSHROOMIC HALLUCINOGENS



PSILOCYBIN



PSILOCIN

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1968

in the local style, as witnessed by the treatment of the eyes, the lips and the grooves on each side of the mouth. Furthermore, the design beneath the eye closely parallels that in the same position on the bird with a human head in its beak at Los Tarros (fig. 17g,h). The second human head, however, shows few of the characteristics of Cotzumalhuapan art, but a third has the groove at the side of the mouth, although in other respects atypical (fig. 19d). Fragments of flat stone heads were found during excavation of Structure 6, El Baul, which was decorated with sculptures of the Cotzumalhuapan style. They were in debris around the base of the structure, and had fallen there when the structure collapsed, having come from the surface or from inside the pyramid, more probably the latter. This association slightly strengthens the case for considering flat stone heads a product of the Cotzumalhuapan school of sculpture.

Stone yokes are not uncommon. There are two at the Hacienda El Baul. One of these is carved on the exterior with a design now badly battered but possibly representing a two-headed snake. The heads are at the extremities of the outer curve, the intervening area being decorated with a series of slanting and countersunk panels with straight sides and rounded ends. The interior and exterior retain traces of red paint. The yoke is 42 cm. long and is 32 cm. wide across the base. The inner wall is vertical; the exterior is sloped, corners being slightly rounded. The second yoke, which is plain, also retains traces of red paint. It is of the same shape as the carved one, with length 40 cm. and width 33.5 cm. A piece of a third yoke, which is decorated underneath and on the side with impressions of a human foot was found in the dump in front of Monument 3, El Baul, which also contained the figure of the warrior with rectangular shield (fig. 20b).

This same dump yielded one complete and several fragments of "mushroom" seats (fig. 20b), and there are several complete examples of these at Hacienda El Baul (fig. 19f). Another was found in the making of a road on the outskirts of the town of Santa Lucia Cotzumalhuapa. A piece of one of these "mushroom" seats was in the fill of a pyramid of the Esperanza phase at Kaminaljuyu.

(Linné, 1934, fig. 113).

Of interest is the polished stone of the so-called sling-stone type in the collection at Hacienda El Baul (fig. 18j). This is an artifact, like yokes and flat stone heads, which is widely distributed in central Mexico (Fewkes, 1907, fig. 60; Thompson, 1948, pp. 57-72).

SOURCES OF COTZUMALHUAPAN SCULPTURE

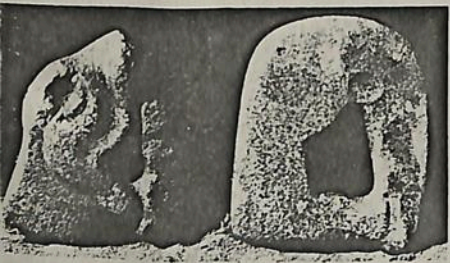
It has been generally agreed that Cotzumalhuapan art shows strong Mexican influences, but few specific traits have been traced to a Mexican source. Bastian (1882) appears to have been the first writer to assign these sculptures to the Pipil, but within two or three years the same opinion was expressed by Stoll (1938), who called attention to the speech scrolls as evidence of Mexican origin. This argument was also used by Spinden (1913, p. 214), who considers the Cotzumalhuapan sculptures "excellent examples of Nahua art." Lehmann, too, considers this art may probably be ascribed to the Pipil, and the same opinion has been expressed by several other writers.

Three important members of the Mexican pantheon are recognizable. These are Xipe, Eecatl, and Tlaloc. In addition, Tlalchitonatiuh, the Mexican manifestation of the rising sun, is depicted, and perhaps Huehuetotl.

The Xipe heads, as already noted, are at Aguascalientes. One of them has a peculiar headdress in the form of a rectangular frame with five circles placed symmetrically on it, and with a rectangular hollow in the center (fig. 11a,b). An almost precisely similar headdress is worn by a Xipe figurine from Santiago Ahuizotla. It was in a pit together with large numbers of sherds and figurines of the Coyotlatelco horizon (Tozzer, 1921, pl. 10d). This is now considered to be approximately contemporaneous with the Mazapan horizon but perhaps a trifle earlier.

Sr. Pedro Armillas, whom I consulted on the dating of the figurine from Santiago Ahuizotla, writes:

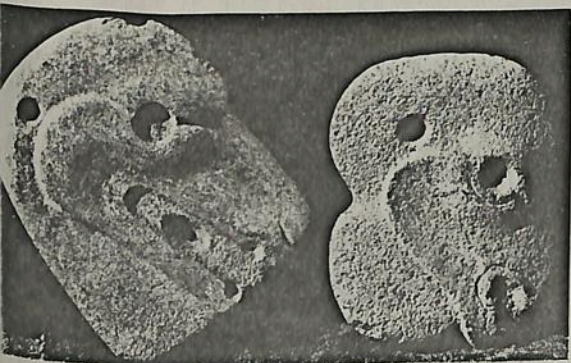
The Xipe in question is distinguished from that found at Teotihuacan by the "tablero" headdress and also by the fringe, surely the hair of the pipil which appears on the frontal band of the mask.



a



b



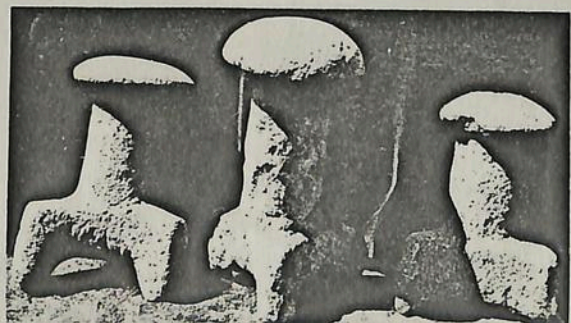
c



d



e



f

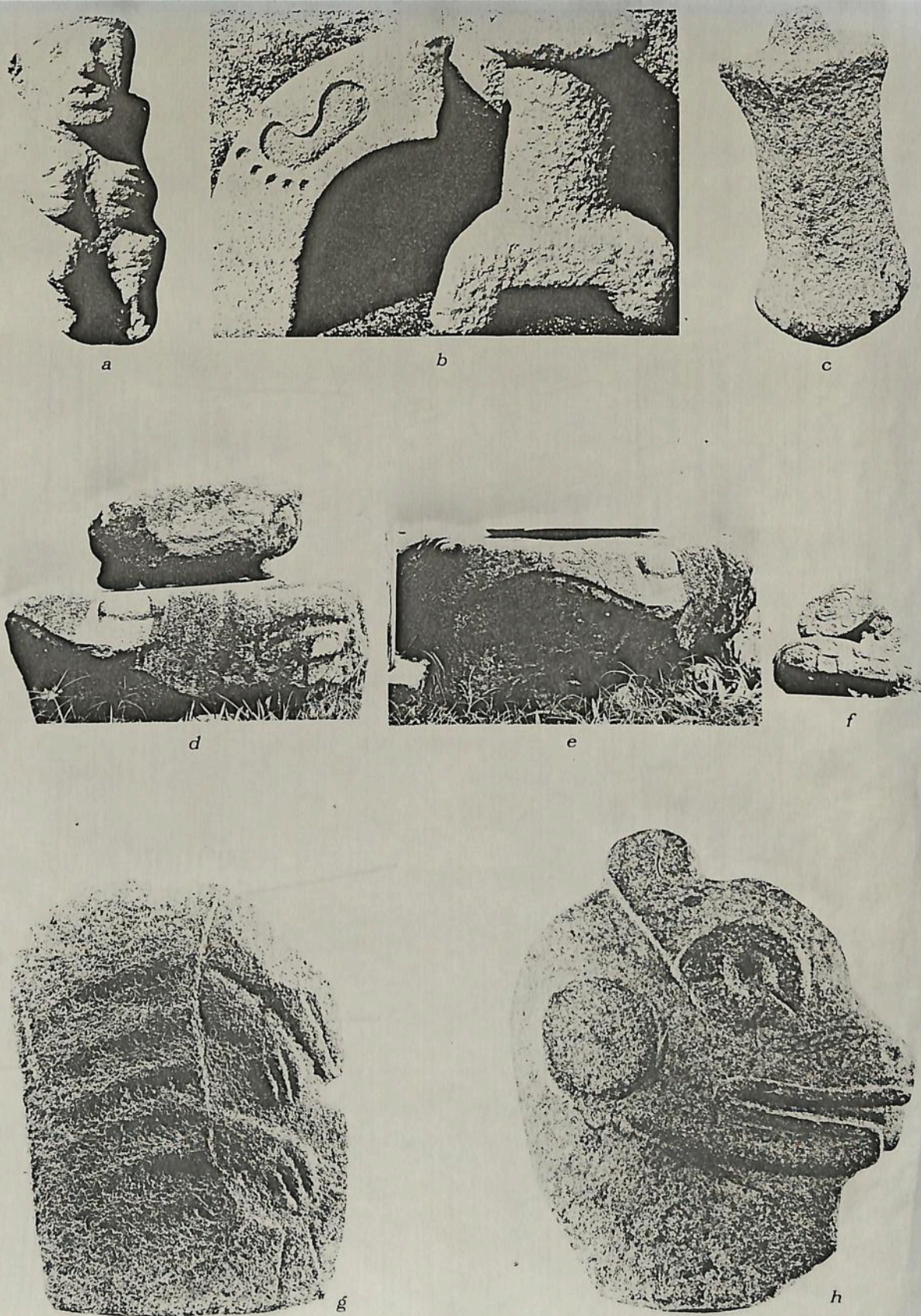


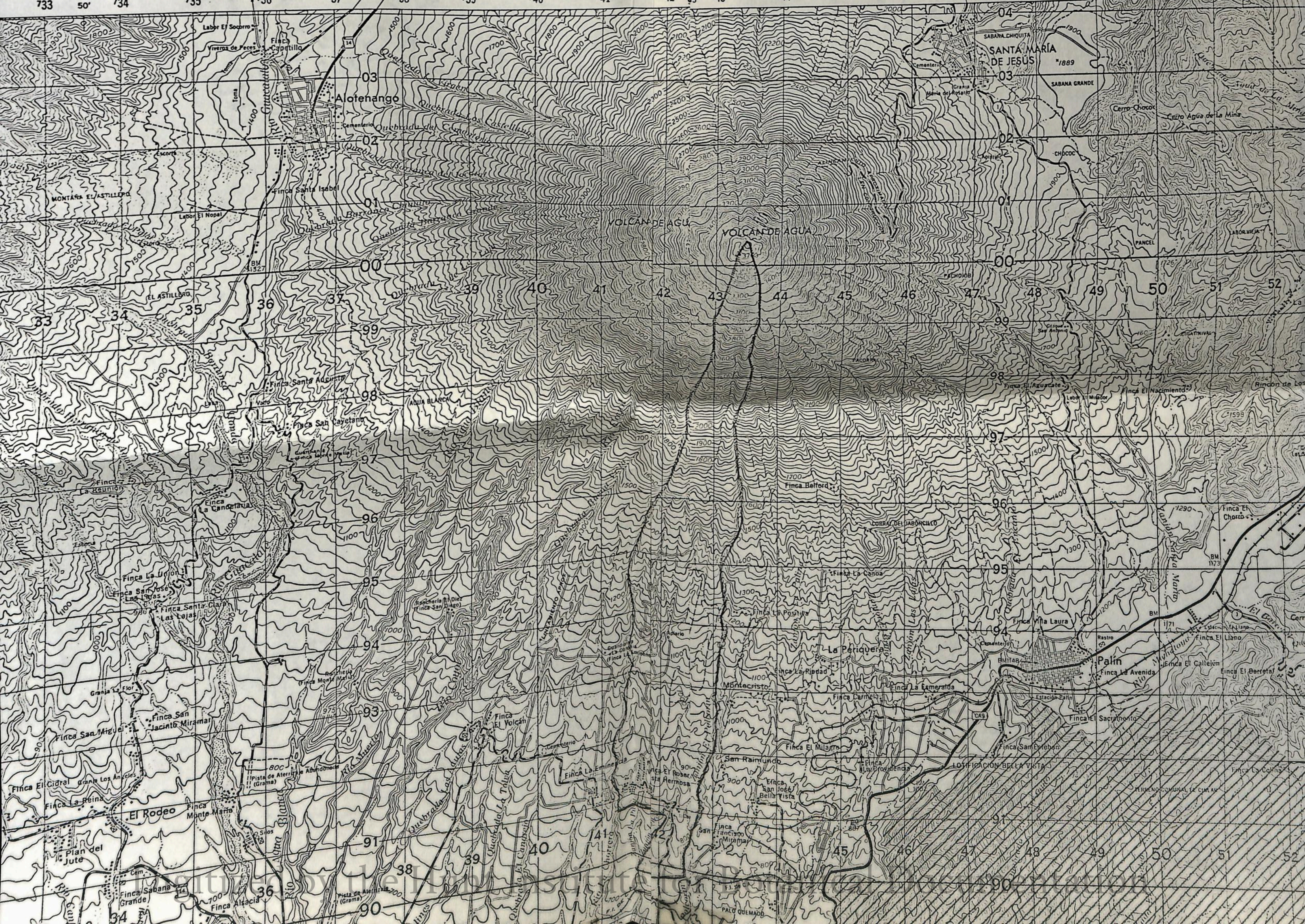
FIG. 20—VARIOUS SCULPTURES

a: Sculpture from El Baul. *b*: Fragment of yoke and mushroom stone. From pit in front of Monument 3, El Baul. Height of yoke fragment 22 cm. *c*: Stone from same deposit as *b*. Height about 50 cm. *d*: Monuments 1 and 2, San Andres Osuna. Length of lower 1.11 m. *e*: Monument 2, San Andres Osuna. Front. *f*: Sculpture 1 above Sculpture 4, Aguna. *g*: Sculpture apparently representing an armadillo. From Tiquisate. Watson Coll. *h*: Flat stone head from Tiquisate. Watson Coll.

SAN MIGUEL DUEÑAS 3.0 KM. ANTIGUA GUATEMALA 10 KM.
FINCA SAN SEBASTIÁN 2.6 KM. CIUDAD VIEJA 4.8 KM.

ANTIGUA GUATEMALA 6.4 KM.

733 50' 734 735 736 737 738 739 740 741 742 45' 743 744 745 746 747 748 749 750 751 40' 752



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