"Huichol" Stills: A Century of Anthropology – Technology Transfer and Innovation

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Introduction

Distillation (fractional distillation) allows the separation of materials using heat, variable boiling points and condensation. This can involve alcohol from ferments, or oils, also water desalination, and in China such things as obtaining liquid mercury from cinnabar.[5] Distillation history has in the past particularly been focused on Europe,[6] and distillation was considered by Forbes to have been invented there and to have disseminated to other cultures from Europe. It is generally explained as deriving from alchemy, using serpentine appliances usually of glass, a type well represented in many older European books focusing on technology and discussed by Forbes. Despite this emphasis in the histories, distillation was widely known in Asia from an early date and used devices entirely different from the mainstream serpentine units of Europe.[7] Mexico also has its very old traditions of distillation using Asian distillation techniques as well as those of Europe, with their technologies derived from serpentines, in the modern tequila industry, for example. It could even have had its own pre-Columbian tradition of distillation.

The ethnologist Henry J. Bruman has explained the presence of the Asian techniques in western Mexico as due to the "Manila Galleon" trade (1565–1815) that linked Manila (and China, including a then large Chinese popula-

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5 Needham, Ho and Lu 1980, 77ff and *passim*.
6 Forbes 1970.
7 Needham, Ho and Lu 1980; Huang 2000.

tion in the Philippines) to Colima province and then Acapulco, on Mexico's Pacific coast.[8] Coconut wine and coconut wine distillation was introduced to the area in the seventeenth century if not well before.[9] In this case Bruman's interpretation contrasted with an earlier explanation given by Lumholtz who claimed that there were "Huichol" stills so rustic and old in appearance that they implied a pre-conquest knowledge of distillation.[10]

Since the late 1990s, other researchers have worked to add more evidence regarding Mexico's "Filipino stills" of the Bruman hypothesis.[11] Nonetheless, following up suggestions by Needham and his collaborators,[12] recently the hypothesis of a pre-Columbian tradition of distillation has been revived.[13] This is in part because of the perceived similarity of early vessel and pottery types in China and Mexico for which a connection to distillation or at least its antecedents has been claimed in both cases. Nonetheless, despite the similarity of some early Chinese vessels to vessels of the Capacha-style from Colima in western Mexico,[14] some of which Zizumbo and his collaborators have claimed were used to make a distilled liquor,[15] there is no indication that such vessels were used to make ethanol in either China or Mexico. Zizumbo and his team have proved that the pots could have been used to distill liquor but not that they were. For certainty residue analysis will be required.

Thus, for our purposes, a comparative history of alcohol distillation as it relates to Mexico, specifically its still technology, begins with Bruman. In the present study we focus solely on Asian stills adapted in Mexico by artisan producers and tribes, looking also at links with a larger Asian world where many groups have used the same technology.[16] As ethnographically described by Needham and his collaborators there were three types of early Eurasian stills, a Mongolian, a Chinese and the Gandharan.[17] The latter type is non-existent in

8 Bruman 1940 [2000]; Schurz 1959.
9 Bruman 1944a, 1944b, 1945; Sauer 1948.
10 Lumholtz 1902.
11 E.g., Zizumbo and Colunga 2008.
12 Needham, Ho and Lu 1980, 106f.
13 Most recently Zizumbo et al. 2009.
14 Capacha pottery, dated to between 1820 and 1720 BC, is the oldest in Mexico. Capacha vessels have wide mouths, and unique shapes.
15 One Capacha variant is formed from overlapped pots joined together by thin pipes with a stirrup, and a narrow mouth. This variant has been associated with distillation by Zizumbo and his team (Zizumbo et al. 2009).
16 Valenzuela, Park and Buell (forthcoming).
17 Needham, Ho and Lu 1980.

Mexico. By contrast, Chinese-type stills mentioned by Bruman as "Filipino still"[18] have many variants among Mezcal producers in Mexico;[19] but what about the "Huichol"-type stills discovered in the late nineteenth century by Lumholtz? Clearly they are part of an older stratum of alcohol production, as will be seen below.

Most alcohol production in Mexico is illegal and underground, thanks to official control of the modern tequila industry. It also is part of the ceremonial rituals of many social groups in Mexico and in many other countries. The World Health Organization estimates that 40% of alcohol is comprised of illegally made national liquors.

Because of its illegality, traditional knowledge associated with the alcohol of national liquor producers, such as those producing mezcal at the folk level in Mexico and in the world, is not commonly investigated. Doing so is not easy in any case. Leaving aside the remoteness of many producing communities, information about alcohol production is kept secret and obscure, partly to confuse government enforcers. Successful commercial developments are at risk from competitors when modern technology is introduced to achieve a greater volume, not particular quality of production, hence the unwillingness of modern producers to tolerate independent producers no matter how primitive the technology involved. Nonetheless, even though not tolerated, the older rudimentary technology found among the alcohol-producing societies, and other smaller producers, embodies a large amount of knowledge. Fully evaluated, it could prove useful in re-writing the history of alcohol. Based in the alcohol production links between Mexico and Asia, we have studied only the most ancient stills (not the Arab-influenced serpentines)[20], to achieve an ethnographic approach and make our preliminary classifications. In the future, as our research progresses, we will have available more information about these devices and be able to compare evolution, adoption and development in more detail, including specific responses to local needs and conditions in a variety of cultures.

18 Bruman 1940 [2000].

19 Valenzuela 2014.

20 Moorish influence on Mexico and its cultures, is a rich topic that is beyond the scope of this short paper.

Methods and Study Areas

Fieldwork among non-industrial mezcal producers has been carried out since 1984 in Oaxaca[21] and Jalisco States in Mexico (see map following). Ethnographical and ethno-botanical techniques have been applied during this research carried out along different research lines.[22] During the fieldwork, interviews with participants have focused on the specific agave plants species used in mezcal production, and on stills types for distillation, all photo documented. Between 2006 and 2013, as part of the process of Mezcal local study, photographs made by those visiting the relevant areas have been reviewed for still identifications as connected to sampling areas. During 2013 fieldwork by Ana Valenzuela intensified in the Huichol ethnic area in Jalisco. This was in connection with the identification of this domain by Faba and Aedo as a ceremony point for *tuchi* (a mezcal) production.[23] In our comparative analysis, we have collected information regarding function, components and device design.[24] References, illustrations, photographs and descriptions have been analyzed comparatively. In February 2013, a visit was made by Ana Valenzuela to the Museo Regional de Guadalajara to examine stills in its collection.

Among areas studied, San Miguel Huaixstita,[25] or Huiaistita (Tsikwaita), is a Mezquitic municipality in northern Jalisco state in Mexico. It has been reported as a ceremony point for *tuchi* production.[26] A "Huichol" style of still had been registered there previously by others, but not consistently. A site visit was made in February 2013. The visit began with interviews conducted in Colotlán, Mezquitic and Huejuquilla, before moving on to San Miguel Huaixtita. Those interviewed about huichol stills comprised three doctors, four health center workers, three mezcal sellers, two teachers and eight Huichol. It was not easy to discover facts since those interviewed were not very candid.

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21 Valenzuela and Lopez 1984.

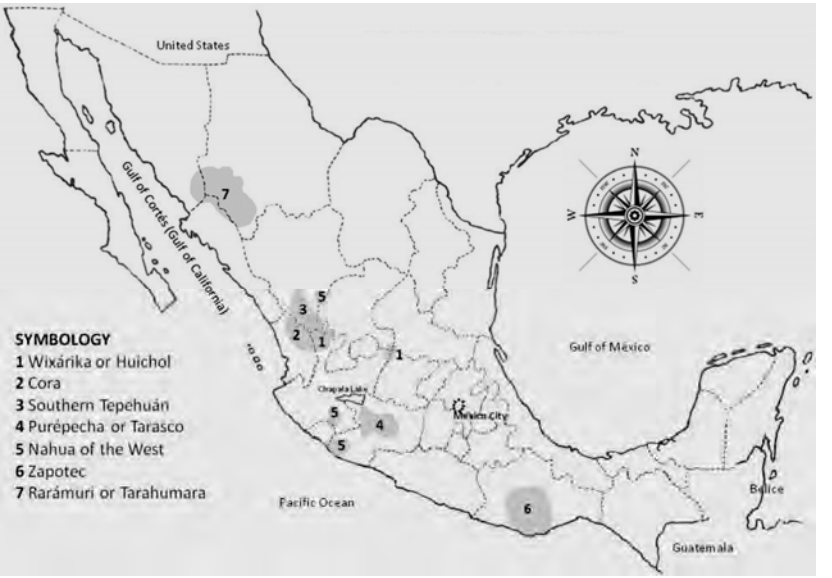
22 Valenzuela 2003a; Valenzuela and Nabhan 2003; Valenzuela et al, 2008; Valenzuela and Gaytan 2012.

23 Faba and Aedo 2003. *Tuchi*, a soft mezcal, is a distilled beverage produced in the Great Nayar area by the Wixárika or Huichol. Discussed by Carl Lumholtz, it has largely disappeared from production, replaced in rituals by other beverages.

24 Valenzuela, Regalado and Mizoguchi 2008; Valenzuela 2014.

25 San Miguel Huaixstita belongs to the community of San Sebastián Teponahuastlán, "Wuatüa. The population is some 539 persons and the town is located at an average height of 1560 meters above the sea.

26 Faba and Aedo 2003.



Map 1 Mexican ethnic groups distilling agave ferments[27]

Below, research results and discussion are presented in the following sequence: 1) still definitions *sensu* Needham and his collaborators;[28] 2) "Huichol" still research; and 3) comparisons with other Indian and traditional Mexican East Asian stills. There then follows a conclusion and final comments.

East Asian Stills and Mexican distillation

The history of distillation technology in China has been well described by Joseph Needham and his collaborators.[29] East Asian stills based simply on evaporation and condensation in the same still body, with various models, variations and applications were made by different cultures in East Asia and from early times. The stills are strongly associated with Taoist alchemical traditions according to Needham and his collaborators. The older Chinese still are completely different from Arabian-originated serpentine stills ("alambics"), as seen, for example, in illustrations of early European alchemical practices. These, as

27 Instituto National Indigenista. Bruman 1940 [2000].
28 Needham, Ho and Lu 1980.
29 Needham, Ho and Lu 1980; Huang 2000.

Forbes shows, were based in Hellenistic chemical and alchemical practices and the ability of the technology of the time to produce such largely glass devices.[30]

Most recent versions of Chinese stills, as described in Needham,[31] Huang[32] and Hommel,[33] are, other than obvious industrial stills, simplified versions of still earlier stills. More often than not they are intended to be portable. How this simplification took place is not entirely clear but as Luo makes clear, the Mongol period (in China *circa* 1211 to 1368) seems to be a critical one.[34] Luo postulates a great interest in portable still technology in particular on the part of the Mongols because kumiss (*airaq*) was the culturally preferred drink among them and even a clarified kumiss (Turkic: *qarakumiss*) would not keep. Only distillation would allow kumiss to be consumed in some form during the entire year. From kumiss the jump to other high-proof beverages was an easy one. Significantly, the generalized Eurasian word (originally Arabic) for high-proof liquor, *arkhi* or *araq*, *arag*, *arak etc*., first appears in a Mongol era source, the *Yinshan zhengyao* 飲膳正要, "Proper and Essential Things for the Emperor's Food and Drink," of 1330.[35]

30 Forbes 1970.

31 Needham, Ho and Lu 1980.

32 Huang 2000.

33 Hommel 1969.

34 Luo 2012.

35 Buell, Anderson and Perry 2010; Luo 2012. Another text mentioning an *arkhi* is the 14th century Chinese household enclyclopedia *Jujia biyong shi lei* 居家必用事類, "Essential Things for Living at Home" (Chūgoku sokukei sōsho 中國食經叢書, Tōkyō, 1973). In this case the recipe is referred to the Southern Barbarians, a term usually used during Mongol times to refer to the peoples of the maritime south. It should be noted that this method of distillation would work perfectly well on shipboard and this may be the reason for the use of such a primitive still, with no cooling, but minimum heat, here. "Good liquor" was a popular term of distilled drinks during the Mongol period in China. It apparently was a borrowing from the Mongolian *sayin darasun*, "good wine," also meaning distilled liquor.

[Burnt-wine method of the Southern Barbarians:] The Barbarian name is *arkhi*. As an ingredient it does not matter if it is sour or sweet, or insipid and thin, any liquor lacking a proper flavor will do. Make ready a pot 80 percent full. Place another empty pot obliquely over the top. Bring the mouths of the pots together. First make a hole in the side of the empty pot. Secure with a bamboo tube as a beak. Below again secure the empty pot. Fill its mouth, mounting with the bamboo beak. Towards the area around the openings of the two pots fill in the holes with pieces of white porcelain bowls. Make it snug by covering up. One can also use pieces of earthenware. Take paper fiber and pound lime and apply abundantly, thick as four fingers. Put into a new large urn and position. Take paper ashes and fill up. In the ashes, fill glowing hard coals, around two or three catties. Put down to the sides of the pot. Inside the pot put liquor to boil. Its vapor will rise into the empty pot. Then inside the bamboo tube of the empty pot you need to lead off what fills up the empty pot. Its color will be very white and will look no differ-

Although he acknowledges that the popular still of the Mongolian Empire was probably what Needham calls the Mongol-type, Luo does record two important archaeological finds of Chinese-type stills, which suggest a rapid development of technology just before the Mongols or a little later. These are the Bronze still (twelth century?) from the Bairin Left Banner (Fig. 1), and the later and more advanced Qinglong 青龍 still, with a piston for delivering cooling water efficiently and incidentally increasing pressure inside the still (Fig. 2). Interestingly, a fourteenth century Mongol-era manuscript illustration in the Diez Album found in the Staatsbibliothek zu Berlin showing a court festivity seems to show a still that is a development of the Qinglong still.

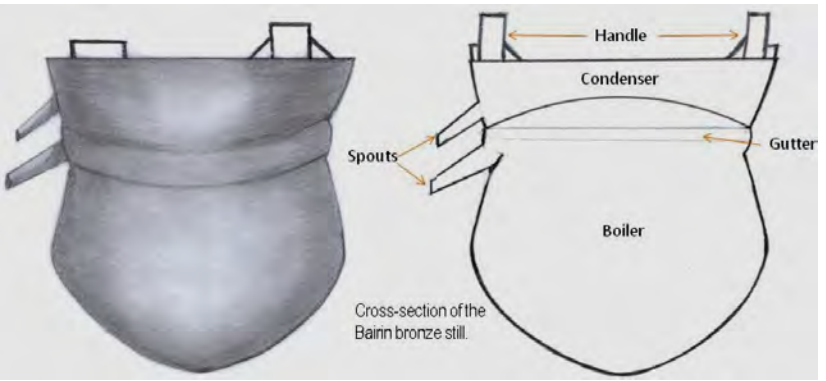


Fig. 1 Bronze liquor still from Bairin, Mongolia[36]

ent than clear water. Sour liquor will have a bittersweet flavor and an insipid liquor will have a sweet flavor. One can obtain one-third "good liquor." This method you can use to cook liquors decocted during the winter, all of them (12, 42b-43a).

The same source also has another recipe calling for distillation, here in a Chinese-type still. Note: a *qian* 錢 is today 3.13 *g*, a *dou* 斗 is 5161.9 *ml*.

["Cooked" Liquor:] Whenever one cooks liquor, use 2 *qian* of wax, 5 slices of bamboo leaf, and "official" *Arisaema japonica*, a fine half a kernel for each *dou*. Transform and put into the liquor. Close up tightly according to method. Place inside a boiler. ([subtext] During autumn and winter use an *Arisaema japonica* "pill." During spring and summer, use wax and bamboo leaves). After that start the fire. Wait until the aroma of the liquor penetrates up into the boiler twists [of the apparatus]. The liquor will come forth in profusion. Then raise the boiler again. Then take up the entire pot [with the liquor], open up and look. If the liquor is boiling then it is ready. Put into the fire for a long time. When you take it down put it into lime. One should not move continuously. One wants the white liquor to expel to obtain the clear [distilled] liquor. Afterwards when cooking again and again, use mulberry leaves to repose. This is to prevent the aroma *qi* 氣 [vapor] from being cut off (11,35a).

36 Adapted from Luo 2012 ; drawing courtesy: Solano, 2013.

The interest of the Mongols in kumiss distillation provides clear evidence as to how such technology was always made to suit local conditions and needs, even possible production in a Mongolian yurt or tent in this case.[37] In fact, barely any of the *arkhi* that now appeared throughout the world was of the same type, and always embodied local raw materials. This includes Korea, where the *arkhi* was based upon rice wine, although clearly the same distillation technology was employed.

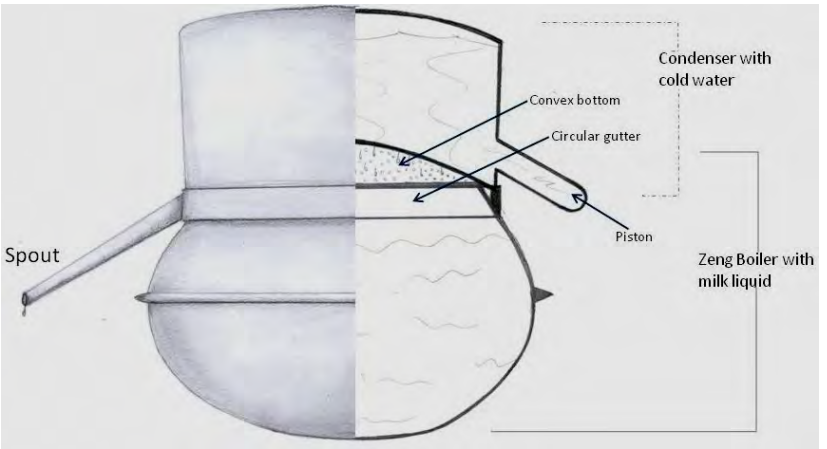


Fig. 2 Chinese-type still from North-China (Qinglong County, Hebei province, 13th Century?). Sorghum stalks or some similar materials were used below the receptor to help collect the distillate and channel it[38]

The case of Korea is worth paying particular attention to for a further comparison because, contrary to the case of most Asian-Mexican stills, transfers of the distillation technology based on Asian prototypes into Korea through direct contacts with China and a larger Mongol world after the Mongol invasions (1231–1258) are extremely well documented in our written sources. For example, the official history of Koryŏ, the Korean dynasty then ruling, hints that *soju*, a unique Korean distilled alcohol using rice, first began to spread from encampments of the Mongol army in Korea such as Kaesŏng and Andong and was even called at first by the Eurasian name *arkhi*. These bases were then being built up as preparation for two Mongol attacks on Japan. Among the stills de-

37 See the eighteenth century description of yurt-based distilled kumiss production in Pallas 1776, 205ff. See also Montrell 1937.

38 After Luo 2012; drawing courtesy: Solano, 2013.

veloped in Korea were both Mongolian style and Chinese style (Fig. 3), stills very similar to those later appearing in Western Mexico where they came across the Pacific Ocean.[39]

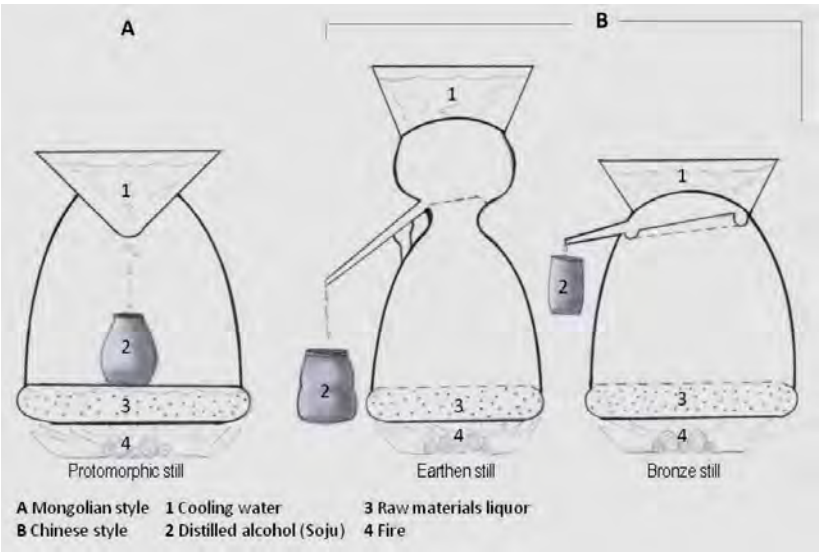


Fig. 3 Types of traditional Korean stills[40]

Bruman and Mexico

In association with Bruman's hypothesis on coconut wine's introduction to Mexico along with distillation technology, a very wide geographical spread has now been reconstructed for variants of the East Asian still. Later Needham, complicating the issue, made his own connection between Chinese traditions and the distillation possibly exhibited in Capacha culture vessels or possible proto-stills from at least 1500 BC. In a letter of September 7, 1977, Bruman answered Needham's inquiries, discussing Asiatic influences on Mexican distillation. Needham continued to stress the importance of possibly pre-Columbian connections but concluded that the so-called "Filipino" still represented mixed Mongolian and Chinese types, the Mongolian being a variant of the Chinese. Bruman did not use Needham's terminology but the following illustration

39 Park and Buell (forthcoming).

40 Source: Pae Kyŭng-Hwa 1999, 42; drawing courtesy: Solano, 2013.

(Fig. 4) is the first to compare distillation technology found on both sides of the Pacific Ocean.

His illustration is extremely useful for comparative discussions in terms of Needham's classification. We will be referring back to it from this point forward.

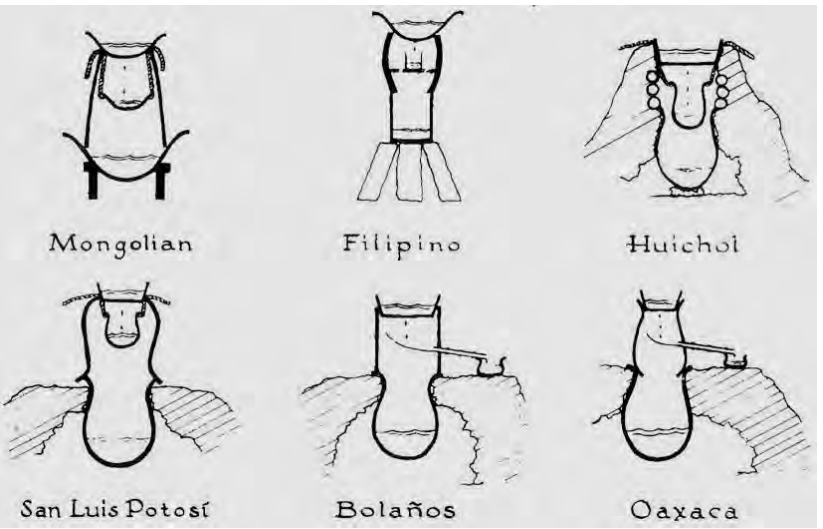


Fig. 4 Types of Primitive Stills[41]

The East Asian stills described by Needham and his collaborators, are recipients where a top vessel containing cold water is the cooler for distillates descending to a small catch (Mongol-type) or conducted outside by a shelf or big spoon and a tube (Chinese-type).[42] Still another still type is the Gandhara type, more common in India.[43] With it, overlapped pottery varying in temperature from hot to cold results in vapor condensation and saves heat. A similar but not identical arrangement is found in East Asian stills which are comprised of the following components:

41 After Bruman 1940 [2000].

42 Needham, Ho and Lu 1980, 106f.

43 The Gandharan device, found largely in Pakistan, is the most evolved still, according to Needham, Ho and Lu 1980, but is not found in Mexico. It basically consists of a pot with oblique or retort apparatus sealed connections, with a bamboo tube receiving a suspended pot in a bowl with cold water.

1) "Reservoirs" to contain ferments for cooking and for the application of heat;
2) A body called a boiler composed of a separate piece wherein vapors descend;
3) A recipient cooler containing cool water in its upper part to condense vapors and alcohol;
4) A distillates catcher;
5) A recepter (shelf-spoon) connected to a tube leading out of the boiler (Chinese-type only).

How this works is shown in Fig. 5.

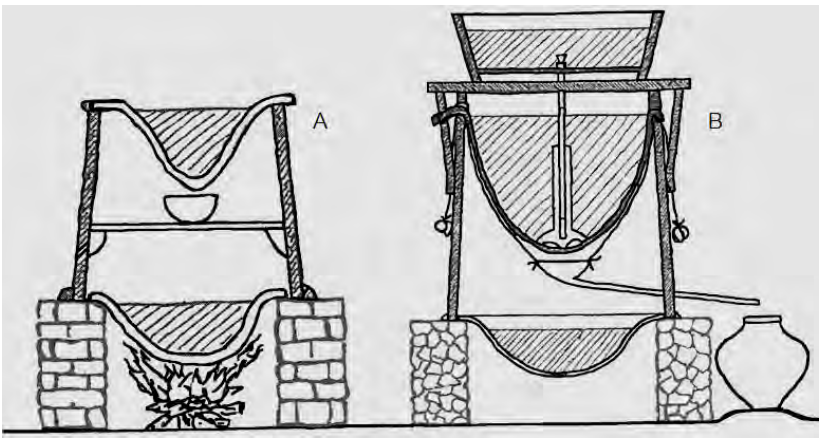


Fig. 5 Types of Stills. A. Mongolian still. B. Chinese still[44]

Needham and his collaborators describe several models of Mongol and Chinese stills, also Mexican types, named Tarasco" and "Zapoteco" types. Both are Chinese-type.

Bruman's illustrations of stills in fact reveal several types and not just a "Filipino" still. A Mongol-type, for example, is shown in a Bruman's illustration dated 1938. It was used for *sotol* preparation.[45] *Sotol* is a spirit similar to mezcal, but with another plant genus (*Dasylirion spp.*), which prefers a dried, desert climate and lives among rocks. This *sotol* still is identical to Lumholtz's "Huichol" still.

In addition to his *sotol* still, Bruman also provides a 1938 illustration of a device from the "Cora" culture. This illustration shows what is clearly a Chinese-type

44 Source: Needham, Ho and Lu 1980, 62, 63.
45 Bruman 1940 [2000], 24f.

still with a tube made from agave leaves.[46] Thus we can easily see from Bruman's illustrations how Mexican western Indians, namely the Cora and Huichol, have different still types, respectively Chinese and Mongol-types. Nonetheless, Valenzuela has found many more Chinese than Mongol-type stills in Mexico[47] and this type seems to predominate also in much of Eurasia, perhaps spread, as already suggested above, by the Mongols themselves during their imperial and post-imperial periods.[48] The easily portable Mongol-type still in any case appears to be a specialized one, adapted with specific conditions found in Mongolia in mind, including life in yurts and stills to be set up in them,[49] but Chinese-type stills are used by the Mongols too. In any case, East Asian-type stills survive in the twenty-first century on both sides of the Pacific Ocean and even in Central Eurasia under familiar semi-industrial conditions

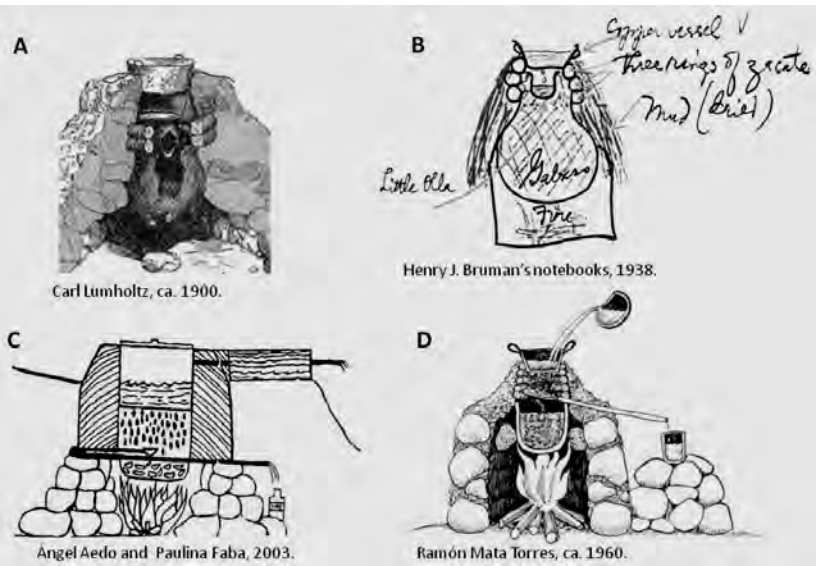


Fig. 6 Types of "Huichol" Stills, 1900–2003

46 Cora culture is close to that of the Wixárika or Huichol. The two cultures share natural resources and a vision of the cosmos. Both the Cora and Wixárika languages belong to the Uto-Aztecan linguistic phylum. Also Cora culture uses distilled alcohols for their ceremonies.

47 Valenzuela 2014.

48 Luo 2012.

49 See the video entitled "Making Mongolian Vodka" on the website "AnthroScape: Human Biodiversity Forum", "Social Sciences", "History & Civilization", "Kumis (Airag), the Mongolian Vodka": s1.zetaboards.com/anthroscape/topic/4637841/1/.

Returning to what is shown in Fig. 4, to explain what was observed by Bruman *circa* 1938, his "Huichol" and "San Luis Potosí" (SLP) stills are Mongol-type stills without a tube and with catch bowls suspended by threads. The other types, the "Bolaños" (Jalisco) and "Oaxaca", have a tube (Chinese-type). They show two shapes, the first one is of a cylindrical form and second is what is known as an *olla* recipient still. An *olla* is a specific kind of boiler chamber. It is described by Needham and his collaborators as "a Zapoteco still."[50] Clearly the "Huichol" distilling units of Lumholtz (*ca*. 1890) Bruman (*ca*. 1940) were similar (Fig. 6).

"Huichol" stills

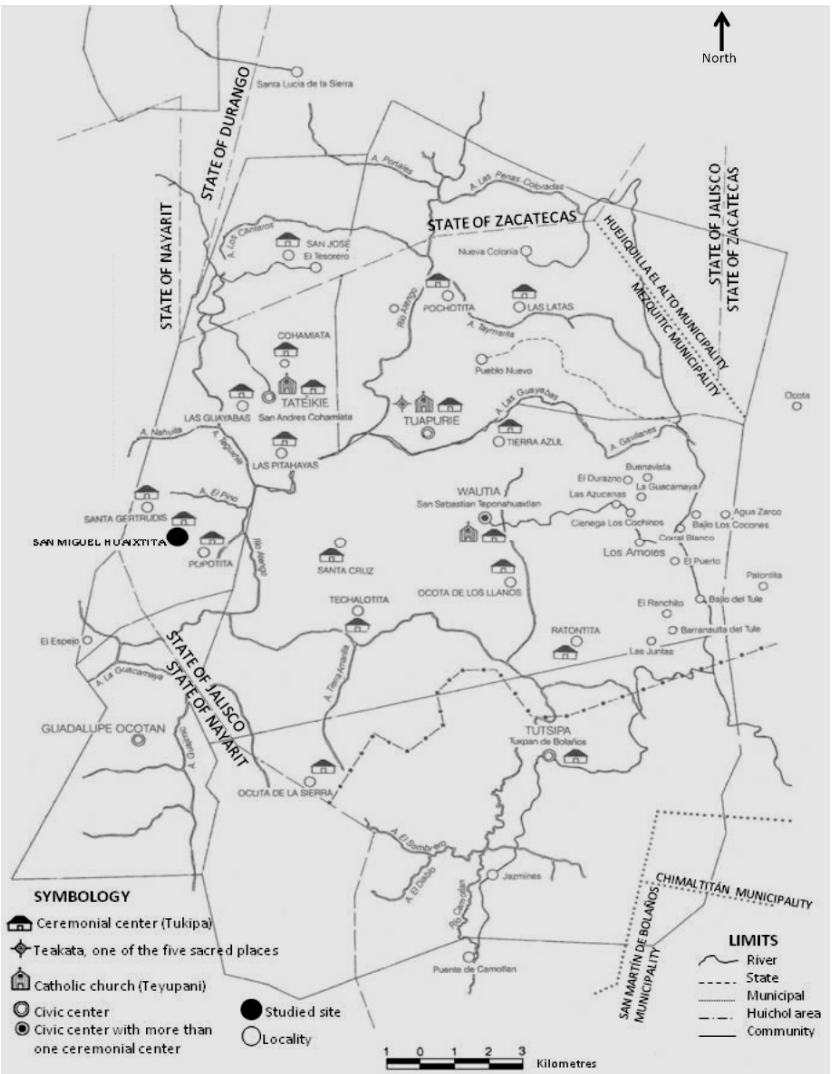
Today, the "Huichol" stills as identified by Faba and Aedo and also by Mata Torres[51] are not the same as those seen by Lumholtz *circa* 1893. In fact, we cannot speak of a single type of "Huichol" still, because this type has been subject to alterations. Still devices have evolved and become transformed. When we went looking for the older "Huichol" stills *sensu* Lumholtz in February, 2013, we did not find them. The Mongol-style stills were no longer in use. So after much effort, we have no image of what the might have been like, but we do have the results of many interviews. These we can compare with results obtained by other authors.

Early versions of "Huichol" stills all showed a pitcher suspended with cords, but one of the peculiarities of this device is its base or platform. The "Huichol" still seen by Lumholtz in western Mexico in 1898, allows us to discuss the origins of distillation in Mexico, but his description is of a device that clearly was rustic, primitive and not like any another found in his tour of the Indians' "villages." He speaks of mezcal being produced continuously as juice is extracted from the agaves, suggesting that other distillation apparatus was present, but it was not. In his work, Lumholtz, stresses the importance of mezcal as an "agency" used by the "mestizos" to persuade, to negotiate with and appease the Indians.[52]

50 Needham, Ho and Lu 1980, 107. The Zapotec comprise an indigenous language family in Oaxaca and are located in, or near the Isthmus of Tehuanpetec.

51 Faba and Aedo 2003; Torres 2000.

52 Lumholtz 1902, vol. 2.



Map 2 Map of the Wixárika (Huichol) area. State of Jalisco, Mexico[53]

Mexico is the center of diversity and area of botanical origin of the *Agave* genus. It is exceptionally a food in dry seasons and in semiarid areas and in drought-deciduous forests. The storage organs for carbohydrates (agavins) are the stem

53 Source: Torres 2003; General mapping of the State of Jalisco. Instituto Nacional Indigenista.

and leaf bases.[54] Cooked or roasted they can be hydrolyzed as sugars. The dried materials with higher sugars concentrated are easy to transport over long distances. They were re-humidified for food and fermentation purposes in Aridoamerica and in Mesoamerica. Agave ferments from aguamiel, called pulque, are a very important beverage-ferment in the ancient Aztec regions.[55] Cooked agaves are different. They are found in all of Mexico and require cooking for carbohydrate hydrolysis and sugar fermentation. A useful Mexican modification in Asian still types involves using agave leaves as part of the still. One big leaf can be used as a shelf for collecting and conducting out distillates and central conical young leaves can be inserted as a tube.

The "Huichol" or Wixaritari (plural; see map 2)[56] currently require agave and *sotol* distillates. For some authors this is associated with great symbolism,[57] for others it is just a matter of bravura and reinforcement for long ceremonies.[58] This disagreement is by no means the only controversy regarding the agave and stills used by Huichol and their cultural significance. The reported Huichol *tuchi* and the name *xapa* for *Agave bovicornuta* as reported by Faba and Aedo,[59] are not reported by Bruman and also not by Mata Torres. There are inconsistencies also regarding what are *sotol* and the *Dasylirion* genus. Some sources speak of a commercial mezcal product (but without using the word *tuchi*) in the Great Nayar area but say little about rituals. A special research line ignored

54 Mancilla-Margalli and López 2006.

55 In the past, some authors have been confused about the agave ferments and varieties exploited for this fermentation in the central plateau of Mexico. The area has large succulent species (*Agave salmiana* and *Agave mapisaga*) that are used for saps named "aguamiel,"which is similar to toddy palm juices.

56 The Huichol ethnic community, self-called Wixárika (pronounced Virrárika), "the healer" or "he who guesses," is one of the groups that has, with difficulty, preserved almost intact values not fully in accord with the those of Spanish Catholicism, which arrived in the sixteenth century. Their religion is based primarily on the worship of nature and the deities thereof, the way of their ancestors, and on corn, deer and peyote. A central figure in this religion is the mara'akame, the healer or shaman. The territory of the Huichol is located in the Sierra Madre Occidental, in western Mexico, specifically north of the state of Jalisco and in Nayarit to the west. The main communities cover approximately 4107.5 km2: Tuxpan de Bolaños, "Tutsipa" San Sebastián, Teponahuastlán "Wautüa", Santa Catarina Cuexcomatilán "Tuapurie", San Andrés Cohamiata "Tateikie" and Guadalupe Ocotán "Ratsisarie." There are other small Hichol towns in the states of San Luis Potosí, Zacatecas and Durango. The Huichol population lives on agriculture, cattle breeding and sales of magnificent pieces of art.

57 Faba and Aedo 2003.

58 Torres 2000.

59 Faba and Aedo 2003.

in ethnographic research is regarding the agave and *sotol* ferments made by Huichol and other tribes. Existing research has taken up different points of view and exhibits many contradictions.

Looking at ethnographic discussion of "Huichol" stills, four images are particularly pertinent: In Fig. 6 above, the first image (A) is a "Huichol" still *sensu* Lumholtz from around 1893. The second (B) is a *sotol* "Huichol" still from around 1938. Finally there are stills from Mata Torres (C), *circa* 1960, and from Faba and Aedo (D), *circa* 2003. Lumholtz and Bruman both show a Mongol-type still whereas Mata Torres along with Faba and Aedo show Chinese types. In the latter two cases, although the rocky bases with fire, a clay insulation, and the vessel top coolers, well depicted here, make it seem like that same apparatus is involved, this is not the case. The stills illustrated have, in fact different mechanisms and are designed for different production scales and different adjustments made to water-flow *canoa*.[60]

Here we will not go into ritual or ceremonies connected with different still types, or the symbolisms involved. Our purpose is rather to examine traditional knowledge associated with the stills, and their designs, with functional comparisons. First, the similarities: all "Huichol" still versions have a boiler made with either zacate, pine leaf cords or branches, and trunks that are thin and flexible; all have clay structures for insulation. There are no boiler pieces. The boilers are made of building clay shaped like the calderas of a volcano. This shape is important because of traditional knowledge regarding optimal use of wood fuel to support combustion. Mata Torres and Faba and Aedo were misled by this similarity in appearance to see major differences in alcohol reception.

This elongated boiler-volcano subtype is perfectly suited to a hermetical environment that reduces the amount of lost vapors. Also a feature is the top-cooling vessel, appearing crater-like, a peculiarity not seen in other East Asian-type stills. The apparatus illustrated by Faba and Aedo has a flexible tube called *culebra* (snake). It allows direction along a slope, with a turn. In Chinese-type stills bamboo is frequently found in Asia as tube material, along with the rigid stems of other monocots, agave leaves in Mexico, but in no case a flexible tube. Regarding the tube *culebra* and *canoa* drainage, we know from interviews with *tepe* sellers

60 There are different notions of the "*canoa*." In Jalisco, "*canoa*" are used as recipients to make the folk drink raicilla (Valenzuela and Gaytan, 2012) in the village of Mascota. The cooked agave is smashed and cut up into small pieces. Spanish "Canoas" can also be a place name associated with mezcal production, in Jalisco and Colima, for example.

that such methods are also used in the Tepehuán culture,[61] found in the same Jalisco region. In this case, the cooler is noteworthy since it is made of timber. Aedo and Faba mention that Tepehuán distillers also use such *canoas*. Is the "Huichol" still thus like the Tepehuán still?

In this case, the *canoa* is a wooden cooler for water drainage, like a channel, allowing a quick exit of material. Hydraulic equipment made with *Agave inflorescences* (*quiotes*) has been observed in Oaxaca.[62] This suggests an improved technology where there is proximity to rivers at least. During the dry season, the mezcal production period takes place at various times between March and June. High temperatures then tend to be less than optimal for cooler vessels and better for concentrating alcohol using condensation. Small-scale production is easier to manage in this case and the cold water in the cooler vessel may be changed repeatedly. Best for improved results is to position mezcal distilleries near to rivers and design a drainage using flowing water. Less work will then be required.

A *canoa*-style still is standard technology among the Huichol, Tepehuán, and Coras, as Bahre and Bradburry make clear.[63] They show *bacanora* production (mezcal from *Agave angustifolia* in the Sonoran desert) using a cool water *canoa* tool but not with the same type of still. The results of fieldwork and textual references make it clear that the centers of *tuchi* and *tepe* production are in the southwestern Chapalagana area.[64]

Geographically, the Great Nayar portion of the Sierra Madre Occidental exhibits large altitude gradients. Different ethnic groups have used these gradients to manage natural resources in different ways. Huichol, Tepehuán and Coras know about the different kinds of rivers, and water temperature, and have adopted techniques accordingly with a high degree of efficiency not only for distillation and for ceremonies, but also for commercial purposes and exchange. Wood materials have dominated in Huichol still-making according to Faba and Aedo,[65] as compared to other types of stills.[66] We suggest that the

61 "*Tepe*" is a soft mezcal produced by the Tepehuán Their culture shares the Ggreat Nayar area with Huichol and Cora; sometimes they provide "*Tepe*" for the ritual ceremonies of other cultures of the area. Actually the Tepehuán are highly acculturated.

62 Valenzuela 1984.

63 Bahre and Bradburry 1960.

64 Chapalagana or Atengo is a river that provides water to many communities across the Great Nayar area.

65 Faba and Aedo 2003.

66 Lumholtz, Bruman, Torres.

canoa-still tradition is close to that of the Tepehuán. They live more in a forest ecosystem, while the Huichol are more adapted to agricultural regions and to arid conditions found at lower altitudes.

There are many gaps in our information regarding Tepehuán mezcal or *tepe*. Looked at in terms of ecosystems and technology, the Tepehuán may be producing more mezcal than any other Great Nayar ethnic group. Possibly also they made it in the past for trade. In this region, indigenous alcohol is distilled using minimal recipient vessels adjusted with agave leaves and gums backed up with clay. Alcohol vapors are naturally well collected. They also share among themselves fermentation recipients made from leather bags named *poo'ta*,[67] or *puta*,[68] seen during in 2013 fieldwork. These leather containers for mezcal fermentation have also been seen among Oaxaca mezcal producers, but with a wood structure, and larger. Similar sacks or bags (*khukhuur*) have long been used in Mongolia in kumiss fermentation. They are hung near the door of the yurt and each entrant is expected to give the bag a shake. This is to make the fermenting milk uniform and enhance the rate of fermentation.[69]

Mezcal production in small towns such as San Miguel Huaixstita or "Tsikwaita" ended in 1997, when seasonal river flows stopped. One Huichol health worker interviewed by Ana Valenzuela said that nothing remains from this production and people have forgotten. Directly involved in this "distillery" were Leopoldo Salvador Carrillo (73) and Rosario Salvador Carrillo, his brother (86) and the son of Vicente Salvador Carrillo, the San Miguel Huaixstita founder. They said that their *corunavino* was a Mongolian-type still. They also called it *rarivino*, a name applied to the big *olla* fermentation container. They confirmed the fact that Chapalagana "taverns" are now placed there. Chapalagana is part of the biggest river in the Huichol area, the Huaynamota. Leopoldo's son René Salvador Carrillo (25) was still planning to distill in 2013, using a *canoa*-type still. We asked him: Why are you wanting to produce? He replied: "Because we have been using un-traditional alcoholic beverages and it's time to come back to tradition".

67 Faba and Aedo 2003.

68 Torres 2000.

69 Montrell1937; www.mongolfood.info/en/recipes/airag.html.

Nahua and Other Stills from Jalisco

Southern Jalisco is now well studied for its Mezcal production using Colima-Capacha proto-stills. Tuxpan is a small town inhabited by people of Nahua culture,[70] and their mezcal is well known, sometimes going under the name Tuxca (Tuxcacuesco).[71] Found in Tuxpan is an East Asian-type still named *tachica* constructed using baked clay pottery. In February, 2013, we found a replica *tachica* in an exhibition of the Regional Museum of Guadalajara, allowing us to examine it in detail, including taking measurements, and making photographs. A *tachica* is a Chinese-type still with special additions and a design not commonly seen elsewhere. It has a metal (copper) pot for heating the ferment. The earthenware boiler is in two pieces and there is a cooling (metal) vessel.

There is a collector in the upper boiler piece, it is an earthenware dish called a *comal*, a clay griddle with three "ears" for cord suspension and a channel conductor. The copper vessels were not at the museum, just earthenware components, but the missing metal parts can be seen in pictures of a *tachica* taken in Tuxpan by Antonio and Nicolas Ramos in 2009 (Fig. 7).

These devices constitute a special "alambic design." This is because the *ollas* overlap and vapor pressure is different in cylindrical devices. The upper boiler piece has an edge in walls with a slope, conducing all the distillate out using a conical shaped tube of same material. Further studies are needed to determine the relationship between pressure changes compared to previous devices, in terms of shapes arrangements of components inside the total assemblage.

Tuxpan, Jalisco, is part of the Amula region (southeastern part of the state). Distillation, as practiced there, has been described by Luis Fabian based upon an interview with a Nahua distiller:[72]

> ...when we obtained the agave juices, we combined them with fibres in a recipient for fermentation. This results in an alcohol (a wine or "*vino*"), because the agave had been cooked. Then, the mash was placed on an earthenware stove. To contain it

70 Nahua culture was one of the most widespread in Mexico and the Nahuatl language was considered the *lingua franca* by the Spanish crown. The Nahua were initially settled in the center of the valley of Mexico, but after Spanish conquest in XVIth century were relocated and re-concentrated, disappearing into many small communities. The Spanish used the Nahua to work in the mines or on the sugar cane plantations. In servitude, the Nahua continued to be ruled with their indigenous laws.

71 Often such names are in terms of places where the mezcal production is being carried out, comercial centers or other important places. Tuxpan Mezcal could also have made that particular place famous.

72 Luis Fabian 2004, 53.

> they used a large vessel, the top forming a "*montera*." This is a vessel as well. In the "*ollita*" (boiler) we placed an earthenware spoon and through it the "vino" came out… That was my job; now they do not know how to prepare good "*vino*."

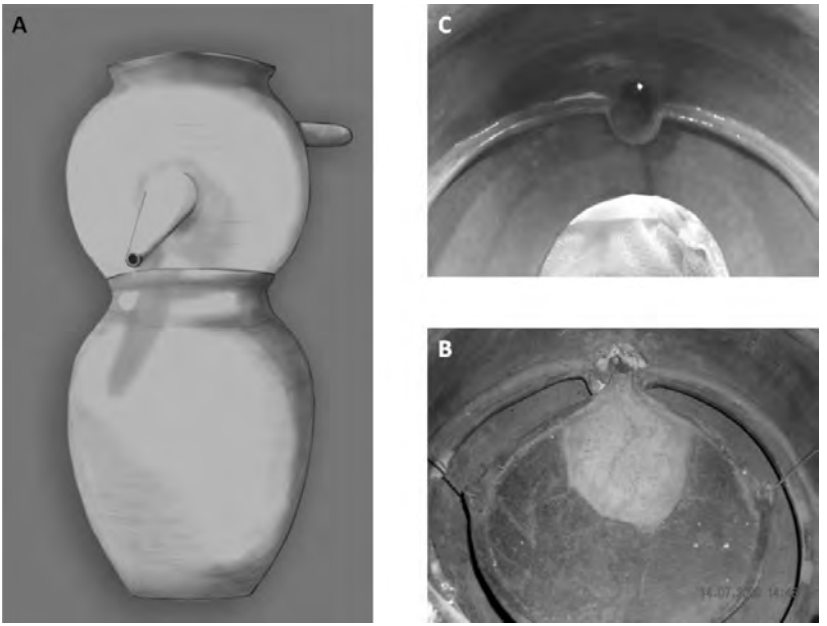


Fig. 7 Nahua Distillation Units. South of Jalisco, Mexico[73]

The stills previously described, coming from the Nahuas of Tuxpan, are different than the pot mezcal stills of near-by Mazamitla, in Jalisco. In Michoacán, the stills are also different from those from the Tarascan. The Tarascan still is a truncated cone, unlike the cylindrical hollow log or more commonly found rootlet in El Tuito, constituting another mezcal still type of Jalisco.

Nahua stills[74] from Jalisco are similar to "Zapoteco" stills of Oaxaca.[75] Clay *ollas* are the boilers. As Bruman noted, pottery was needed to prepare the mezcal and build East Asian-type stills but local ethnic groups designed the specific models of stills used. *Ollas* culture as seen in Nahua and Zapoteco stills and the wood and pottery ones found among the Great Nayar provide evidence than

73 A. Drawing courtesy: Solano, 2013. B. Courtesy Valenzuela. Regional Museum of Guadalajara, Jalisco, 2013. C. Courtesy: Antonio Olvera and Nicolás Ramos. Tuxpan, Jalisco, 2009.

74 Nahua stills are formed by two *ollas* (pot; *ollita*, little pot) made with clay, with a metallic cooler on top.

75 Needham, Ho and Lu 1980.

can be shown and interpreted, offering still more information to be organized for a preliminary classification of East Asian-type Mexican stills.

Here we define a preliminary classification of Mexican-Asian stills. Based on Jalisco, Michoacan and Oaxaca, the Pacific coastal states of Mexico are where mezcal production made by traditional producers and indigenous ethnic groups is found in connection with Asian-type stills (images date from 2012 and 2013). We found stills a) with cylindrical boilers or trunks (oldest and most primitive); b) the truncated cone or Tarascan (barrel-shaped) still; c) Nahua stills of the southern Jalisco, *ollas* (overlapped earthernware pottery, similar to the Zapotec stills from Oaxaca in southern Mexico; and d) "Huichol" stills characterized by caldera bases and their external shapes.

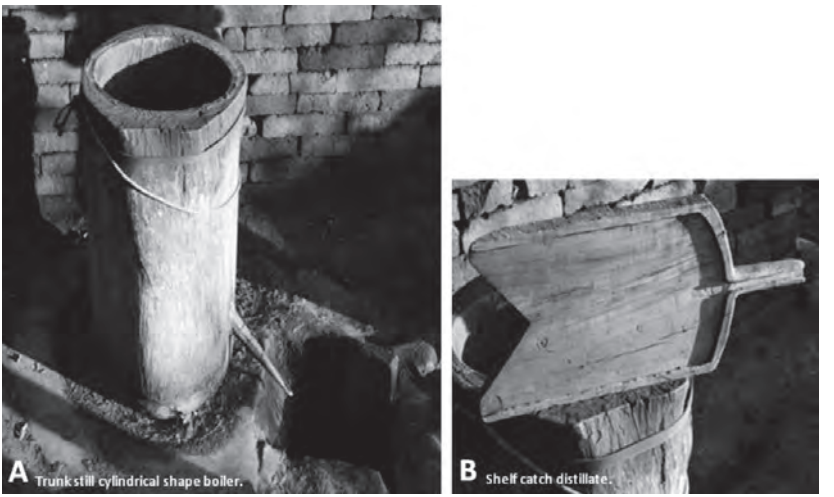


Fig. 8 Trunk Still, with Cylindrical Shaped Boiler and Shelf to Catch the Distillate. Zapotitlán de Vadillo, Jalisco. 2012[76]

Distillate catchers or receivers are sloped to drive alcohol produced to outlet pipes. They usually are made of wood, are a shelf, or occur as spoons,[77] of the type common in Mexican cuisine for the production of pozole.[78] Spoons can

76 Courtesy: Ignacio Torres García, Mezcólatras de Moreilia.

77 Wooden spoons for beans or pozole with carved channels are easily adaptable as still tubes. Interestingly, Montrell (1937) shows a similar device, closely resumbling the Mexican pozole spoon, used in Mongolian distillation. Note that in Mongolia, as indicated by Montrell and his sources, women are those primarily doing the distilling.

78 Pozole is the quintessential dish of Mexican food, made with corn that has pork, beef, chicken or shrimp. It is prepared in many ways depending on the region.

also be specifically designed for each distiller. Fig. 8 and 9 show two types of receptor-conductors. The first type illustrated is shaped like a letter "V." This allows the passage of steam with the other side of the channel held in the output of the orifice tube boiler. In the second photograph, the elongated shape of the "bucket" receiver-driver suggests a smaller area of contact, and friction for steam in its ascent.

Fig. 9 Tarascan Still in La Escalera. Charo Municipality, Michoacán[79]

Boiler shapes must exert pressures effects in distillation vapor production. The barriers in the boiler also create obstructions. According to Valenzuela, Regalado and Mizoguchi in the mezcal Mazamitla, *olla* mezcal still,[80] and in the Zapotitlán de Vadillo still, at least in twentieth century descriptions[81] and according to interviews, shelf-like receptors create more opposition to alcohol vapours, and there is more surface in the boiler. Agave leaves are a kind of shelf, a *comal* in the *Tachica*-Nahua still, and a table in that of Zapotitlán de Vadillo. All of them there have a letter "V form" that allows the passage of vapors. In conclusion, we suggest fewer barriers in boilers with spoons than those with shelves. Suspended

79 Courtesy: Ignacio Torres García, Mezcólatras de Moreilia.
80 Valenzuela, Regalado and Mizoguchi 2008.
81 Valenzuela, Park and Buell (forthcoming).

spoons can also be found in Asia, in the *kabutogama jiki* 兜釜磁器 still used to produce the spirit *shōchū* 焼酎,[82] and also in Southeast Asia to produce Laos rice "whiskey",[83] also with a cylindrical boiler constructed with stainless steel.[84]

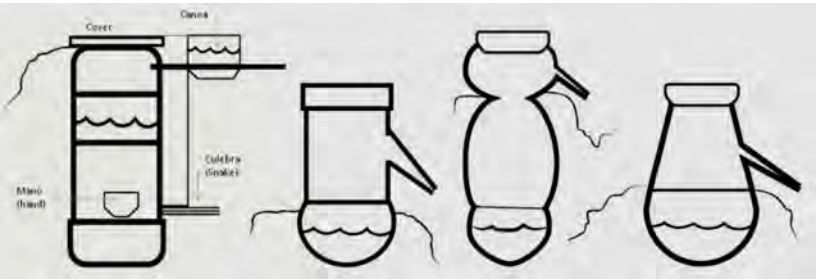
Tarascan Stills

Tarascan[85] stills were described by Bourke[86] and were also discussed in Needham.[87] The discussion shows that over a century ago the stills had the same body shape, like a barrel, a truncated cone-shaped, as today. Bourke's 1893 drawing, reproduced here in Fig. 10, shows these features clearly.

Fig. 10 Tarascan still[88]

82 Valenzuela et al, 2008.
83 Valenzuela, Park and Buell (forthcoming).
84 Courtesy Florence Striegler, 2009.
85 Purépecha (*P'urépecha*) or Tarasca culture belonged to one of the most important empires in western Mesoamerica, until the Spanish conquest in XVIth century. "Tarasco" is a name given by the Spanish conquerors, thus considered derogative by the people of the culture. The culture is actually located in the center of the state of Michoacán. Because of living legacy constituted by their traditions they have earned two awards from UNESCO as an Intangible Heritage of Humanity: the *pirekua* – the melodious and cheerful musical form and Night of the Dead.
86 Bourke 1893.
87 Needham, Ho and Lu 1980.
88 Source: Bourke 1894.

Spoons and wooden alcohol catchers are different in their impact. Bourke illustrated a wooden vessel, with a deep and large area against today's unit that is elongated and spoon-ribbed.[89] Such modifications are affecting and influencing alcohol production. New lines of research, including lab work, are now required to study the dynamics of the traditional knowledge of distillation in terms of its change over time in connection with East Asian-type.



Huichol still Cylindrical wooden still Olla (Pot) Nahua still Tarascan still

Fig. 11 Mexican-Asian still types by Structure[90]

The various methods for distillation that exist currently in Mexico are mostly used for agave ferments.[91] Today, more than 30 species of agaves are registered in mezcal production. Agave species grow in almost all of Mexico. The thousands of mezcal versions produced from selected species are a rich natural and cultural heritage showing pre-historical, Hispanic and Asiatic influences. Traditional knowledge currently existing in artisanal mezcal production in Mexico and the biodiversity that it represents can help us not only understand Mexican traditions but also other techniques surviving in Asia where the history of distillation is similar to that of Western Mexico. The alcohol bridge that exists between Asia and America support hypotheses in a history that still has to be written. In conclusion, we can define in Mexico the local variants of the East Asian still (Chinese type) as cylindrical or trunk, as exhibiting the Tarascan barrel or truncated cone, or in terms of overlapped earthenware pots, or Zapotec and Huichol stills.

89 Bourke 1893.

90 Source of all images: Valenzuela, 2013.

91 Also distilled is rum, likewise illegally. Rum will not be considered here.

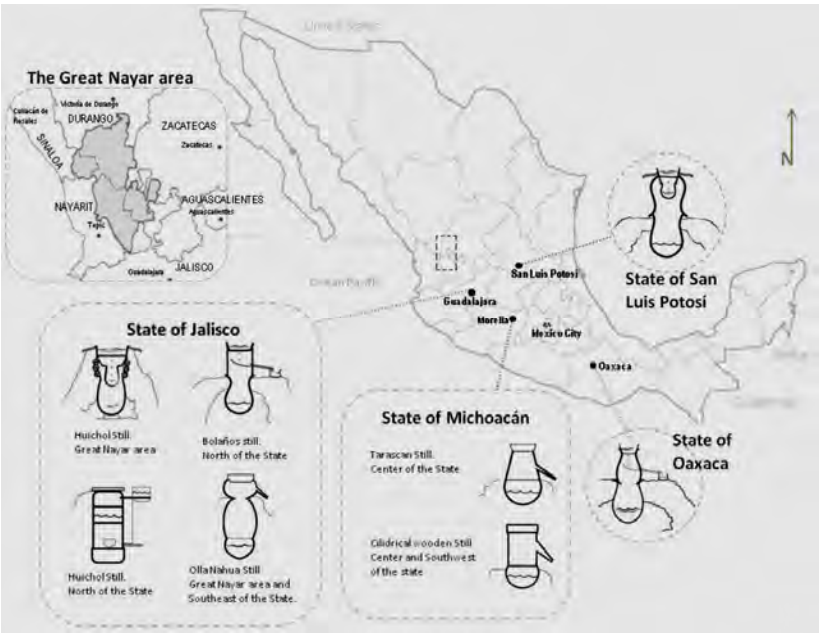


Fig. 12 Asian-Mexican stills and their distribution (authors)[92]

New Issues: Capacha, Mongolian, Chinese and "Huichol" Stills

Recently it has been claimed that Mexico has had a tradition of proto-distillation that is pre-Hispanic. Reference is to the Capachas vessels with shaped tripods, used with *Lagenaria spp.* (i. e. bottle gourds).[93] Their claimed antiquity is greater than that of comparable devices in India that are considered to be the oldest, or among the oldest in Eurasia.[94] To be sure, traditional knowledge regarding mezcal is not fully registered and there is a great deal yet to be learned. But what of the claim of some producers that mezcal was a creation of Mexicans living thousands of years ago?

Unfortunately this question cannot be answered definitively. There is some evidence in one pottery set that may suggest early distillation in Mexico but no more Capacha vessels appearing to be proto-stills have been found. Much more

92 Sources: Bruman 1940 [2000]; Serrano Carreto 2006; Valenzuela, 2013.
93 Zizumbo et al. 2009.
94 Alchin 1979.

will be needed to link what has been found with modern Mezcal production and modern tequila marketing. In this paper, by contrast, we suggest other lines of research looking at the evolution and distribution of Asian-type stills in Western Mexico and their many local adaptations often made in response to real local needs. We have found no evidence of the Mongolian-type still in Mexico today, but the type did exist at one time for mezcal-*tuchi-sotol* among the Huichol. Thus both the Chinese-types and Mongolian-types are found in use or were in use in the recent past.

The concept of a "Filipino still" was used by Bruman to explain a "package knowledge" coming in connection with *vino de cocos* (coconut wine) and its distillates, *tuba* (Tagalog term for coconut sap ferments) and their lore. In this same connection Bruman discussed his Mongolian-type and Chinese-type distillation units, now well classified thanks to Needham and his collaborators.[95] The devices were not hard to reproduce and ferments were processed with stills of this type all over the Pacific area. Bruman discusses *sotol* and mezcal "ferments" and stages before an actual distillation process. The Manila Galleon may or may not have carried Asian-type stills physically, but it did carry units for distilling fresh water from seawater along with crewmen who knew how to distill coconut wine and were ready to reproduce their knowledge locally.[96] There may, for sure, have been more than one pathway of dispersal to Western Mexico, as, for example, in connection with the Ayuquila River as mentioned by Zizumbo and Colunga and discussed by Valenzuela and Bowen.[97] In any case, many techniques were adopted among indigenous and other populations of New Spain by observation. Mongolian nomads today still use the same recipients, for large-scale production and for kitchen milk distillation. By contrast, tree trunks, agave leaves and inflorescences, wooden spoons, earthenware pottery; agave threads and ferments, agave gums used with clays are Mexican adaptation of Asian-type distillation.

Modern distillation seeks efficiency in heating fermentation starters, using a minimum of scarce fuels such as wood, or dung (*argal*). There is also the issue of refrigerant water for condensing and, most important, its source. There is little water for cooling in Mongolia, for example. It is better distilling next to a river, as in some parts of Western Mexico, but most rivers are seasonal in Mongolia and there is always competition with humans and animals for water use. We

95 Needham, Ho and Lu 1980, 106f.
96 Bruman 1944b, 1945; Sauer 1948.
97 Zizumbo and Colunga 2009; Valenzuela et al, 2008.

need a great deal more research to determine proportions and scale of distillation using Asian-type stills to understand the specific adaptations involved applying to various, diverse areas.

Asia and Mexico exhibit very different ecosystems and scales of production. Mexican stills showing adaptation in some specific components can reveal a specific diversification of Mexican stills to suit different consumers and also for a production that must largely be clandestine. The palates for flavors and aroma found in clear agave spirits (mezcals) with high alcoholic concentrations are produced in old equipment, in essence a delayed technology.

Two distillations are needed to achieve superior results.[98] A single distillation is found where sales of mezcal take place in short market circuits, not common now. This is because impurities and repulsive colors and aroma are present in low alcohol distillates (less than 40-60 proof) of this sort. Generally two distillations are needed to produce a liquor 90 to 120 proof. The high alcohol concentrations found in the best mezcal are the result of a special, classical village way of doing things and the choices and preferences of producers. Today's renovate technology is trying to change the *gout*, that is "cultural taste" in traditional mezcal. There is tension between mezcal producers who are pushing for change, production in modern devices, and rejecting the older Asian still-type of production. The need is for much increased mezcal yields to suit a growing export market even though the quality is not equal to that of traditionally-produced mezcal.

In the case of the "Huichol" stills it is not easy is to discover all the types today that we suspect exist or once existed. Nothing like the specimen described by Lumholtz in the nineteenth century has been found recently. In the first half of the last century, Bruman showed the "Huichol" still as a *sotol* device. San Miguel Huaixstita (Mezquitic), Jalisco informants claim to know about this type of still but it is currently not in use. By contrast, they mentioned instead a Chinese-type still of the kind described by Faba and Aedo with *canoa*.[99] Léon Diguet described but did not illustrate a suspended *olla* still or Mongolian-type:[100]

98 Also important in producing a superior product is the character of the mash and other raw materials used, the water, and many controllable production variables such as the precise type of still as well as technological methods. European distillers, for example, have learned the importance of using a richer, more uniform mash to produce a superior product, as a taste comparison between single-malt Scotch whisky and other varieties shows.

99 Faba and Aedo 2003.

100 Diguet 1910, 25.

> Le curieux appareil de distillation, dont ces indiens font usage consiste en un sorte de chemine cylindrique construite en terre, sur la partie supérieure de laquelle on place un de ces vases en poterie, à fond rond, que on l'on nomme "*olla*", faisant l'office de refrigerant; à la partie inferieure de cette cheminée, on place sur de brases ardentes, un récipient contenant liquide à distiller, peu a peu l'alcool se volatilise et va se condenser sur la paroi, de la olla qui forme le cheminé, cette alcool tombe goute à goute va se collecter dans une ecuelle suspendue au-dessous vase de terre servant de réfrigérante.

Following his reference to a Mongolian-type still, Bruman also makes note of a "San Luis Potosí still," described by Manuel Payno. He defines the *campanilla* (little bell) still used in San Luis Potosí mezcal production. Payno describes an inverted pot, copper cooler, with the suspended recipient, the alcohol catcher, characterized as the little bell.[101] At least for the last century we still have references to Mongolian-type stills existing in Jalisco, and among the San Luis Potosí. This was in an area influenced by the peyote route sacred ceremony.[102]

Worth discussing in this context is today's traditional knowledge of distillation found among mezcal producers and its possible origins. Before the discovery of possible proto-distillers and Bruman's theories, distillation had no pre-Hispanic trace in Mexico. At present, by contrast, there are more lines of research that help us identify the production of ethanol in general terms, not just the production of tequila or mezcal, but alcohol from various sources. We provide here an outline of origins of knowledge acquisition and of distillation units in Mexico without serpentines. Involved for Mexico are three alternative interpretive scenarios. These are by no means mutually exclusive; in fact they can be cooperating.

We have seen that the Mongolian suspended catch-alcohol style still has almost disappeared, although knowledge of it still exists among the Huichol, perhaps as a kind of "Capacha souvenir." In its place they seem to have copied, *in situ*, an Asian-type still for their use, but one not influenced by their "Capacha souvenir." This is scenario one. Our second scenario, involves the possible *in situ* mixture of the knowledge of proto-distillers with that coming from

101 Payno 1864, 102-105.

102 Peyote (*Lophophora williamsii*) is a small cactus without thorns used in rituals and ceremonies among many ethnic groups of Northwestern Mexico and the Southwest United States. It serves a connector with deities, and also is considered almost one itself. Peyote is rarely used outside of rituals, and is offered to deities mixed with fermented corn beverages. Peyote's alkaloidal active substances are also used in traditional medicine as a stimulant because it alleviates thirst and hunger. It has therapeutic uses mainly for rheumatism or muscular affections. See La Barre 2002.

outside during the introduction of East Asian-type stills, Mongolian and Chinese types. Our third scenario postulates that the Capacha tradition did not actually produce distilling apparatus of any kind. Fig. 13 is a diagram of three scenarios proposed:

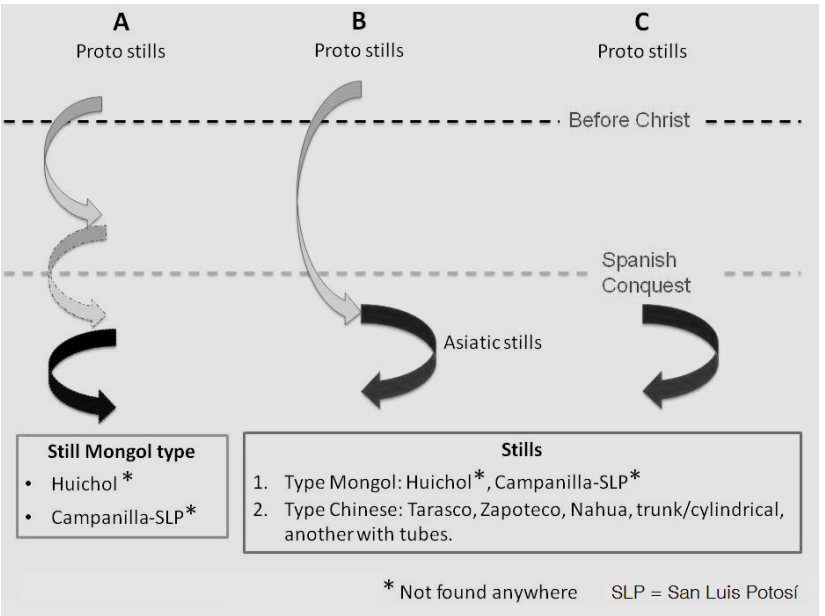


Fig. 13 Interpretive Scenarios to Explain Ancient Distillation and Asian Influence (authors)

It is also possible, in theory, to postulate an additional scenario, an absence of Asian influences exerted on certain Mexican still types. Was there simply parallel development in America and Asia? This is always possible, but highly unlikely, given what we know about contacts across the Pacific Ocean. Also the evolution of Mexican stills, with the Chinese-type largely replaces a Mongolian-type closely follows the pattern in Eurasia[103] where a better still was introduced apparently to increase the production of alcohol and better suit local conditions. We conclude that there were real technological diffusions with similar local adaptations and responses to real local needs. The resemblances are too close. They cannot be merely coincidental.

Comparison with Korea with its excellent documentation can help us consider this possibility even more seriously. Both traditional Korean stills and

103 Needham, Ho and Lu 1980.

Asian-Mexican stills are very close to their apparent Asian prototypes, and there is a high degree of resemblance in specific distillation techniques as well.[104]

It is extremely important that we have a great deal of documentary evidence of influence of the Asian prototypes (both Mongolian style and Chinese style) on the Korean stills through Korea's direct contacts with China and Eurasia during the Mongol period. This leads to a logical assumption that the Mexican stills, which closely resemble the Asian prototypes and whose level of resemblance in technique is similar to that of Korean ones, certainly offers still another case of transfers/diffusions of the techniques of the Asian prototypes to a wider world.

Conclusions

The sheer size and range of Mexican territory and the great varieties of cultures found there provides us with ample opportunities to validate suppositions and carry out useful fieldwork, which continues. This fact, coupled with the previous studies of Henry J. Bruman, Joseph Needham and Carl S. Lumholtz supply us with the elements of a comparative view of distilling units as used along the Pacific coast of Mexico and in that of Asia and beyond, where the same kind of stills found in Mexico, with variations, are part of a much larger Eurasian tradition with considerable historical depth and documentation, in the case of Korea. Further studies will be required including details field investigations in areas where the Mongolian-type still is no longer in use in Mexico even though reported earlier, by Bruman and Lumholtz. Another question to be investigated is the character of specific still adaptations and how these relate to societies and specific material conditions. In particular, what kinds of planning and social strategies do the individual adaptations represent and from whence the raw materials to support them (agave in Mexico but kumiss in Central Asia and rice in Korea). This will require a careful study of local conditions of agriculture and even livestock, in the case of Mongolia, and cooking traditions as they relate to distillation and models of evaporation and condensation. To perform this latter task properly, not only will more information have to be collected, but distilling apparatus will need to be constructed based upon traditional knowledge and tested in a laboratory. Only then will we be able to tell the precise ways in which local adaptations represents local conditions, specific local conditions.

104 Valenzuela, Park and Buell (forthcoming).

Aknowledgements

Thanks go first and foremost to Group 3 Director Dagmar Schäfer for allowing Paul D. Buell to work on the history of distillation as part of his visiting scholar status at the Max Planck Institute. In addition, valuable information was provided to us by Paulina Faba and Miguel Ángel Aedo. Johannes Neurath assisted us with information regarding a Huichol route. Special thanks goes to Ignacio Torres (Mezcólatras de Morelia) who provided photographs. 2013 Huichol field research would not have been possible without the help of Liliana and Nicolás Romero and Antonio Olvera, who also shared photographs with us taken of Nahua stills in Jalisco. Thanks also go to Fernando Juárez and Gabriel Santos Navarro for bibliographical assistance, to Angela Schottenhammer and Matthieu Torck, where plans to start a project on distillation began in Ghent early in 2011, to Gladys O. Abascal Johnson for Huichol and Nahua information, and to Gene Anderson for advice and general support, including proofing in the case of Gene. John Moffett of the Needham Research Institute provided a copy of an important Bruman letter. Facilities were made available by the Museo Regional de Guadalajara INAH, Ricardo Ortega Gonzalez director, and by the Max Planck Institute in Berlin.

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