Journal of Ethnobiology 18(2):161-187 Winter 1998

Editor's note: This article is an edited translation of "Les fondements historiques de l'ethnobiologie (1860-1899),", which appeared in *Anthropologica* 40: 109-128 (1998). It is not our policy to publish translations, but the editorial board judged this historical analysis of particular interest and that it should therefore be made more readily accessible to an English-speaking audience.

THE HISTORICAL FOUNDATIONS OF ETHNOBIOLOGY (1860-1899)[1]

DANIEL CLÉMENT
Canadian Ethnology Service
Canadian Museum of Civilization
Hull, Quebec
Canada J8X 4H2

ABSTRACT.—The origin of ethnobiology, defined here as the study of the biological sciences as practiced by the various peoples studied by ethnology, can be traced to the end of the 19th century when different names were given to its subdisciplines. Those names — applied botany, Aboriginal botany, botanical ethnography, ethnographic conchology, botany, ethno-conchology, plant-lore and, finally, ethno-botany and ethnozoology — appear in a context where Westerners were mostly interested in the economic utility of aboriginal products made of plant or animal material. The researchers — botanists and zoologists, as well as ethnologists, missionaries, and adventurers — often worked for museums. They denied any form of scientific knowledge to indigenous people. They were more interested in the products which could be used by Western civilization than in the knowledge of the people they assigned to a savage state.

RESUMEN.—El origen de la etnobiología, definida aquí como el estudio de las ciencias biológicas tal como son practicadas por los diversos grupos humanos estudiados por la etnología, puede ser rastreado a finales del siglo XIX, cuando se le dieron diferentes nombres a sus subdisciplinas. Estos nombres — botánica aplicada, botánica aborigen, etnografía botánica, conquiliología etnográfica, botánica a secas, etno-conquiliología, folklore de plantas y, finalmente, etnobotánica y etnozoología — aparecen en un contexto en el cual los occidentales estaban interesados principalmente en la utilidad económica de los productos aborígenes hechos de materiales vegetales o animales. Los investigadores — botánicos y zoólogos, así como etnólogos, misioneros y aventureros — frecuentemente trabajaban para museos. Ellos les negaban cualquier forma de conocimiento científico a los pueblos indígenas. Estaban más interesados en los productos que pudieran ser usados por la civilización occidental que en el conocimiento de las gentes a quienes asignaban a un estado salvaje.

RÉSUMÉ.—L'origine de l'ethnobiologie, en tant qu'étude des sciences biologiques telles qu'elles se pratiquent dans les diverses ethnies étudiées par l'ethnologie, peut être retracée à la fin du XIXe siècle alors que diverses appellations pour ses

sous-disciplines sont proposées. Ces diverses appellations — botanique appliquée, botanique aborigène, ethnographie botanique, conchyliologie ethnographique, botanique tout court, ethno-conchyliologie, folklore végétal et finalement ethnobotanique et ethnozoologie — voient le jour dans un contexte où priment des intérêts manifestes de la part des Occidentaux pour les usages économiques des produits autochtones à base végétale ou animale. Les chercheurs, botanistes, zoologistes mais aussi ethnologues, missionnaires, aventuriers, travaillent souvent pour des musées, nient toute connaissance scientifique aux autochtones et, par conséquent, s'intéressent davantage aux produits susceptibles d'être utilisés par la civilisation qu'aux savoirs des peuples, qui, dit-on, vivent encore à l'état sauvage.

Ethnobiology is the study of the biological sciences as they are practiced by the various peoples studied by ethnology[2]. Hence it is as concerned with the botanical and zoological knowledge, present and past, of the various peoples of Africa, the Americas, Asia, or Australia as with biology as manifested in our Western societies. The term "ethnobiology" first appeared in the United States in 1935 (Castetter). The term is a compound of two elements, "ethnos" and "biology," after the fashion of many similar terms formed since the words "ethnography" and "ethnology" were coined in the late 18th century. Parallel terms include ethnobotany (Harshberger *in* Anonymous 1895b), ethnozoology (Mason 1899), ethnoscience (Murdock *et al.* 1950), ethnolinguistics (mid-20th century), ethnohistory (mid-20th century), and so on. The above definition of the term ethnobiology follows the same principle as that which gave rise to these other fields of ethnology. For example, if ethnolinguistics and ethnohistory can be defined as the study of the various languages of peoples in their cultural context and the study of the history of various peoples as they recount it, ethnobiology cannot be conceived otherwise, i.e. other than from the point of view of the people primarily concerned. This is less than the comprehensive study of all the relations that humans have with plants and animals, as that would include ethnobiology in the strict sense just noted, as well as paleoethnobotany, plant and animal pharmacognosy, zooarchaeology, the study of crop plants and domestication, etc. We shall have to wait some time yet for the homogenous methodological and theoretical foundations of such a discipline to be laid.

There are operative and theoretical advantages of employing a strict definition of ethnobiology that is more limited in scope than that which now prevails in certain specialist circles. First of all, such a definition allows one to definitively attach the discipline to the social sciences by distinguishing it from the practical applications of botany and zoology, which some have christened economic or applied botany and zootechny. It is a logical extension from most of the other "ethno-" disciplines, and it promotes a better understanding of ethnobiology's historical development by emphasizing the scientific knowledge that various peoples have regarding the biological elements they find around them, a key aspect of the general relations between human beings and their environment, one which had already been sensed in the last century.

Historically, science is presumed to be a product of Western societies. Recognition that other peoples could engage in scientific work is very recent, if expressed at all. It is a question of power, which can be measured by the number and pejorative quality of the terms used by Western scientific authorities to distinguish

"scientific" knowledge from that which is not. For example, the sciences of non-Western peoples have been labeled "folklore," "natural knowledge," "pre-science" or "para-science," if not as "natural history," "knowledge" pure and simple, "traditional ecological knowledge," or simply as a world view. A similar situation prevails in many circles as to the actual possibility that societies other than the major civilizations may have highly developed language systems. Languages of tribal or indigenous peasant communities are often called "dialects." This also calls to mind our religious past, when Christianity held a central position of authority and all the other religions were relegated to the status of paganism, idolatry, or superstition. Now that power has shifted from religion to science, the dominant societies claim the prerogative of science.

The history of ethnobiology, which spans a little more than a century (1860 to the present), testifies to some changes of attitude regarding the status of non-Western peoples' knowledge. This is apparent in the writings of many authors from North America, Europe, and elsewhere, who have shared an interest in the study of the knowledge that various peoples have of their plants and animals. These authors — physicians, archaeologists and botanists as well as ethnologists — were initially attentive only to the economic uses that these peoples made of the biotic elements in their surroundings. They next turned in succession to vernacular nomenclature, systematic classifications, and finally, knowledge of resources and how to manage them. These major divisions fall into three periods. The first period, which we might call the "preclassical," began in the last century when the foundations of the discipline were laid and its various branches, e.g., ethnobotany and ethnozoology, first designated and defined. This period ended in the 1950s when the attention of ethnobiologists turned from an etic representation and evaluation of Aboriginal sciences (economic uses, general knowledge, first syntheses) to an attempt at emic study of the same phenomena, this time based on the perceptions peculiar to those primarily concerned (local knowledge from an Aboriginal perspective and major classification studies). This second period, which one of its critics (Murray 1982) has termed the "classical" age of the discipline, extended until the 1980s, when major shifts in interest again occurred. The third or "postclassical" period has seen the emergence of marked co-operation between Western scientific researchers and Native peoples. These advances have raised new questions that flow from Western societies' control of knowledge of the resources of the ethnic groups studied. In the 1990s, issues of cooperative resource management, indigenous intellectual property rights, the control of world databases, etc. are in the foreground.

This study is particularly concerned with the preclassic period of ethnobiology, and focuses on the period which produced the initial designations, ethnobotany and ethnozoology. This stage, which extends from 1860 to 1899, is mainly the province of American and European authors. Of course, the origin of ethnobiology *lato sensu* lies deep in the mists of time, when the first hominids took an interest in plants and animals; it can rightly be argued that the foundations of ethnobiology were laid long before the 19th century, and are to be sought in the sacred texts, oral or written, that form the substructure of many civilizations.

However, this is not our subject here. The limits we have set ourselves are

defined by the appearance of the first formal academic designations. All of the researchers and the few rare historians of ethnobiology (Chandra 1991; Ford 1994 [1978]; Ford 1994; Davis 1994 [1991]) concur in acknowledging a common origin, attributing for example to Harshberger (1896c) the initial formulation of the aims of ethnobotany. The ideological context of the proliferation of terms for ethnobiology in fact makes up the content of the historical analysis that follows.

SCIENCE DENIED

At the end of the last century, the distinction between civilized and uncivilized was pervasive, not excepting many works devoted to the study of peoples' knowledge of plants and animals. This distinction was no doubt related to one of the concerns of the age when ethnography as a discipline was born, namely the study and classification of races. This concern was central to the anthropological evolutionism of the time, which held Western civilization to be the culmination of all human development. However, it took on a particular tone when naturalists, physicians, and even ethnologists were describing and analyzing the plant and animal data brought back from their sojourns among men reported to be still living as savages.

It seems in fact that one of the prerequisites for presenting any knowledge foreign to "civilized" society was first of all to rank it as inferior to that of "civilization." This made the knowledge inoffensive, though it might well be very complex. How it might be used was one of the main areas in which this knowledge provoked interest. For if the knowledge of strange new peoples was in no way equivalent to the civilized sciences, that knowledge might nonetheless call attention to potentially useful materials and products.

Savage and civilized stomachs. — This judgment is a recurring feature of late 19th-century ethnographic works on plants and animals, although a grudging appreciation may slip through. For example, Ross (1861, 1862), an agent of the Hudson's Bay Company, in writing about plants and animals of economic value to the Chipewyan Indians of Canada, reports that the products of the Chipewyans, although primitive, "to the philosophic mind [...] would speak volumes, as showing the human intellect, though in its lowest stages, attempting, not unsuccessfully, to break through the surrounding crust of animalism, and struggling to emerge into a sphere of higher intelligence" (1861:433). Moreover, the Chipewyan are without manners and their arts are crude, although they are kind-hearted, "and would doubtless, if dwelling in a more genial climate, prove the most amenable, of any of the red nations, to the humanizing influence of civilization" (1861:441).

Ross was not alone in this view. Robert Brown writes in the *Journal of the Botanical Society of Edinburgh* in a similar vein. He claims to be contributing to "the economic history of plants, and the ethnology of a little known people" (1868:378). Brown, introducing the plant products of the American Indians of the Northwest Coast, writes that these products will be of very little use to "civilised art or medicine" (1868:378). He stresses that the Indians of Vancouver Island — he does not specify which group — naturally do not know the reason why starch is transformed into sugar by cooking, even though they use this conversion process in

roasting the bulbs of camas (*Camassia esculenta*). He dismisses the whole of Indian medicine as nothing but superstition and asserts that Indians detest work; that their innate laziness prevents them from attending properly to their potato crops; and finally, that they are a race on the road to extinction.

One group in particular seemed to represent the lowest level of humanity to these 19th century observers. These are the Digger[3] Indians, who according to Brown are "little elevated in [their] dietary above the lower animals" (1868:385), accompanying their grasshopper dish with a very agreeable salad of white clover (*Trifolium repens*). Palmer (1871:427), a doctor with the United States army refers to the Diggers as "of a low grade of mental organization" (1871:427), embellishing his point by confirming the reports that this people resorts to desperate expedients for sustaining life, feeding on enormous quantities of reptiles, insects, roots, grasses, and lichens. Professional concern leads him to provide a detailed description of the physiological effects of such consumption: "The stomach becomes distended and the visceral function overworked; the organs are enlarged to protuberant dimensions, producing a distortion which would be ludicrous were it not pitiable" (1871:428). The author says that it is also well-known among military men that Indians who eat the white man's food waste away and lead a wretched life; in fact, so incredible is their craving for their wild life that they "hail, therefore, with a yell of pleasure, the opportunity to leap over the bounds of civilization into the wild scenes familiar to their childhood" (1871:428).

Palmer published many works on the useful plants of the Amerindians of North America, chiefly those of the Southwest (1871, 1874, 1878). Yet despite his meticulous inventories of roots, tubers, fruits, nuts, berries, and seeds consumed by Natives, many of which might possibly be adapted for consumption in our societies, he regarded the men whose knowledge he reports as scarcely human. He focuses his disparaging gaze on their repulsive appearance and dietary habits: "in his mode of foraging ... [the Indian] ... resembles in his nature the more savage animals which share the forest with him" (1871:405). They sully their naked bodies from head to toe and show no great concern for the cleanliness of their hair when they consume in group their mush of mesquite seedpods (*Prosopis* sp.), using only their hands as spoons (1871:410); they are fat (1878:594, 596, 648); the men are lazy, leaving the work of gathering and cooking to the oldest women (1878:605); they are obviously not civilized (1871:425); and the "review of the articles of food consumed by the Indians will show that many of the substances are not only distasteful but disgusting to civilized persons, and many, also, are not of a nutritious character" (1871:427).

Palmer goes so far as to identify a type of stomach peculiar to civilization[4], noting that the quantities of nuts ingested by the Indians would unquestionably be dangerous for "more civilized stomachs" (1871:411). Powers (1875), one of the first authors to define the field of ethnobotany, proves no exception in this regard when he acknowledges that many sorts of bulbs (*Brodiaea* sp., *Sanicula* sp., etc.) consumed by the Nisenan[5] are "by no means disagreeable to the *civilized taste*" (1875:377; our emphasis).

Havard, another army doctor, refers to this again in the introduction to his article on the food plants of the North American Indians, where he states that "it may be truly said of some tribes that they reject nothing which their teeth can

chew or their stomachs digest, however tasteless, unclean and repulsive" (1895:98). Even Cushing, considered a genius in his time, who was one of the ethnologists most thoroughly integrated within an ethnic group, cannot refrain from mentioning this. In his famous *Zuñi Breadstuff* he refers to the "Zuñi palate" (1920 [1884-1885]:558), noting the months of training he had to undergo before he could appreciate Indian cooking after his initial reaction of disgust; in this regard, he tells of a prepared dish which reminded him of the taste of a cigarette lit at the wrong end, until at last he became accustomed to it (1920 [1884-1885]:560-561).

Indian medicine is nothing but superstition and fetishism. — Apart from diet, there is another domain that was similarly denigrated in the ethnographic writing of this period. This is medicine, and its attendant objective knowledge of the virtues of plants. It seems to have required but a single step to move from disparagement of Native medicine to a negative assessment of the botanical and zoological knowledge of the peoples encountered, given the close relations that existed in practice between all of these types of knowledge.

In view of the many negative references to him, the medicine man might be supposed to pose a major threat to the civilized world. Some healers may have exploited their patients' naïvete, promising fantastic results through Indian medications, and some remedies may have since proved false. But, systematic denigration of Indian healers certainly served to reinforce the superiority of the dominant society, and may have delayed a higher standard of study, analysis, and understanding of the Amerindian pharmacopoeia.

For example, Brown (1868:390-391) considers medicine men mere sorcerers and Indian medicine nothing but superstition, though he acknowledges that Indian knowledge of the medicinal properties of plants is empirical: "pagan empiricism," as he puts it. This apparent contradiction between superstition and empiricism in the evaluation of Native medical knowledge can also be found in Powers, who warns his readers that there are "many substances popularly called 'Indian medicines' which are humbugs, and which have been fathered upon the aborigines by patent-medicine men" (1875:373). However, Powers refrains from discussing these; his examination is confined to plants about which he has obtained first-hand information. At the same time, he states that the botanical knowledge of Natives is mainly based on bitter experience.

Native medical knowledge itself may be the subject of comment, most often negative. Though Holmes (1884-1885b:304) sees the selection of natural medicines by the Hudson Bay Cree as remarkable, Powers (1875:379) is somewhat less laudatory in comparing the knowledge of the Nisenan to that of the Chinese. Mooney has no praise at all for Cherokee medicine, when he describes their theory and diagnosis as "entirely wrong," and the scientific value of their remedies as "next to nothing" (1891:322). According to Mooney (1891:323), the average wife of an American farmer would know more about the treatment of internal ailments than all of the tribe's doctors put together.

Also judged wanting is the aboriginal knowledge of plants, or rather, the mode of discovery of the powers of plants. It is not the ingenuity of the Natives that is challenged, since this is in part justification for the researchers' interest, nor the Natives' great capacity for observation, for this is often highlighted. Rather the aboriginal mental process is targeted. The researchers — naturalists, physicians,

even ethnologists — strive to differentiate themselves by denying Native thought any, or next to no, scientific character. Aboriginal thought is "strange": according to Brown, "Some of them have strange notions of the best method of cultivation" [1868:380], pondering the behavior of an old Indian chief who regularly stalked through the village in the morning advising his people in a stentorian voice to eat only the small potatoes and keep the big ones as seed for the next crops. This case might be explained on an empirical basis: the selection of stronger specimens to enhance production[6].

Several observers attributed aboriginal medicinal plant use to the Doctrine of Signatures. Palmer cites the homeopathic nature of Indian remedies in the case of the California laurel (*Oreodaphne californica* [= *Umbellularia californica* (Hook. & Arn.) Nutt.]). The leaves of this plant give off a strong spicy odor. According to Palmer, their use was guided by the same principles as those of the German physician Hahnemann, founder of Western homeopathy: "Hahnemann is not the only discoverer of the fact that like cures like; for long before he was born, the Indians of California were aware of the power which this plant had to produce a headache in those that are well and to cure those who are afflicted with it" (1878:652). Mooney explicitly refers to the Doctrine of Signatures to explain Cherokee practices, but more critically:

> It seems probable that in the beginning the various herbs and other plants were regarded as so many fetiches and were selected from some fancied connection with the disease animal, according to the idea known to modern folklorists as the doctrine of signatures. Thus at the present day the doctor puts into the decoction intended as a vermifuge some of the red fleshy stalks of the common purslane or chickweed (*Portulaca oleracea*), because these stalks somewhat resemble worms and consequently must have some occult influence over worms. (1891:322-323)

Hough designated this same mental process "inferential medicine," which he noticed among the Hopi: "Tea made from the thistle is a remedy for prickling pains in the larynx, milkweed will induce a flow of milk, and there are other examples of inferential medicine. Perhaps another class is shown by the employment of the plant named for the bat, in order to induce sleep in the daytime" (1898:139). Some Amerindians interviewed were quite conscious of this reasoning process. Hough's informants explained to him that they ate the leaves and flowers of the *pala katchi* 'red male flower' (*Gilia aggregata*) to hunt antelope, since these were among the antelope's preferred foods. Moreover, a solanum with the evocative name of *cavayo ngahu* 'watermelon medicine (*Solanum triflorum*) was planted with watermelon seeds to influence the harvest, "that is, the watermelon would be influenced to become as prolific as the small plant" (1898:139-140).

Is indigenous knowledge science? — These 19th century observers were at pains to note that while Amerindians may have been excellent, highly experienced observers, they were certainly not scientists: "Among savages, of course, there is no systematic classification of botanical knowledge" (Powers 1875:373). "It is absurd to suppose that the savage, a child in intellect, has reached a higher development in any branch of science than has been attained by the civilized man, the product

of long ages of intellectual growth" (Mooney 1891:329). Every Moki Indian "is a botanist; not a botanist, of course, in the scientific way; one for practical purposes, rather [...]" (Hough 1898:137). The same Moki Indians studied by another author were judged better observers than most white men, but they "are not ornithologists, and cannot be expected to name even all birds that have fallen under their observation [...] or to discriminate between closely related species or those which resemble one another in color or form" (Mearns 1896:393). A "naturalist, on this count, would enumerate, for each area, a long list of invertebrate creatures, of fishes, reptiles, birds, and mammals; but the Indian would not go above a hundred species" (Mason 1899:50).

There are rare exceptions to this rule, but they are not significant, in that they are isolated instances that would not leave their mark on this era as Conklin (1954), Berlin, Breedlove, and Raven (1974), or Hunn (1977) did more than a half-century later. Matthews (1886) is among these exceptional observers. He, with Paso y Troncoso (1883-1884) in Mexico (to whom we shall return), praised aboriginal knowledge with almost no reservation, and for good reason: he studied the vernacular names of plants among an Indian group. It is noteworthy that studies of ethnobiological nomenclature laid the foundation for some of the greatest researches in the history of ethnobiology. Matthews reported that Navajo knowledge is remarkably precise and extensive compared with that of certain white men not versed in botany. Furthermore, their vocabulary is stable, they make distinctions between major species, and they create generalizations for similar species, generalizations which in some cases correspond to ours. For example, they have a generic term for the juniper, *koth*, and recognize the three species present in the region, each of which has its own name. The same applies for the sunflower.

> The most common kind of sunflower bears the name of *indigili*; as with ourselves, this is taken as a type or foundation species of plants in the subtribe Heliantheæ, and we have *indigili nilchini*, strong-scented sunflower (*Verbesina enceloides*), and *indigili nilchinitso*, great strong-scented sunflower (*Helianthus nuttallii*). (Matthews 1886:767)

The goodwill of the odd researcher such as Matthews notwithstanding, egalitarian humanism was less the fashion in the late 19th century than evolutionism. Consequently, the scientific knowledge of the non-Western peoples were denied the status accorded the sciences of civilized man. The situation was much the same on other continents. In France, for instance, botanists, doctors, and army officers who had spent time in the colonies expressed a certain European disdain for indigenous food. For example, Heckel wrote of the shea butter made by the Bambara and Malinke of Niger from seeds of the tree of the same name (*Butyrospermum parkii*):

> The butter thus obtained is of a grainy consistency like tallow and a dirty white colour, sometimes reddish. It has a special odour, one not very pronounced at ordinary temperature but which increases particularly with cooking, sometimes causing a certain repugnance in Europeans called upon to partake of it. (1897:230)

Indigenous therapies were scrutinized; their foundation usually situated at the opposite pole from civilized science. Such was the verdict of the same doctor, a "soldier of science" whose mission was to illuminate the true and the false, to distinguish science from superstition in medicinal plant usage among the aboriginals of the Ivory Coast: "A great many of their curative practices are sullied with superstition, but do we not have our own in this Age of Enlightenment? Our scientific research methods shall refute them, allowing us to separate the gangue from the precious crystal" (Heckel 1900:552).

As in the Americas, the knowledge of indigenous peoples is also called into question. It is seen as partly superstition, a mixture of imagination and empiricism (Lasnet 1900:171), or as fetishistic. Sébire, a missionary and botanist, referring to the aboriginal peoples of Senegal, states that "All of these tribes are fetishistic." He goes on to evoke one of the greatest concerns of civilized man at that time, namely the development of agriculture, and to denounce local farming practice: "The more a country is infected by Islamism, the more agriculture is scorned" (Sébire 1899:xii).

Necessity knows no law. —Native peoples of the internal American colonies and the external European colonies nonetheless demonstrated empirical knowledge. How else justify the effort of studying indigenous knowledge in order to discover useful applications of that knowledge? The most common explanation of this seeming paradox is that, "Necessity knows no law," or, as we might say today, "Necessity is the mother of invention." So Havard introduces his article on Indian food plants: "The maxim that 'Necessity knows no law' is well exemplified in the diet of the North American Indians who, when driven by stress of hunger, eat whatever the animal and vegetable kingdoms bring within reach [...]" (1895:98). Starvation explains their discoveries. Havard cites several cases, such as that of arum roots (Araceae), which could be consumed only after being dried and cooked to remove their characteristic acridity: "The pangs of hunger must indeed have been keen which drove the natives to experiment with them, but the happy discovery was made that drying and cooking dissipated this noxious acridity and that the roots contained a large proportion of nutritious starchy food" (1895:106). Similar reasons are advanced for medicinal plants. Heckel states that the indigenous peoples of the Ivory Coast, "[...] by way of therapeutic resource, they have nothing at their disposal but the plant kingdom where they must find their means of cure" (1900:552). Such discoveries were also the product of luck or chance. So Mooney imagines the emergence of the Cherokee Indian therapeutic system :

> There can be no doubt that in course of time a haphazard use of plants would naturally lead to the discovery that certain herbs are efficacious in certain combinations of symptoms. These plants would thus come into more frequent use and finally would obtain general recognition in the Indian materia medica. By such a process of evolution an empiric system of medicine has grown up among the Cherokees, by which they are able to treat some classes of ailments with some degree of success, although without any intelligent idea of the process involved. (1891:323)

THE ECONOMIC USES OF PLANTS AND ANIMALS

The "discovery" of new uses. — Such dismissive explanations notwithstanding, the research undertaken during this period was motivated by the same Native discoveries of foods and therapies, particularly potentially marketable plants. Writers constantly refer in their studies to previously unknown uses which might benefit more civilized nations. Attention was not confined to plants as foods or medicines; their utility as textiles, fuel, rubber, resins, and ornaments were also investigated. The *Revue des cultures coloniales* (1897-1904), the forebear in France of the *JAT* (*Journal d'Agriculture Tropicale*) and the *JATBA* (*Journal d'Agriculture traditionnelle et de Botanique appliquée*[7]), made this a priority. "The editorial staff of this journal," wrote Lecomte, "will strive to facilitate so far as possible the task of colonial farmers by providing them with the most complete information on the various crops which can be launched in our colonies and on all related questions; fertilizers, crop diseases etc. The natural products of today may be cultivated as crops tomorrow; hence we shall reserve a large place for the study of all usable natural products, such as rubbers, gutta-percha, gums, resins and so on" (1897:4).

The publications of this period also sometimes mention plants discovered among aboriginal peoples that had already proven useful, as justification for more intensive future investigation. In the United States, Harshberger, the founding father of ethnobotany, stressed the contributions Indians have made to the white man: "In fact, most of the plants which the new world afforded were made known in this way; tobacco, chocolate, the potato, maize, and tomato were first used by the Indians of North and South America and afterwards *borrowed* by white men" (1896c:153; our emphasis). Heckel likewise lists the therapeutic products that our Western societies owe to indigenous peoples, such as "*cinchona, opium, ipecac, curare, jaborandi,* and even *jequirity,* [which] are obvious evidence of this special genius among the primitive races" (1900:552).

Numerous studies were devoted to specific animal and plant products, not solely for their industrial or commercial potential, but for reasons ranging from a dawning interest in aboriginal sciences in their own right — although that interest was always marked by economic considerations — to an emerging concern about the disappearance of certain biological species. Examples include a series of articles on maple syrup, its importance to the American economy, and above all its origin, which authors attempted to demonstrate as being Indian (Henshaw 1890; Chamberlain 1891a, b). An evolutionist conception of humanity persisted, with the Indian depicted in his struggle "upwards" for survival and in the "gifts" he made to his conqueror, maple syrup being not the least of these: 36 million pounds of maple sugar produced in 1880 in the United States, yielding a million gallons of syrup at a total value of $4 million. This article by Henshaw also highlights the ingenuity of the Amerindians, such as the Iroquois with their knowledge of how to separate the sugar from the water in sap by simple freezing: the ice that forms on the top of the sap is removed, leaving the unfrozen sugar on the bottom (1890:347). This type of detail is scattered throughout the period documents, and it must be acknowledged that the authors who recorded it probably saved many elements of Native knowledge from oblivion.

The monograph by Cushing (1920 [1884-1885]) on the breadgrains and especially the maize (*Zea mays*) of the Zuñi of the Southwest, with its multitude of ethnographic detail on the agricultural myths, beliefs and practices of these Indians, is another example of a major research project conducted on a single subject. Other examples of the same type include the writings on wild rice (*Zizania aquatica*) by Stickney (1896) and Jenks (1898), particularly the latter's monograph on how the plant was harvested near the Great Lakes, which typically combines ethnographic description with economic evaluation. Jenks (1898:1020) thus provides a nutritive assessment of the wild rice and statistics on its production. The work by Hornaday (1889) on the extermination of the American bison (*Bison bison*) is similarly constructed, with its statistics on the animal's economic importance to the Indians and whites of North America, the hunting methods used, the many products that could be derived from the flesh (jerky, pemmican, marrow, tongue), hide (clothing, blankets, rope, sacks), or other parts (hair as ornamentation, dung as fuel, horns as utensils), and a plea for the protection of other endangered species.

Many French works of the same nature concern such colonial crops as coffee, cacao, date and rubber trees, tea and pepper plants, sugar cane, in short all the products that met the growing needs of the colonies. This research emphasizes indigenous experience in growing crops or even domesticating animals which might be of interest to colonists, and always combines ethnography with economic evaluation. For example, there is one description of the methods of planting and harvesting coconut palm used by the Annamites of Binh-Dinh province in Indochina, of their knowledge about the enemies of this tree, about converting its different parts into rope and oil, and about using its wood for construction and its leaves as vegetable fiber. The same article also features a statistical evaluation, based on a sample of 1,000 nuts, of its yield in various products such as oil and copra (Rideau 1901). Stock breeding on the west coast of Madagascar is given similar treatment when Perrier de la Bathie (1902), himself a breeder, reports details about the hunting of wild oxen (*Bos zebus*) by and with the indigenous peoples, as a way of forming a herd, while supplying figures on the guarding, pasturing, and per-head yield in francs of these animals.

The studies from this period are not all monographs, however. Many are general in nature, comprised of long lists of useful food or other plants in a given region or in several regions together. These lists occasionally allude to products which might be of use to civilized societies. For example, in his long index of plant products used by the Amerindians of the Northwest, Brown (1868:388-389) emphasizes the potential interest of growing wild flax (*Linum perenne*) or an allied plant from which the Indians manufactured nets, twine, and rope, as a textile substitute in the cotton and rope industry. Palmer's list of the food plants of North American Indians also begins with the explicit aim of reporting "many plants almost unknown to the people, and very little known to science, which may be utilized in the arts and in food products" (1871:404). Palmer returned to this theme in 1878, notably to vaunt the merits of a species of yucca (*Yucca bacata*), whose fiber the Indians processed into rope, twine, shoes and mattresses, as a species that could be used to manufacture paper (Palmer 1878:646-647). He also recommended a species of agave (*Agave deserti*) for the same purposes because of its abundance in desert areas not conducive to growing other crops (1878:648). Sage-

brush (*Artemisia tridentata*), used by the Paiute Indians as a medicine, contains a pungent oil which he suggested could become "a profitable article of commerce" (1878:652).

Food plants. — Food plants are often mentioned in these ethnobotanical lists. By this time the most important plants of the New World had already been incorporated into the culture of the dominant societies of the Americas and Europe: potatoes, tomatoes, and corn were part of the daily menu of the French-, English-, and Spanish-speaking peoples of the Americas, and had long since crossed the Atlantic to become almost national dishes in certain European countries. However, Havard for example suggested growing a lesser-known tuber, commonly known as *tipsinah* by the Sioux, *tahgu* by the Osage and "Pomme de Prairie" or "Pomme Blanche" by the Canadian voyageurs (*Psoralea esculenta*), on account of its abundance, wide distribution, nutritive content in starch and nitrogen, and ability to adapt to arid conditions (1895:108). He also recommended the roots of an umbel, *Carum gairdneri*, the *yamp* or *yampah* of the Shoshone Indians, which he noted were not astringent but aromatic, with the taste of sweet nuts (1895:108-109). However, he advised absolutely against certain other plants, such as a passion-flower (*Passiflora incarnata*) from the southern states grown by the Indians of Virginia, since there is little nutritional value in the fruit and it would be difficult to improve the plant (1895:104).

Drink plants. — Beverage plants, tea and coffee substitutes, draw the most attention. Havard (1896) devotes several pages to the leaves of the yaupon (*Ilex vomitaria*) which, in infusion, procured a "black drink" much in vogue among the eastern Amerindians before the contact period. He strongly advises that its economic value be assessed as a substitute for coffee or tea. The subject is also treated in the *Revue des cultures coloniales*, notably in an article on tea substitutes published in 1902 (Anonymous 1902).

Medicinal and stimulant plants. — Medicinal plants were also examined and their value assessed, as in Lasnet's review of the pharmacopoeia of the Sakalava of northwestern Madagascar: "Not all of these medicines are pure imagination [...] intensive examination and minute analysis of them would be very interesting, and would surely reveal the alkaloids that can be used in therapeutics" (1900:171). Other authors go further, offering examples of recent finds. Harshberger cites a tonic whose discovery was facilitated by the Indians' use of a certain plant, which was then studied.

> Again, we may learn by this study new uses of plants of which we were in ignorance. A stimulant and nerve tonic new to materia medica has been discovered in this way. Dr. D. Webster Prentiss discovered the action of the drug popularly known as mescal button, which is yielded by *Anhalonium Lewinii* [*Lophophora* sp.]. He obtained the supplies through agent James Mooney of the U.S. Bureau of Ethnology, who resided among the Indians of the southwest, especially the Kioways, for many years. It is to the use of the mescal button by the Kioways in their religious ceremonies that the white man owes his present knowledge of the drug. (1896c:152)

Many American authors were fascinated by stimulant plants and recommend in-depth expert reports on them. Havard (1896:38-40) reports research done on most of these, starting with peyote (*Anhalonium engelmanni* [= *Lophophora williamsii* (Lem.) Coulter]), which seemed to have remarkable properties. He goes on to list datura (*Datura meteloides*), used by the Indians as a stimulant and narcotic, and the seeds of *Sophora secundiflora*, also used as an intoxicant, which contains the alkaloid sophorin, a narcotic poison.

Alcohol plants. — Plants capable of yielding alcoholic liquors are also given pride of place, and there is much speculation as to whether Indians knew of the distillation process. The Indians of Mexico are acknowledged to have known about fermentation prior to the contact period, such as the Aztecs, who made *pulque* by fermenting the cooked hearts of various species of *Agave*, and *chicha*, a beer-like, maize-based drink (Havard 1896:33-38). Other alcoholic drinks reported include one made by the Tarasco of Mexico from mescal leaves (Bourke 1895:49); the Apaches' *tizwin* or *tulpi*, made from fermented maize, a product introduced from Mexico in the early 19th century; a drink of fermented fruit of the giant cactus (*Cereus* spp. [= *Carnegiea gigantea* (Engelm.) Brit. & Rose]), consumed by the Pima, Maricopa, and Yuma Indians, among others; *colonche*, another beverage of the Indians of Mexico, based on fruits of prickly-pear cacti (*Opuntia* spp.); the mesquite beer (*Prosopis juliflora*) of the Indians of the Colorado and Gila Rivers, and so on (Havard 1896:33-38). Since the Amerindians of the American Southwest and Mexico were familiar with fermentation, there is still debate as to why this process was not known in eastern North America, even though grape vines (*Vitis* spp.) were plentiful and wine making could well have developed.

Substance and product analysis. — Chemical analyses of many plants and of the products themselves were performed to evaluate their composition and with the aim of revealing some unknown active ingredient. In North America, Palmer for example gives the constituents of a bread made from fruit of the western juniper (*Juniperus occidentalis*), consumed by the Indians of Arizona and Mexico: "Water, 14.34; proteine compounds, 5.69; starch, 17.87; sugar, 10.66; cellulose, gum, oil, &c., (by difference) 47.58; ash, 3.86 = 100" (1871:411).

Pharmaceutical journals also published analyses of plants used by Natives. In the *American Journal of Pharmacy*, Trimble (1888-91) analyses five plants supplied to him by Havard, four food plants and one detergent plant. In the latter (*Chlorogalum pomeridianum*) he detects 1.87% saponin (6.95% in the dry bulb), which explains its soapy properties. In the British *Pharmaceutical Journal and Transactions*, Holmes (1883-1884a and b; 1884-1885a and b) comments in turn upon a vegetable tallow from Borneo, obtained from the fruit of *Hopea* spp. and used for various purposes (dyeing, candles, and machinery oil); limes from Trinidad whose oil could be profitably marketed; a Chinese plant with medicinal seeds; and various medicinal plants of the Cree Indians of Hudson Bay. In at least two cases the author provides detailed chemical analyses.

The starch, sugar, and carbohydrate content of a number of plants consumed by the Panamint Indians arouses the interest of Coville (1892), a botanist with the U.S. Smithsonian Institution. Heckel in France comments at length on the chemical composition of the seed used to make shea butter ("hygroscopic water, 6.72;

leaching by petroleum ether: fats, 45.36; leaching by alcohol: tanin, sugar, unidentified matter, 12.60; leaching by water: coloured gummy and other matter, 13.58; leaching by water: fixed salts, 1.82; iodized lime treatment: strange album. matter, 10.25; incineration: fixed salts, 0.18; by difference: ligneous and losses, 9.49") (1897:233), closing with a note on its richness in butterfat.

THE FIRST DESIGNATIONS

During this hectic time of discovery and search for new products, authors introduced neologisms to designate the new discipline or disciplines, proposed general investigatory methods, and carried out syntheses.

The historical context. — Many of the first ethnobiologists worked in museums. Ross (1861), an agent of the Hudson's Bay Company, collected Chipewyan artifacts for a museum in Edinburgh; Rochebrune (1879, 1882-1883) was an assistant naturalist at the Paris *Muséum* and worked with the state collections in the Trocadéro; Holmes (1883-1884a, b; 1884-1885a, b) was curator of the Museum of the Pharmaceutical Society in Great Britain; Mason (1889, 1894, 1899) was curator at the ethnology department of the Smithsonian Institution from 1884 to 1908; Hough (1898) and Fewkes (1896) were associates in the same department; Harshberger (1896a, b, c) was a professor of biology at the University of Pennsylvania, where he laid the foundations of ethnobotany based on a collection of artifacts; and Coville (1895) and Stearns (1889) were or would be curator and associate respectively at the Smithsonian Institution's Department of Biology. It was primarily these authors, particularly Stearns, Rochebrune, Harshberger, Mason, and Coville, who would lay the first foundation stones of ethnobotany and ethnozoology. They were primarily interested in the material products of the peoples they studied, whether archaeological or ethnographic, examples of industrial or of medical arts. This focus on products is central for understanding the origins of ethnobotany and ethnozoology. Emphasis was on economic products first of all, then on the species used to make them.

Let us examine the historical context in which the first formulations of these fields of study emerged. Ethnology was still in its infancy, having been an active concern for barely 50 years. Botanists had just come to an agreement at the Paris International Congress of 1867 on rules of nomenclature which would at least give scientists the world over a better forum for reaching an understanding as to what they were talking about (Lawrence 1951:196). At first, these rules were not religiously followed in writing about the economic uses of plants and animals, but as the discipline developed, they would become a *sine qua non* for any presentation of findings. It should also be added that not only are ethnobotany and ethnozoology among the oldest divisions of ethnology (ethnoecology, ethnoscience, ethnohistory, and ethnolinguistics are terms that were not born until the 1950s), they are also among the most stable, for they are frequently used — especially ethnobotany — and their definition and related methods are continuously being developed (see Table 1).

Applied botany. — In the early 19th century, the French botanist de Candolle (1819 [1813]) had proposed that botany be divided into three branches: botany proper,

TABLE 1. — Ethnobiology-related terms in the 19th century

Year	Author	Term	Definition
1813	Candolle	*Applied botany*	"study of the relations that exist between plants and the human species"
1875	Powers	*Aboriginal botany*	"all the forms of the vegetable world which the aborigines use for medicine, food, textile fabrics, ornaments, etc."
1879	Rochebrune	*Botanical ethnography*	study of plant remains which "provides invaluable information about the diet, hygiene and industry of a people who are no more"
1882-1883	Rochebrune	*Ethnographic conchology*	"that which relates to the use of Molluscs, whether as objects of adornment or industry, or as substances used for food, dyeing, textile fabrics, etc. among ancient and modern peoples"
1883-1884	Paso y Troncoso	*Botany*	plant science
1889	Stearns	*Ethno-conchology*	conchology "in its ethnological aspect"
1886	Matthews	*Plant-lore*	knowledge about plants
1895	Harshberger	*Ethno-botany*	ethno-botany helps elucidate the cultural position of tribes who use plants for food, shelter or clothing; provides information on the past distribution of plants; assists in the discovery of ancient trade routes; and serves to suggest new lines of manufacture
1899	Mason	*ethnozoölogy*	"zoölogy of the region as it is recounted by the savage"

organic botany or plant physics, and applied botany. The latter, defined as "the study of the relations that exist between plants and the human species," would include agricultural botany, medical botany, economic and industrial botany, and other subdivisions. This classification was to go unheeded for some time. Candolle was chiefly interested in botany proper. After briefly alluding to the realm of applied botany, he in effect abandoned it as an independent field, though it had been the subject of numerous, varied annotations in most of the works on plants and animals written since antiquity.

Aboriginal botany. — In 1875 in the United States, Powers — who had more of a background as a journalist and adventurer, having crossed America on foot in

1868 (Powers 1975:221) — proposed another term which proved short-lived. He referred to all of his data on the use of plants by the Bear River Nisenan as "aboriginal botany." These data concerned the economic uses of plants: "As employed in this paper the word, 'botany' is somewhat loosely comprehensive, and is used for the lack of a better. Under it are included all the forms of the vegetable world which the aborigines use for medicine, food, textile fabrics, ornaments, etc." (1875:373). This was the framework for Powers' discussion of 73 plants, identified in Latin with the help of a specialist and presented with their uses. He stated that in no way could the Indians have a classification system. Though they were very good observers, their knowledge as revealed by their complete nomenclature of plants could readily be explained by the pangs of hunger. In thus taking up the usual refrain of the period, Powers was thus clearly asserting, despite his use of the term "botany," that Natives could not claim to have knowledge comparable to that of civilized society.

The term "aboriginal botany" was rarely used. It is to be found in Mason in 1889 and in Coville in 1895, just before the coining of the term "ethnobotany," which was to replace it for good. In Mason (1889:235-239), "aboriginal botany" simply repeats the plant uses of the California Indians based on data from Powers and other sources. Coville uses the term in his "Directions for Collecting Specimens and Information Illustrating the Aboriginal Uses of Plants" (1895). These Directions were published by the U.S. National Museum along with other similar ones for collecting birds, fossil plants, small mammals, physical anthropology specimens, and so on. In France, the fifth edition of the *Instructions pour les voyageurs et les employés dans les colonies sur la manière de recueillir, de conserver et d'envoyer les objets d'histoire naturelle* (1860), published by the Muséum impérial d'Histoire naturelle[8], included an anthropology section for the first time, in addition to the established sections on zoology, botany, mineralogy, and geology. This very short section simply stressed the importance of collecting artifacts such as "weapons, instruments, fabrics, and generally all objects of a nature to furnish information about primitive industries" (1860:15). The zoology and botany sections contained strong recommendations to include in the collection notes the vernacular names of species, the uses made of their various parts, and the "folk opinions or superstitions" entertained in their regard.

Coville's Directions of 1895 reflect the same museological concerns, but they are extremely detailed for the period, and stand out as a founding text in terms of data collection methods. The Directions are also exclusively dedicated to the aboriginal uses of plants — a first in the history of ethnobiology. Coville proposes a set of general methods based on observation and inquiry ("conversation") to obtain data on "aboriginal botany" which is defined, as in Powers, as "primitive uses of plants." Three aspects are discussed: selection of informants (chiefs, medicine men, and Indian teachers are to be preferred), the specimens to be collected (plants as well as plant-based products, at all processing stages), and supporting notes.

Coville provides plenty of information about collection, selecting certain parts of plants to bring back, drying, mounting, and transportation, in short, every step required to create a classic herbarium. It should be remembered that he himself was a botanist. He indicates that all of these instructions have but one purpose —

scientific identification of the plant: "Probably the most important fact to be learned about a vegetable product of aboriginal use is the scientific name of the plant from which it was derived" (1895:4). With this directive, Coville definitively establishes the importance of the scientific name of the biological species as a basis for research and interchange among researchers. Coville (1895:6) also indicates the relevant notes which must accompany every specimen: 1. Number; 2. Common name; 3. Aboriginal name of plant; 4. Aboriginal name of derived product; 5. Tribe; 6. Place; 7. Uses; 8. Part used; 9. Date of collecting; 10. Collector; 11. General remarks. In conclusion, Coville presents a list of the main uses of plants by the Natives of North America. We cannot be indifferent to it, since the author had personally compiled a similar inventory for the Panamint of California (1892). The 1895 list, which aptly illustrates the substantial interest at that time in the products of the peoples studied, can be summarized as follows (1895:7-8):

Food:	
Foods proper	farinaceous, saccharine, herbaceous, fleshy fruits, condiments
Drinks	simple aqueous, acid, fermented, distilled, and narcotic drinks
Clothing	for protection and use; for ornament
House and furnishings	house frames and coverings, beds, and utensils
Heating, cooking, and lighting	matches, tinder, fuel, fire receptacles
Manufacture	general and special tools
Industries	hunting, trapping, fishing and harvesting devices
Travel and transportation	boats, land vehicles, packing utensils, snowshoes
Language communication	paper, ink, pens
War	weapons, painting
Amusement	outdoor and indoor games
Ceremonial and religion	musical instruments, dancing ornaments, pipes, tobacco
Medicinal plants	external and internal use

Botanical ethnography and ethnographic conchology. — In addition to Powers' (1875) "aboriginal botany," two new terms were coined in France at this time by Rocheburne: "botanical ethnography" (1879) for the study of plant usage and "ethnographic conchology" (1882-1883) for the study of the use of molluscs. Rochebrune worked at the Paris *Muséum national d'Histoire naturelle* with burial collections, mainly of South American origin. In the first case, the study of plant remains from the site of Ancon (Peru) "provides invaluable information about the diet, hygiene, and industry of a people who are no more" and proves an "indispensable complement to the ethnographic research" already under way (1879:344). The analysis is organized according to plant product, i.e., food and medicinal plants, followed by industrial and dye plants.

In the second case, comment is made on the uses of molluscs, "whether as

objects of adornment or industry, or as substances used for food, dyeing, textile fabrics, etc." The author invites us on a kind of "journey through the State collections" to explore a field where study is just beginning. Rochebrune quotes from a few works by Stearns, the American who in turn would propose the term "ethno-conchology" in 1889.

Ethno-conchology. — Ethno-conchology is a designation often cited by ethnobiologists as the first "ethno-" related to their discipline to appear in print. Stearns, who at that time had already written a great deal on the use of shells by Amerindians for monetary purposes, succinctly defined it as conchology "in its ethnological aspect." Hence this definition puts the emphasis on conchology, and the hyphenated prefix that associates this science with ethnology in the compound "ethno-conchology" is to be interpreted as an attendant circumstance: the two elements remain isolated; the ethnology aspect simply qualifies the malacology aspect. Stearns was in any case affiliated with a biology department, and his primary interest in usages seems to reflect this. The terms devised by Stearns and Rochebrune were soon forgotten, and subsequently rarely used.

Plant lore or genuine botany? — Those with a real interest in aboriginal knowledge were not legion in the late 19th century. There is Matthews (1886), whom we quoted earlier, who describes the botanical knowledge of the Navajo, particularly their nomenclature, as "plant-lore," a term that would be picked up by Mooney (1889) solely to designate the plant mythography of the Cherokee he was studying. Above all, however, a certain Mexican historian, also mentioned above, stands as a precursor from every point of view, by virtue of his assertions and analyses to the effect that the Aztecs of Mexico had a genuine botany comparable to modern science. This of course is Paso y Troncoso (1883-1884), who left a study of Nahuat botany — which he refers to as "botany" pure and simple, with no qualification — written as the first part of a planned trilogy on the history of medicine in Mexico, which was also to include a study of the materia medica of the ancient Mexicans and an epidemiological study. This trilogy was supposed to stand as a thesis in medicine, but was never finished; all we have is the botanical study, which itself is incomplete (Galindo y Villa 1923).

Paso y Troncoso constructs his argument from historical sources, in particular works by Francisco Hernández (16th century) and Bernardino de Sahagún and various codices. In brief, his thesis is that the ancient Indians developed two sciences of observation, namely natural history and astronomy. Their botanical science achieved a very high degree of perfection and was disseminated even to the least educated classes of society.

Paso y Troncoso assigns much importance to the botanical gardens maintained by the monarchs. Among other things, these gardens allowed for the study of new specimens — chiefly ornamental, medicinal, and food plants — brought back from Aztec conquests in distant regions. Experiments were conducted with the medicinal plants. There were even irrigation systems which made it possible to conserve plants from wet areas or, conversely, arid ones. The Nahua may not have been the only people to maintain such gardens. Oral tradition mentions others among the Tarasco at Pátzcuaro. Paso y Troncoso quotes the following comments by the Italian Conde Carli on the arrangement of the gardens:

> "Bernard Diaz who accompanied Cortez, Herréra and Solis report that the Emperor of Mexico and the Nobles had Gardens where they cultivated medicinal plants for public use, and that they were most proud of this prodigious quantity of medicinal herbs which they had divided into Classes and beds, with surprising intelligence." (Carli *in* Paso y Troncoso 1883-1884:163)

According to Paso y Troncoso, medicine was a major reason for the Nahua's interest in the botanical study of plants. The study of properties had to include a comparison phase, followed by a description which, in Nahua society, took the form of an iconography of nomenclature and classification. This iconography served didactic and mnemonic purposes. The author provides numerous examples, including the following which aptly indicates how a single symbol can encompass a bewildering amount of information about a plant. The symbol is taken from the Codex Mendocino, and refers in this case to a pine:

> The conjunction of these signs tells us: that the plant was arborescent; that the bark was deeply fissured, whether naturally or artificially; that these fissures exuded a resinous product; that the frugiferous inflorescence was sessile, conical in shape, with an uneven reticulate surface by reason of the assemblage of bracts or ligneous scales; and lastly, that the leaves of the tree were linear, stiff and erect. (1883-1884:204-205)

The Nahua had also developed a nomenclature for the parts of plants, which Paso y Troncoso presents and analyses as a "glossology." The plant nomenclature itself was "a systematic nomenclature which shows major analogies with that used by modern science since the time of Linnaeus" (1883-1884:213-214). The author examines in detail the system of names which, like that of Linnaeus, is based on the rule that a good nomenclature must give a true idea of the thing described and mention at least one characteristic property. Nahuat nomenclature is generally binomial, featuring a term for the genus followed by a species qualifier. There are names with three components or more which generally correspond to Linnaeus' varieties. The classification groups also contain prototypes, here referred to as type species, which bear the same name as the generic group. While acknowledging that the Linnean system is more highly developed than that of the Nahua on account of its scope and access to means of communication which allow for the accumulation of knowledge, Paso y Troncoso nonetheless states that if the ancient Mexicans had worked together like European botanists, their science "could no doubt have competed with that of modern times" (1883-1884:217).

While it has its imperfections, the Nahuat classification demonstrates some major similarities with modern classification. It is based on dual horizontal and vertical differentiation, since it assumes "ready recognition of each element that is grouped, and distinction of these elements from each other, and from one group to another" (1883-1884:224). According to what Hernández reports, the number of plants classified, synonyms excluded, is 1,000, compared with the 600 plant species which form the basis for the work by Dioscorides, the Greek physician. The Nahuat classification is the product of observation, comparison and experimentation, as in the Old World. Finally, Paso y Troncoso claims that it can be divided

into two very close branches: an artificial (or arbitrary) classification and a natural classification. The author presents a few examples of the first system, giving classification terms and their operative mode for the following groups: 1) *xihuitl* 'grasses', 2) *quahuitl* 'trees', 3) *mecatl* 'cord plants', 4) *patli* 'medicinal plants', 5) *quilitl* 'food plants, cultivated and gathered', 6) *xochitl* 'flowers, ornamental plants'. The second system was never to be presented, for the study by Paso y Troncoso ended just when most awaited.

Paso y Troncoso's work is not well known. It is not quoted by the historians of ethnobotany, and when other authors refer to it they ignore its significance. Paso y Troncoso spoke about Aztec botany, not "Aztec *folk* botany" (Atran 1990:20; our emphasis) or "classical Nahuatl *ethno*botany" (Berlin 1992:110; our emphasis), as it is termed by two modern writers. The difference is subtle but important. At issue is whether or not non-Western societies have knowledge equivalent to science. From this perspective, Paso y Troncoso remains a founding father of ethnobotany and ethnobiology. His analyses of glossology and classification, which clearly stray from a strict concern about products, stand as precursors, long before their time, of the work on nomenclature and classification that will be done, mainly in North America, in the 1950s and afterwards.

Ethno-botany. — The major contribution of this Mexican Americanist notwithstanding, when it comes to associating one name with the foundation of ethnobiology and, in particular, ethnobotany, the unanimous choice is J.W. Harshberger. In Europe, the Americas, Asia, and Africa, all concur in regarding him as the father of the term ethnobotany, which first appeared as the qualifier and compound "ethnobotanic" in a Philadelphia newspaper on October 26, 1895 (Anonymous 1895a). The article in question, by an unknown journalist, summarized certain comments by Harshberger which would be published the following year in a scientific article (Harshberger 1896a), or as part of a scientific article (Harshberger 1896b, 1896c), on the possibility of creating a "Public Ethno-botanic Garden" adjoining the future museum buildings planned by the University of Pennsylvania at Philadelphia. This garden, which apparently was never established, would have had the dual mission of public education and assistance in scientific research. The context of this first mention of ethnobotany is very significant. That context is still museological: hence it is material, in this case the plant collection, which serves as the basis for the discipline. The article states that Harshberger is also a university professor, an instructor in botany, general biology, and zoology: the product of a biologist, "ethno-botany" is thus still conceived with a hyphen, and despite the fact that this is an ethnology and archaeology museum, support for the garden is primarily botanical, since it is plants that will be exhibited (maize, sunflower, tobacco, tomato, potato, oak, etc.) and not ethnographic artifacts.

On December 4, 1895, Professor Harshberger delivered an address to the Archaeological Association of the same university which was reported in the local newspaper (Anonymous 1895b). In early 1896 this speech was simultaneously published in two scientific journals, one botanical, *The Botanical Gazette*, and the other historical, ethnological and archaeological, *The American Antiquarian*. In it Harshberger formulates the four basic objectives of the discipline, illustrated with examples from European archaeology, but chiefly with artifacts of Amerindians

from the Southwest (Anasazi), comprising an archaeological collection presented at an international exhibition. These objects are all plant products — chiefly foods, clothing, and utensils. The four objectives are as follows:

1. "The study of ethno-botany aids in elucidating the cultural position of the tribes who used the plants for food, shelter or clothing."
2. "An ethno-botanical study throws light upon the past distribution of plants."
3. "An ethno-botanical study helps us to decide as to the ancient trade routes."
4. "Ethno-botany is useful as suggesting new lines of manufacture."

The first objective is typical of its period, since it implies an evolutionist breakdown of peoples as "savage, pastoral, agricultural, and civilized" (1896c:146). The second reflects purely botanical concerns, since it involves discovering the migration routes of plants as hidden behind the routes of the humans investigated in the third objective, concerning trade routes. The final objective is also typical of the period, since it refers to the idea of discoveries of new uses or new techniques of manufacture. An example of a "new" drug was given in this regard.

Harshberger also goes into some detail about the methods that can draw the maximum of information from the products or plants studied in "ethno-botany" (microscopic examination, formula for determining the specific gravity of specimens, ash determination, weighing, dendrochronology). He insists on microscopic study as proper to the discipline: "The especial province of ethno-botany is to study microscopically the nature of the fiber employed, as in many cases new methods of obtaining raw materials from hitherto undeveloped sources might be suggested" (1896c:152). The author closes with a plea for appropriate research resources, which should include a collection of seeds from each plant, microscopic slides, and above all, as we have mentioned, a garden, which should allow for the conservation of live specimens which could be used, for example, for comparison purposes to identify the plants used to manufacture the products analysed.

Harshberger's text is the first formulation of theory in the field of ethnobotany. The objectives it targets are still strongly influenced by botany and museological interests, but the process has been set in motion, and it will snowball. To this day, ethnobotany has remained the single most stable and most widespread term in ethnology to designate one of its fields of activity.

The influence of Harshberger was immediately felt in what appears to be the first academic thesis in the field, although its author Jenks (1898 for the published version) speaks of a research project in "primitive economics" rather than in ethnobotany. However, his dissertation, presented in Madison at the University of Wisconsin's School of Economics, Political Science and History, concerns a plant, wild rice; and in his introduction, while not officially quoting from Harshberger, the author unquestionably refers to him when formulating the results he has achieved: "This study has *helped to elucidate the culture position of the tribes* which used wild rice [...]. It has given a detailed picture of aboriginal economic activity [...]. It has thrown light upon the almost constant warfare between the Dakota and Ojibwa Indians [...]. It has *suggested new lines of manufacture*" (Jenks 1898:1019; our

emphasis). Here is a verbatim statement of two of the four objectives set forth by Harshberger in his text of 1896(c).

During the same period, Harshberger also had — or may have had[9] — an influence on a few U.S. ethnologists who referred to ethnobotany to describe or present their work, although they used the term without a hyphen (Fewkes 1896; Hough 1897, 1898). In doing so they perhaps considered ethnobotany as an activity which rightfully falls within the scope of ethnology, something not suggested by Harshberger's compound of ethno-botany, which conveyed more the idea of botany as applied to ethnology. Whatever the case, "ethno-botany" was not to disappear — it would even be used by certain ethnologists — and the constant to-and-fro between the two forms, and indeed the two concepts, was to fuel in part the development of the new field of research.

Ethnozoölogy. —In 1899, Mason, a curator at the Smithsonian's Department of Ethnology, coined the term " ethnozoölogy," using the same model as Harshberger but with more emphasis on the ethnological aspect, Mason defined "ethnozoölogy" as the "zoölogy of the region as it is recounted by the savage" (1899:50), which he conceived as a division of a broader science called "zoötechny", whose task it is to study "all industries associated with the animal kingdom" (1899:45). "Zoötechny" had seven branches: 1) American Indian zoölogy, 2) methods of exploiting animals, 3) the elaboration of products from animals, 4) the products themselves, 5) social organization of the users, 6) knowledge about animals, and 7) religious aspects of man-animal interaction. The fact that Mason excludes " knowledge" about animals from "American Indian zoölogy" ("or ethnozoölogy in America") in itself tells us something about his definition of the latter term. For Mason, " ethnozoölogy" amounts to an Aboriginal list of the animals used particularly the subsistence species — in the region studied by the ethnologist. To illustrate, he cites many supporting examples of lists of animals reported by Americanist ethnologists who had worked with Indians from Alaska to Tierra del Fuego. On the other hand, the whole linguistic aspect of knowledge, whether the Native nomenclature for the "different forms of animal life" or for "different parts of the animal's body," is relegated to the sixth branch of "zoötechny," namely, "knowledge about animals" (1899:79).

CONCLUSION

In the years ahead, ethnozoology would not experience the same good fortune as ethnobotany, whose position would be constantly consolidated. This may have been due to the excessive subdivision proposed by Mason in his initial text, or his treatment of ethnozoology as part of a science and not a science in itself[10]. However, the two pillars of ethnobiology had now been erected. The material and economic base had been identified. Mason, Harshberger, as well as the other theorists and practitioners of the late 19th century, were primarily interested in economic uses of the biological elements in the environment; and it is the study of these products, old or new, archaeological or contemporary, and that of the materials used by Natives to manufacture them, that were at the core of such investigations. The initial threefold origin of ethnobiology — economic, material, and museological — would continue to mark the orientation of this discipline for a long time to come.

NOTES

[1]This text is an abridged version of the first chapter of a work being prepared on the history, theories, and methods of ethnobiology made possible by a research associate contract in 1996 at the Laboratoire de Langues et Civilisations à Tradition Orale (LACITO, UPR 3121), of the Centre national de la recherche scientifique (CNRS) in Paris. The text was first written in French and has appeared as such in *Anthropologica* (40:109-128, 1998) the official publication of the Canadian Anthropology Society. Michael Ustick is responsible for this translation into English.

[2]This definition is discussed further in Clément (1995:5-61; 1998).

[3]In the 1970s, the term «Digger» was still being used pejoratively to designate chiefly the Nisenan, a Maidu people of California. They traditionally fed on various roots, grasshoppers, ants, etc. (Wilson and Towne 1978).

[4]This question of a different stomach must be considered in its context, namely the evaluation of races, a concern already noted in respect to the distinction between civilized and uncivilized that suffuses many studies of that period. It is not specific to ethnobiology. As William Balée told me — for which I am very grateful — the well-known anthropologist W.H.R. Rivers (1901) held the same opinion when he suggested that the paucity of color terms in "primitive" languages could probably be attributed to a physiological difference of the retina of the people under study (Berlin and Kay 1969:148).

[5]Powers probably assessed differently the same Nisenan that Palmer and others disparaged.

[6]I am thankful to Gary J. Martin for having directed my attention to this phenomenon.

[7]This is its most recent name. Since its creation in 1921, the journal has had various titles and subtitles.

[8]By the early 19th century, at least one methodological text specifically devoted to the collection of ethnographic data had been written as part of Baudin's French expedition to Australia (Copans and Jamin 1978). However, this text by J.M. de Gérando, «Considérations sur les diverses méthodes à suivre dans l'observation des peuples sauvages, 1800,» was to have very little influence on the development of French anthropology. So far as our subject is concerned, it contains no particular directive regarding methods of ethnobiological investigation, any more than the text by F. Péron published as part of the same expedition, «Observations sur l'anthropologie, ou l'histoire naturelle de l'homme, 1800,» which at most insists on the need to take an interest in Aboriginal medical knowledge. Fowler (1975), in his inventory of inquiry methods used in anthropology up until the 19th century, reports a few questionnaires which include aspects of ethnomedicine and one questionnaire on animal superstitions (Thomas 1900). Fowler (1975) does not cite Coville's Directions of 1895. Thomas's questionnaire on animals is probably the first published questionnaire of an ethnozoological nature.

[9]Fewkes published his "A Contribution to Ethnobotany" in the January issue of the *American Anthropologist* of 1896. He does not refer to Harshberger and his article must have been submitted in 1895, about the time Harshberger coined the term ethno-botany. It is still unknown if Fewkes was influenced by Harshberger or if he coined the term independently.

[10]Mason's contribution has fallen into oblivion; this article is never cited and ethnobiologists invariably attribute the original coining of the term "ethnozoology" to J. Henderson and J.P. Harringtonin in 1914.

ACKNOWLEDGEMENTS

I wish to thank all the members of the cultural linguistics department of the LACITO (CNRS) in Paris who kindly commented on the first draft of this text, as well as the three anonymous reviewers of the *Journal of Ethnobiology* who provided useful comments. Thanks also to Michael Ustick for translating the article into English.

LITERATURE CITED

ANONYMOUS. 1895a. Museum and garden. Philadelphia Evening Telegraph, 26 Oct., pg. 5.

ANONYMOUS. 1895b. Some new ideas. Philadelphia Evening Telegraph, 5 Dec., pg. 2.

ANONYMOUS. 1902. Les succédanés du thé. Revue des cultures coloniales XI (107):114-117.

ATRAN, SCOTT. 1990. Cognitive Foundations of Natural History. Towards an Anthropology of Science. Cambridge University Press, Cambridge, and Éditions de la Maison des Sciences de l'Homme, Paris.

BERLIN, BRENT. 1992. Ethnobiological Classification. Principles of Categorization of Plants and Animals in Traditional Societies. Princeton University Press, Princeton, New Jersey.

———, DENNIS E. BREEDLOVE, and PETER H. RAVEN. 1974. Principles of Tzeltal Plant Classification. An Introduction to the Botanical Ethnography of a Mayan-Speaking People of Highland Chiapas. Academic Press, New York and London.

——— and PAUL KAY. 1969. Basic Color Terms: Their Universality and Evolution. University of California Press, Berkeley and Los Angeles.

BOURKE, JOHN G. 1895. The Folk-Foods of the Rio Grande Valley and of Northern Mexico. Journal of American Folk-Lore 8 (28):41-71.

BROWN, ROBERT. 1868. On the vegetable products, used by the north-west American Indians as food and medicine, in the arts, and in superstitious rites. Transactions of the Botanical Society of Edinburgh IX:378-396.

CANDOLLE, A.-P. de. 1819 [1813]. Théorie élémentaire de la Botanique ou Exposition des Principes de la Classification naturelle et de l'art de décrire et d'étudier les végétaux. 2nd edition. Deterville, Paris.

CASTETTER, EDWARD F. 1935. Uncultivated Native Plants Used as Sources of Food. Ethnobiological Studies in the American Southwest I, Biological Series 4 (1). University of New Mexico Bulletin 266, Albuquerque.

CHAMBERLAIN, ALEXANDER F. 1891a. The maple amongst the Algonkian tribes. American Anthropologist 4(1):39-43.

———. 1891b. Maple sugar and the Indians. American Anthropologist 4(4):381-383.

CHANDRA, SUDHIR. 1991. Foundations of Ethnobotany (Pre-1900 Ethnobotany). Deep Publications, New Delhi.

CLÉMENT, DANIEL 1995. La zoologie des Montagnais. Ethnosciences 10. Peeters-Selaf, Paris.

———. 1998. L'ethnobiologie / Ethnobiology. Anthropologica 40(1):7-34.

CONKLIN, HAROLD C. 1954. The relation of Hanunóo culture to the plant world. Ph.D. dissertation. Yale University, New Haven, Connecticut.

COPANS, JEAN, and JEAN JAMIN (editors). 1978. Aux origines de l'anthropologie française. Éditions Le Sycomore, Paris.

COVILLE, FREDERICK VERNON. 1892. The Panamint Indians of California. American Anthropologist 5 (4):351-361.

———. 1895. Directions for collecting specimens and information illustrating the aboriginal uses of plants. Bulletin of the United States National Museum 39, Part J:1-8.

CUSHING, FRANK HAMILTON. 1920 [1884-1885]. Zuñi Breadstuff. Indian Notes and Monographs 8:1-673.

DAVIS, WADE. 1994 [1991]. Towards a new synthesis in ethnobotany. Pp. 341-357 *in* Las Plantas y El Hombre. Memorias del Primer Simposio Ecuatoriano de Etnobotánica y Botánica Económica. M. Ríos and H. Borgtoft Pedersen (editors). Ediciones ABYA-YALA, Quito, Ecuador.

FEWKES, J. WALTER. 1896. A contribution to ethnobotany. American Anthropologist 9:14-21.

FORD, RICHARD I. 1994. Preface to second edition. Pp. viii-xxxii *in* The Nature and Status of Ethnobotany. Richard I. Ford (editor). Museum of Anthropology, Anthropological Papers No. 67. University of Michigan, Ann Arbor.

———. 1994 [1978]. Ethnobotany : Historical Diversity and Synthesis. Pp. 33-49 *in* The Nature and Status of Ethnobotany. Richard I. Ford (editor). Museum of Anthropology, Anthropological Papers No. 67. University of Michigan, Ann Arbor.

FOWLER, D. D. 1975. Notes on inquiries in anthropology: A bibliographic essay. Pp. 15-32 *in* Toward a Science of Man. Essays in the History of Anthropology. T.H.H. Thoresen (editor). Mouton Publishers, The Hague.

GALINDO Y VILLA, JESUS. 1923. Don Francisco Del Paso y Troncoso. Memorias y Revista de la Sociedad Científica "Antonia Alzate" 42 (3-6):135-304.

HARSHBERGER, JOHN W. 1896a. Ethnobotanic gardens. Science N.S. 3(58):203-205.

———. 1896b. The purposes of ethnobotany. The American Antiquarian 17(2):73-81.

———. 1896c. The purposes of ethnobotany. The Botanical Gazette 21:146-154.

HAVARD, V. 1895. Food plants of the North American Indians. Bulletin of the Torrey Botanical Club 22 (3):98-123.

———. 1896. Drink plants of the North American Indians. Bulletin of the Torrey Botanical Club 23 (2):33-46.

HECKEL, E. 1897. Sur l'arbre africain qui donne le beurre de Galam ou de Karité, et sur son produit. Revue des cultures coloniales 1(6):193-198; 1(7):229-233.

———. 1900. Contributions à l'étude des plantes médicinales et toxiques employées par les indigènes de la Côte d'Ivoire (Afrique occidentale). Revue des cultures coloniales 7(61):548-553.

HENDERSON, JUNIUS, and JOHN PEABODY HARRINGTON. 1914. Ethnozoology of the Tewa Indians. Bureau of American Ethnology Bulletin 56. Government Printing Office, Washington, D.C.

HENSHAW, H.W. 1890. Indian origin of maple sugar. American Anthopologist 3(4):341-351.

HOLMES, E.M. 1883-1884a. Vegetable tallow from Singapore. The Pharmaceutical Journal and Transactions. Third Series 14:401.

———. 1883-1884b. Essence of limes from Trinidad. The Pharmaceutical Journal and Transactions. Third Series 14:1005.

———. 1884-1885a. Lukrabo or TA-FUNG TSZE. The Pharmaceutical Journal and Transactions. Third Series 15:41.

———. 1884-1885b. Medicinal plants used by the Cree Indians, Hudson's Bay Territory. The Pharmaceutical Journal and Transactions. Third Series 15:302-304.

HORNADAY, WILLIAM T. 1889. The extermination of the American Bison. Annual Report of the Board of Regents of the Smithsonian Institution 1887, Part II:367-548.

HOUGH, WALTER. 1897. The Hopi in relation to their plant environment. American Anthropologist 10(2):33-44.

———. 1898. Environmental interrelations in Arizona. American Anthropologist 11(5):133-155.

HUNN, EUGENE S. 1977. Tzeltal Folk Zoology: The Classification of Discontinuities in Nature. Academic Press, New York, San Francisco, London.

JENKS, ALBERT ERNEST. 1898. The wild rice gatherers of the Upper Lakes: A study in American primitive economics. Annual Report of the Bureau of American Ethnology, Vol. 19, Part 2:1013-1137.

LASNET, DR. 1900. Notes sur la pharmacopée des Sakalaves du nord-ouest de Madagascar. Revue des cultures coloniales 6(49):171-175; 6(50):209-213; 6(51):233-238.

LAWRENCE, G. H. M. 1951. Taxonomy of Vascular Plants. The MacMillan Company, New York.

LeCOMTE, HENRI. 1897. Notre programme. Revue des cultures coloniales 1(1):4-5.

MASON, OTIS TUFTON. 1889. The Ray Collection from Hupa Reservation. Annual Report of the Board of Regents of the Smithsonian Institution 1886, Part I:205-239.

———. 1899. Aboriginal American zoötechny. American Anthropologist 1:45-81.

MATTHEWS, WASHINGTON. 1886. Navajo names for plants. The American Naturalist 20(9):767-777.

MEARNS, EDGAR A. 1896. Ornithological vocabulary of the Moki Indians. American Anthropologist 9(12):391-403.

MOONEY, JAMES. 1889. Cherokee plant lore. American Anthopologist 2(3):223-224.

———. 1891. The sacred formulas of the Cherokees. Seventh Annual Report of the Bureau of American Ethnology (1885-1886):301-397.

MURDOCK, GEORGE P. *et al.*. 1950. Outline of Cultural Materials. 3rd ed. Human Relations Area Files, Inc., New Haven, Connecticut.

MURRAY, STEPHEN O. 1982. The dissolution of "classical ethnoscience". Journal of the History of the Behavioral Sciences 18:163-175.

MUSÉUM IMPÉRIAL D'HISTOIRE NATURELLE. 1860. Instructions pour les voyageurs et les employés dans les colonies sur la manière de recueillir, de conserver et d'envoyer les objets d'histoire naturelle. Fifth edition. Imprimerie de L. Martinet, Paris.

PALMER, EDWARD. 1871. Food products of the North American Indians. Report of the Commissioner of Agriculture for the year 1870:404-428.

———. 1874. The berries of *Rhamnus croceus* as Indian food. American Naturalist 8(4):247.

———. 1878. Plants used by the Indians of the United States. The American Naturalist 12(9):593-606; 12(10):646-655.

PASO Y TRONCOSO, FRANCISCO del. 1883-1884. Estudios sobre la Historia de la Medicina en México. Anales del Museo Nacional de México 3(5):137-192; 3(6):193-235.

PERRIER DE LA BATHIE, H. 1902. L'élevage sur la côte ouest de Madagascar. Revue des cultures coloniales 11(104):1-5.

POWERS, STEPHEN. 1875. Aboriginal botany. Proceedings of the California Academy of Sciences 1873-1874 5:373-379.

———. 1975. Autobiographical sketch. Pp. 221-222 *in* The Northern California Indians. Stephen Powers. A reprinting of 19 articles on California Indians originally published 1872-1877. R.F. Heizer (editor). Contributions of the University of California Archaeological Research Facility 25. University of California, Berkeley.

RIDEAU, L.. 1901. Notes sur la culture et l'exploitation du cocotier dans la province de Binh-Dinh (Annam). Revue des cultures coloniales 9(82):76-82; 9(83):117-121.

ROCHEBRUNE, A.T. de. 1879. Recherche d'Ethnographie botanique sur la flore des Sépultures péruviennes d'Ancon. Actes de la Société Linnéenne de Bordeaux XXXIII (4ième série, t. III):343-358.

———. 1882-1883. De l'emploi des mollusques chez les peuples anciens et modernes. Revue d'ethnographie 1:465-482; 2:311-320.

ROSS, BERNARD ROGAN. 1861. An account of the animals useful in an economic point of view to the various Chipewyan tribes. Canadian Naturalist and Geologist 6:433-445.

———. 1862. An account of the botanical and mineral products, useful to the Chipewyan tribes of Indians, inhabiting the McKenzie River District. Canadian Naturalist and Geologist 7:133-137.

SÉBIRE, A. 1899. Les plantes utiles du Sénégal. Plantes indigènes — plantes exotiques. J.-B. Baillière et Fils, Paris.

STEARNS, ROBERT E.C. 1889. Ethnoconchology. A study of primitive money. Annual Report of the Board of Regents of the Smithsonian Institution 1887, Part II:297-334.

STICKNEY, GARDNER P. 1896. Indian use of wild rice. American Anthropologist 9(4):115-121.

THOMAS, N.W. 1900. Questions on animal superstitions. The Journal of the Anthropological Institute of Great Britain and Ireland 30, Anthropological Reviews and Miscellanea No. 114:114-116.

TRIMBLE, HENRY. 1888-1891. Some Indian food plants. American Journal of Pharmacy 60:593-595; 61:4-6, 556-558; 62:281-282, 598-600; 63:525-527.

WILSON, NORMAN L., and ARLEAN H. TOWNE. 1978. Nisenan. Pp. 387-397 *in* Handbook of North American Indians, Vol. 8, California. W.C. Sturtevant (editor). Smithsonian Institution, Washington, D.C.