



Veröffentlichungen zur Iranistik 75

Bert G. Fragner, Ralph Kauz and Florian Schwarz (eds.)

With the editorial assistance of Bettina Hofleitner

Wine Culture in Iran and Beyond

Verlag der
Österreichischen Akademie
der Wissenschaften



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ÖSTERREICHISCHE AKADEMIE DER WISSENSCHAFTEN
PHILOSOPHISCH-HISTORISCHE KLASSE
SITZUNGSBERICHTE, 852. BAND

VERÖFFENTLICHUNGEN ZUR IRANISTIK
HERAUSGEGEBEN VON BERT G. FRAGNER UND FLORIAN SCHWARZ

NR. 75

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Wien 2014

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sible. We are obliged also to the Department of International Relations of the Austrian Academy of Sciences for its support of the symposium. We wish to thank all participants for their contributions and discussions which have enriched the symposium and are reflected in this volume, and the authors for agreeing to thoroughly revise their papers for publication. We also thank the anonymous reviewers for their useful comments. All remaining shortcomings of the volume are ours. These acknowledgements would not be complete without a word of thanks to the Austrian Academy of Sciences Press, the book production team of the Austrian Academy of Sciences, and Bettina Hofleitner of the Institute of Iranian Studies without whose tireless efforts this book would never have been published.

Iranian Wine at the “Dawn of Viniculture”

PATRICK E. MCGOVERN

My recent book on *Uncorking the Past* (2009/2010) provides a good starting point as well as a summary of the interdisciplinary research on ancient wine that my laboratory and others have been engaged in over the past twenty years. This book is more than just about wine – it traces alcoholic beverages around the world as far back in time as possible. It tries to show how far we’ve come in understanding the origins and biocultural importance of alcoholic beverages world-wide since our species came “out of Africa” some 100,000 years ago.

In dealing with ancient wine, the main lines of evidence are:

- (1) Archaeological evidence, with the emphasis on well-excavated, well-preserved, and well-published sites. Scientific analyses of the pottery sherds, grape seeds, and other remains that survived the millennia are essential;
- (2) Organic or biomolecular archaeological evidence, which is the focus of my laboratory at the Penn Museum;
- (3) Textual and artistic evidence, whether an ancient Egyptian fresco or the writings of a Roman or Greek writer such as Pliny the Elder or Columella, who devote nearly half of their works to wine and the vine, demonstrating the importance of this subject. Literary statements or artistic motifs cannot be accepted at face value, since they are not written or composed after the fact, unlike archaeological and chemical data, and sometimes incorporate legendary and fanciful elements;
- (4) Ethnographic and ethnohistorical evidence. Traditional viniculture provides interpretative insights into how best to interpret the archaeological, textual, artistic, and chemical data.
- (5) Experimental archaeology. After developing a scenario of how an ancient wine was made, we can process modern natural products, which are genetically as closely related to the ancient ingredients as possible, by the hypothesized ancient methods. We can then assess the extent to which these techniques work, and, perhaps most importantly, discover whether

the wine tastes any good. Our ancestors had much the same sensory organs and brains as we do, and would have had similar predilections to ours, even if cultural preferences (sweet, sour, etc.) change from time to time.

Experimental archaeology provides an entree into the past not only for the archaeologist and scholar, but also for the general public who gain an appreciation for innovative (and sometimes) tasty accomplishments of our ancestors. In collaboration with Dogfish Head Brewery in Delaware and other individuals and microbreweries, we have carried out a variety of experiments on ancient wine, including vinifying in goat wineskins and adding herbs, spices and tree resins, which are described in ancient literary works and inscriptions and have been attested in our chemical analyses, to wine made from cultivars genetically close to the Eurasian grape (*Vitis vinifera*).

The earliest alcoholic beverage that we have thus far chemically confirmed and re-created is from the early Neolithic site of Jiahu in the Yellow River Valley of China, dated around 7000 B.C. It combined a native Chinese grape species, along with hawthorn fruit, honey, and rice. Although more archaeological and chemical evidence is still needed to bolster the theory that Middle Eastern grape wine dates back this early (see below), it can be proposed that a kind of "prehistoric silk road" ran across Iran and Central Asia during the Neolithic period. Such a route might well have provided a conduit for ideas to flow in both directions, however fragmentary the process and however short the distances involved from oasis to oasis. That in turn might have led to the domestication of grains (barley and wheat in the west, and rice in the east) and the production of fermented beverages on a large scale at about the same time.

This hypothesis might help to explain the marked similarity between the ancient Chinese "alcoholic beverage" pictogram, showing a jar with three drops falling from its rim, and the proto-Elamite/Sumerian sign for "beer" in ancient Mesopotamia, which incorporates a similarly shaped jar with pointed base. A prehistoric connection between western and east Asia might also help to account for why some ethnic groups in China still drink their cereal beers through multiple drinking-tubes from a single large jar, like the ancient Mesopotamian peoples did thousands of years ago.

PREHISTORIC WINES FROM IRAN

In a very real sense, my research into ancient wine begins with Iran. I organized a conference on "The Origins and Ancient History of Wine" at the Robert Mondavi Winery in the spring of 1991 (McGovern, et al., 1995). The star of the show at the conference was a rather nondescript pottery jar (McGovern 2003/2007: fig. 3.1) from Godin Tepe, dated to about 3500–3000 B.C. It provided us with the earliest chemical evidence for wine at the time. That the vessel came from high up in the central Zagros Mountains of Iran, which now outlaws alcoholic beverages, made it all the more intriguing!

Our chemical analyses of a reddish residue inside the jar showed the presence of tartaric acid, the finger-print or marker compound for grapes in the Middle East, and a tree resin. In other words, we had discovered a resinated wine, in which the resin acts as an anti-oxidant to keep the wine from going to vinegar. Although widespread in antiquity, this tradition is only perpetuated today in Greece as retsina.

The then-earliest wine jar came from the so-called Deep Sounding at Godin Tepe, a complex of buildings and rooms, surrounding a central courtyard, which were exposed at the top of the mound and dubbed the "oval". When Virginia Badler, who was preparing a dissertation on the Late Uruk (Chalcolithic) levels at Godin first came to us with the jar, we were skeptical that we could identify preserved organic residues of wine which had been "aged" 5000 years or more. But she proved to be right (Michel, et al. 1993).

Archaeological Chemistry or Biomolecular Archaeology is what made our identification of ancient wine possible. In short, a revolution in scientific techniques over the past forty years has enabled a re-examination and, in many cases, a re-writing of the history of fermented beverages generally and wine specifically. We are just at the beginning of this process, which promises many more discoveries—hopefully in Iran!--and perhaps some new taste sensations.

The principal chemical technique that we now employ to identify tartaric acid, which has been absorbed as a liquid into pottery fabric of vessels, is liquid chromatography tandem mass spectrometry or LC/MS/MS (McGovern, et al. 2009). This acid and its more insoluble potassium and calcium salts readily precipitate out from solution and make up much of the lees that one sees in an unfiltered wine. We employ an array of other instrumentation to detect additives to the wine.

Since tartaric acid is found in large amounts only in grapes in the Middle East, its dominant presence in the Godin sherd and residue pointed to a grape product, most likely wine since once the grapes have been expressed as a liquid (obvious from the narrow mouth on the vessel and the accumulation of residue on the bottom of the jar), it will quickly ferment to wine in the warm climate of the Middle East.

The Late Uruk period is important because the earliest development of a complex society of city-states in the southern Tigris-Euphrates valley and adjoining lowland areas occurred then – that of the proto-Sumerians and proto-Elamites – based on irrigation agriculture of cereals, dates, and other plants. The first writing with pictographic signs appeared in which the signs depict the thing or concept that was being conveyed. For example, one clay tablet at Godin Tepe from the oval had incised on its surface the sign for “pottery vessel” or *dug* in ancient Sumerian; this jar sign also forms the basis for the “beer” sign (*kaš*). Three circles, each representing the number 10, and three vertical strokes, representing 1, accompanied the *dug* sign on the tablet, and indicated that altogether thirty-three jars were recorded. We might also ask what these vessels contained – perhaps a wine, barley beer or something more exotic – but this information is not provided on the tablet.

The finding of the Godin tablet is one indication that the oval was in fact built by lowlanders. The symmetrical layout and well-constructed niched and recessed walls of the buildings in the oval, as well as a considerable amount of lowland pottery excavated there, also support this hypothesis.

But why should lowlanders be interested in living up in the mountains of Iran at Godin Tepe? It is known that extensive trade ties developed between the lowland and highland regions in the Late Uruk period. And semi-precious stones such as lapis lazuli from Afghanistan, metals including copper, silver and gold, even such mundane goods as wood which were unavailable in the Tigris-Euphrates valley, were exploited in the uplands. Godin is located along a major ancient trade route, what later became the famous Silk Road going from China to the Mediterranean – indeed, it lies on the hypothesized “prehistoric silk road” which I mentioned above. It was thus ideally situated to serve as a proto-Sumerian or proto-Elamite administrative and trade center.

Raw materials, such as lapis lazuli, were put to good use in lowland Mesopotamia. One amazing artifact referred to as the Royal Standard (see McGovern 2003/2007: 159–160, pl. 7), for example, was made of lapis lazuli and shell. It comes from the Early Dynastic Royal Cemetery at Ur in the Lower Tigris-Euphrates Valley of southern Iraq, dated to about 2600–2500

B.C. One side of the piece, called the “Peace Standard,” depicts the victory celebration following a military conquest, the so-called “War Standard” shown on the reverse. The peace scene shows the king sitting placidly on his throne, goblet in hand, facing six of his generals or high officials who salute the king with their goblets raised. Can we know what he and his comrades were drinking? Our chemical analyses (Badler, et al. 1996) have shown that the beverage in the cups or goblets and the long-spouted jugs, such as that seen on the lower image of the Peace Standard, was wine.

Cylinder seals from the Ur cemetery of the same period also show what at first appears to be a rather strange vessel – a large, wide-mouthed jar seemingly sprouting branches. Our chemical analyses have borne out that we are witnessing barley beer-drinking here. The “branches” are drinking-tubes or “straws”, actual examples of which have been excavated from the Ur tombs, made of lapis lazuli, gold, and silver. The straw enabled the drinkers to penetrate through an accumulation of grain hulls and yeast, floating on the surface of the liquid, and reach the beverage below.

Our discovery at Godin led to a spate of new ancient analyses over the past two decades, including two wine jars (McGovern, et al. 1996) from another important site in Iran, Hajji Firuz Tepe, which predate the Godin jars by 2000 years, going back to ca. 5400–5000 B.C.

Hajji Firuz, farther north in the Zagros Mountains from Godin Tepe, was among the first permanent, year-round settlements of the Neolithic period in the Near East. These villages were a direct result of humans taking control of their food resources by domesticating a variety of plants and animals. The invention of pottery around 6000 B.C. gave more impetus to the process, since special vessels for preparing and storing wine and other foods and beverages in stoppered jars could now be easily made. What can be termed a Neolithic cuisine emerged. A variety of food processing techniques – fermentation, soaking, heating, spicing – were developed, and Neolithic peoples are credited with first producing bread, beer, and undoubtedly an array of meat and cereal entrées that we continue to enjoy today.

What better place to look for evidence of wine dating to the Neolithic period than my home-base at the University of Pennsylvania Museum, which has one of the best collections of well-documented excavated artifacts in the world. After the Mondavi conference, I simply asked a Neolithic archaeologist, Mary Voigt, if she had ever noted intriguing residues on any of the Neolithic pottery she had excavated in 1968 at Hajji Firuz. She remembered some yellowish residues on the bottom of a narrow-mouthed jar. This jar and five others (fig. 1) had been set into recesses in the clay floor and lined up

along the wall of a kitchen, where an oven and cooking vessels were also found. Each jar had a capacity of about nine liters when full. Mary had thought the residue might be from a dairy product, such as milk or yogurt. A chemical analysis at a time when chemical techniques were less sensitive, however, was negative. The sherds then lay in museum storage for twenty-five years.

Once we re-excavated the sherds from storage, we went to work using more modern methods to solve the archaeological puzzle of what the jars originally contained. Again, we were able to show that the Hajji Firuz jars held a resinated wine.

Of course, if oxygen remains available, fermentation can continue and eventually the acetic acid bacteria will convert all the wine to vinegar – this is called “wine disease,” which any competent winemaker, even one living in the Neolithic period, wants to avoid. Although cork was not yet available, raw clay stoppers function the same way, absorbing liquid and expanding to seal off the mouth of the jar. Such stoppers were found in the vicinity of the wine jars at Hajji Firuz. The tree resin additive, which also fends off wine disease, made it virtually certain that the jar originally contained wine.

Although we first analyzed a jar sherd with a yellowish deposit, another jar had a reddish residue that also tested positive – perhaps, it was the red to go with the white, although we are yet to prove this chemically.

THE “WINE CULTURES” OF THE MOUNTAINOUS NEAR EAST, AND BEYOND

On current evidence, the northern mountainous region of the Near East, including the northern Zagros Mountains where Hajji Firuz is located, the Caucasus and the Taurus Mountains of eastern Turkey, was a “hotbed” of experimentation during the early Neolithic period from about 8500 B.C. down to 6000 B.C. (for details, see McGovern 2009/2010: Ch. 3). For example, excavations at Çayönü on the upper Tigris River yielded wild grape seeds, dating back to around 9000 B.C. and associated with a long sequence of monumental cult buildings which had been “ritually” buried during the Neolithic.

Most recently, the construction of dams along the Tigris and Euphrates have led to an ambitious salvage archaeological program, and the results have been truly astounding at sites such as Göbekli Tepe and Nevali Çori, which date as early as ca. 8500 B.C. Today, the barren terrain of calcareous hills and valleys might not appear to be conducive to viticulture. But excavations paint a different picture of a *terroir* generally characterized by an iron-

rich red loam, so-called *terra rossa*, whose porosity and mineral content would have been ideal for growing grapes in antiquity.

What are believed to be religious shrines or temples Göbekli Tepe and Nevali Çori are amazingly adorned with 3-dimensional sculptures and architectural elements, including birds of prey serving as headdresses for female figures or deities, a male with a snake slithering down the back of his head, and an array of naturalistic depictions of animals, e.g., an aurochs (wild ox), fox, and crane which adorn a pillar.

Most important for the issue of early viniculture, many stone goblets and bowls have been recovered from these sites and others in the region. One carved goblet depicts a male and female dancing with a turtle on a festive occasion, perhaps a wine celebration? Schematic snake and bird motifs are also very common on such goblets.

The stone used to make these bowls was chlorite, a clay mineral with highly adsorbent properties. We are now in the process of analyzing the copious amounts of ancient organics retained in pores of this mineral, to determine what the vessels originally contained. Grape wine, based on positive results for tartaric acid using two of our chemical techniques, is the best possibility, but LC/MS/MS confirmation is required to be certain.

These bowls could well be important as the earliest evidence for wine having been prepared, drunk, and offered to the gods. Such vessels led on to the earliest pottery, beginning around 6000 B.C., which included larger jars and sieves, ideal for processing and storing wine, and decorated with clay appliqués like those on jars from Georgia, dated around 6000 B.C. or some two thousand years later than the chlorite bowls and goblets from eastern Turkey. One appliqué shows a stick-like figure apparently dancing beneath a vine which is festooned with grapes, perhaps in celebration of the grape harvest or another occasion.

In short, the upland region of the Caucasus, Taurus, and Zagros Mountains are all possibilities for the earliest domestication and the beginning of winemaking. These areas comprise the so-called “world center” of the Eurasian grape where its greatest genetic diversity is found. And this is where a “wine culture” consolidated itself in the Neolithic period and progressively moved southwards to Egypt through Lebanon, Syria, and Israel/Palestine, and to Shiraz in southwestern Iran along the spine of the Zagros Mountains.

A “wine culture” is self-evident to most southern and central Europeans, as well to Georgians in the Caucasus who have likely carried on their traditions for at least 8000 years. It can be defined as a culture in which everyday meals, social events and special celebrations from birth to death, including

rites of passage and major festivals, are marked by the drinking or offering wine. With time, viniculture comes to dominate the economy, religion, and society as a whole.

An excellent illustration of such a culture in antiquity is the Hittite empire of central Turkey. This great Indo-European power of central Turkey was still unknown until the beginning of the 20th c., aside from several mentions in the Bible. Yet, it was an equal to ancient Egypt and Assyria in the mid- to late 2nd millennium B.C. Near East. Based on excavations and texts, we know that the Hittites had vast royal vineyards surrounding their capital city of Boğazkale, ancient Hattusha, which produced an unending flow of wine, enjoyed by the king, his retinue, and, of course, the gods. Row upon row of gigantic wine jars or *pithoi*, which stood between 1–2 meters tall, filled the storage rooms of the palaces. Exquisite rhyta or drinking-horns in silver and gold were used to present wine to the gods at festivals throughout the year.

THE NOAH HYPOTHESIS

With evidence of very early wine from Hajji Firuz and elsewhere in the mountainous Near East, it was starting to look likely that the winemaking industry took off in the Neolithic period, and if this were true, then it was likely that the wild Eurasian grapevine (*V. vinifera sylvestris*) was taken into domestication then, like so many other plants and animals at this time. Six jars in the Hajji Firuz kitchen, assuming they all contained wine—some fifty-five liters – were the “smoking gun”. The house with the six jars of wine was an ordinary residence, and if the amount of wine in it was multiplied many times over by houses throughout the settlement, then a lot of wine, much more than could be produced by gathering wild grapes, must have been produced.

What makes the domesticated vine so desirable is that it is hermaphroditic, i.e., the male (stamen) and female (pistil) parts are located on the same flower – so the plant produces much more fruit on a predictable basis than the wild vine. This self-fertilizing plant could then be selected for larger, juicier and tastier fruit and fewer seeds, and cloned by transplanting branches, buds, or rootings. This assumes further that humans had discovered how to propagate the vine horticulturally, since its seeds are genetically too variable. But how early was the vine domesticated and did it happen in only one place, perhaps at Hajji Firuz or somewhere else in the upland region of the Near East where the wild grape thrives? DNA studies of ancient and modern grape are now in progress, and the answer has begun to emerge.

Any debate about the Noah Hypothesis boils down to whether the Eurasian grapevine was domesticated in only one place at one time and then transplanted from place to place, or whether it was domesticated in many different places and times, including Europe. The Noah Hypothesis is an apt phrase to describe a one-time origin of viniculture in one place, because the biblical patriarch’s first goal, after his ark came to rest on Mount Ararat, was to plant a vineyard and then make wine (Genesis 8.4 and 9.20). Like the Eve Hypothesis, which claims to trace all of humanity to an original human “mother” in East Africa (whether 2 million or 200,000 years ago) on the basis of mitochondrial DNA lineage trees, a DNA investigation of the Eurasian grape would seek the ultimate progenitor of modern domesticated grape varieties.

To test the Noah Hypothesis, we have focused on the three mountainous areas where the wild grapevine thrives: the Caucasus Mountains where a “wine culture” had emerged by at least 6000 B.C. and grape seeds of the domesticated type have been found in Neolithic villages; the Taurus Mountains of eastern Turkey where stupendous Neolithic sites have been found recently (above), predating those in the Caucasus, and where einkorn wheat and probably chickpea and bitter vetch – so-called founder plants for the Neolithic period – were first domesticated; and, of course, the Zagros Mountains. You might say that we’re looking for the vinicultural Garden of Eden. There’s a lot of territory to cover in these mountains, and we’ve only been sampling archaeological materials and grapevines for about ten years.

Our search for wild vines in eastern Turkey in 2005 illustrates how arduous the process can be. Climbing steep cliffs above the raging torrent of the Tigris in spring, we sought out our prize and were rewarded. In one locale, a hermaphroditic plant was positioned between a wild male and female vine, exactly the situation that an early viticulturalist would have needed to observe and select for.

There now appears to be very good evidence from our investigation (Vouillamoz et al. 2006) and a recently published paper by Myles et al. (2011) that the great grape of Burgundy, Pinot Noir, and other important European cultivars are related to the wild Eurasian grapevine of the mountainous Near East. In other words, *Vitis vinifera* must have been first taken into domestication somewhere in that extended region. It was then transplanted one step at a time southwards through the Fertile Crescent and westwards across the Mediterranean to France and other Mediterranean countries. Because the grapevine is highly promiscuous, it crossed with wild vines as it went and produced the thousands of grape cultivars and wine

which we know and enjoy today.

CONCLUSION

We already know a lot chemically and archaeologically from Neolithic sites in eastern Turkey and the Caucasus. What we really need, going forward, is have similar research carried out in Iran.

Iran in antiquity was preeminently a “wine culture” with its Persian kings and Bacchic poets like Omar Khayyam or Hafiz, who hailed from Shiraz. Recently, I happened upon an Iranian, Mitri Faravashi, making wine for David Bruce, one of the best producers of Pinot Noir in the Santa Cruz region of California. Mitri told me that “yes, wine is still made in Shiraz,” using traditional techniques of stomping the grapes on the roofs by only virgin women and running the juice to fermentation jars in the basement. He claimed that one wine he had tasted there recently, made from a native clone, was the best that he had ever had, and that is saying a lot coming from someone who makes excellent Pinot. Perhaps, someday, we will know how the true Shiraz grapevine was established there, the extent to which it harbors the DNA of other great varieties such as Pinot Noir, and how it became synonymous with the finest wine in the world.

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