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UNIVERSITÀ DEGLI STUDI DI SIENA

ARCHEOLOGIA DELLA VITE E DEL VINO IN TOSCANA E NEL LAZIO

Dalle tecniche dell'indagine archeologica
alle prospettive della biologia molecolare

a cura di

Andrea Ciacci, Paola Rendini, Andrea Zifferero



All'Insegna del Giglio

In copertina: Scena di spremitura delle vinacce dallo *skyphos* della Collezione Forman, Museum of Fine Arts, Boston (disegno di J.-P. Brun) su paesaggio vitato in località Montarioso (SI) (foto di M. Giannace).

In allegato un cd-rom contenente materiale aggiuntivo

Sul supporto sono presenti le cartelle Progetto VINUM, Progetto ArcheoVino e Progetto *Senarum Vineae*, contenenti le schede archeobotaniche e ampelografiche in formato PDF, con relativi indici di consultazione.

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THE ARCHAEOLOGICAL AND CHEMICAL HUNT FOR THE ORIGINS OF VINICULTURE
IN THE NEAR EAST AND ETRURIA

The translation of my recent book on *Ancient Wine* into Italian (McGOVERN 2004) partly accounts for my invitation to the conference, and it's always encouraging when a book strikes a chord with on-going research. I cannot claim to know Italian and am hardly an Etruscologist, only marginally touching on ancient Etruria in my book. What I propose to do first is to describe some of the principal points in my book dealing with Near Eastern and Eastern Mediterranean archaeology, especially its implications for the spread of a wine culture to central and western Mediterranean (in the following discussion, see McGOVERN 2004 for details and references).

Then, I will act as devil's advocate or more in keeping with our topic, Socratic symposiast, to ask specific questions about what we know or can hope to find out about the beginnings and subsequent development of Etruscan viniculture. Using the modern methods of Archaeological Chemistry or Molecular Archaeology, combined with recent archaeological discoveries and a reexamination of ancient art and writings, we can discover a great deal about the history of wine. We are just at the beginning of this process, which promises many more discoveries in the future.

Our first chemical examination of a wine jar was one from Godin Tepe in the middle Zagros Mountains of Iran, dated to about 3500 B.C., which at the time pushed back the oldest chemically confirmed instance of wine some 3000 years (McGOVERN 1995).

The analyses showed that this jar and several others from the same site had originally contained a resinated wine. Today, the tradition of making a resinated wine is perpetuated only in Greece as *retsina*.

The Godin Tepe jar inspired me to look for even earlier evidence for wine. At the 1991 conference on the «Origins and Ancient History of Wine» (McGOVERN 1995), the so-called «Palaeolithic Hypothesis» was proposed, viz., the idea that our hominid forebears might have serendipitously discovered wine from time to time. Indeed, it is not difficult to imagine that fermented beverages, especially wine and honey mead, were extremely important in the development of human culture, perhaps as far back as the origins of our species. Brightly colored, high-sugar wild grapes would surely have been exploited as a food source, and in the process of collecting grapes in an animal hide or wooden container, some skins might have ruptured and released their juice under the accumulated weight of the grape mass above. This liquid might then have fermented, due to natural yeast found on some skins, and produced a low-alcoholic wine. The appeal of this mind-altering beverage is obvious, and more intentional squeezings and tastings could have ensued, at least during harvest. Any Palaeolithic wine would also have to be drunk quickly before it turned to vinegar. The possibility of finding preserved organic residues inside Palaeolithic containers and confirming the hypothesis, however, are slight, because the vessels have decomposed.

Since finding and analyzing a Palaeolithic wine vessel was very unlikely, my laboratory focused on the Neolithic period, from about 8500 B.C. down to 4000 B.C., when the first year-round villages emerged in the Middle East. These villages were a direct result of humans taking control of their food resources by domesticating a variety of plants and animals. During a time of extensive experimentation, it seemed likely that the grape could also have been domesticated and wine produced on a large scale. The invention of pottery around 6000 B.C. gave impetus to the process, as well as providing excellent samples for analysis, since special vessels for preparing and storing wine in stoppered jars could now be made.

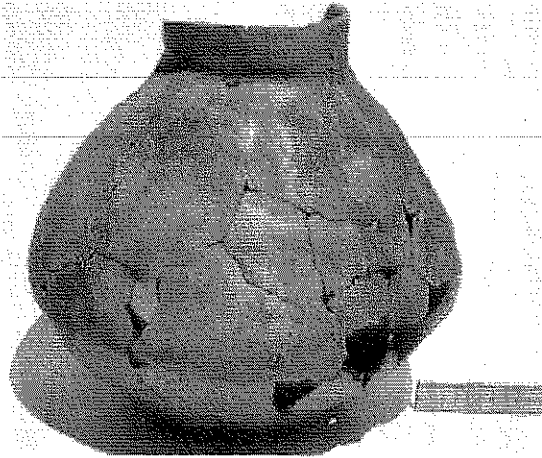


Fig. 1 – One of six resinated wine jars, from a “kitchen” of a Neolithic residence at Hajji Firuz Tepe (Iran). No. 68-205, University of Pennsylvania Museum 69-12-15 (height 23.5 cm) (dating to ca. 5400-5000 B.C.) (courtesy of Hasanlu Project, University of Pennsylvania Museum).

A kind of Neolithic cuisine emerged, in which a variety of food processing techniques (fermentation, soaking, heating, spicing, etc.) were employed to produce bread, beer, and undoubtedly an array of meat and cereal entrées that we continue to enjoy today.

My home-base at the University of Pennsylvania Museum provided an excellent resource for finding Neolithic samples. With one of the best collections of well-documented excavated artifacts in the world, I sought suitable material from in-house Neolithic archaeologists. Dr. Mary Voigt, for example, had noted intriguing deposits on some pottery she had excavated in 1968 at the Neolithic village of Hajji Firuz Tepe in the northern Zagros Mountains of Iran. Yellowish material could be seen on the interior bottom third of a narrow-mouthed jar (Fig. 1), which together with five similar vessels had been set into the clay floor and lined up along the wall of a “kitchen” in one house at the site. Each jar had a capacity of about nine liters when full. The color of the deposit suggested milk, yogurt or some other dairy product, but chemical analysis during this early stage in the development of Molecular Archaeology, yielded negative results. The sherds then sat in Near Eastern storage at the museum more than 25 years until we began our analysis.

Once we dug the sherds out of storage, we went to work using more modern methods of biomolecular archaeology to solve the archaeological puzzle of what the jars originally contained. Without going into all the analytical details here (references provided in MCGOVERN 2003 / 2006, 2004 and 2009 / 2010), we targeted tartaric acid, which occurs in large amounts only in the Eurasian grape in the Middle East, and confirmed its presence by diffuse-reflectance infrared Fourier-transform spectrometry, high-performance liquid chromatography, and a Feigl spot test. 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 and at the bottom of an ancient vessel holding a liquid. Its dominant presence in the Hajji Firuz 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.

In the past five years, we have gone on to detect tartaric acid in our ancient samples by a more powerful technique: liquid chromatography tandem mass spectrometry (LC/MS/MS) (see GUASCH-JANÉ *et alii* 2004; MCGOVERN *et alii* 2009).

In brief, tartaric acid ($M_r = 150.1$) is ionized when it comes off an LC column at a specific time in the first cell of the quadrupole mass spectrometer, where it is mass-filtered. The deprotonated molecular ion is then fragmented in a collision cell, and the daughter ions are again filtered by a second quadrupole. Tartaric acid is identified based on discrete fragmentation products that are detected. We have developed special extraction procedures using ammonium hydroxide in the extraction process, which accentuates the contribution of the tartrate ion and salt.

The yeast cell is microscopic and was too small for ancient humans to see, but the visible signs of fermentation were obvious to an aspiring winemaker, as carbon dioxide evolved and roiled the surface of the fermenting grape juice in a seemingly miraculous process. Since the grape juice was probably partly fermented in the Hajji Firuz jars themselves, one can imagine them rocking back and forth, further adding to the mystique and allure of the beverage. In short, here was a beverage that would have been easily recognized as undergoing mysterious changes, combining mind-altering and medicinal properties, and imbued with powerful religious and social connotations.

Neolithic winemakers, however, would have been faced with a problem: if oxygen remained available in the jar, fermentation could continue and eventually the acetic acid bacteria would have converted all the wine to vinegar. Any competent winemaker, even one living in the Neolithic period, wants to avoid «wine disease». Lacking corks, raw clay stoppers can function in much the same way, absorbing liquid and expanding to seal off the mouth of a jar. And indeed, stoppers with the same diameter as the jar mouths were found in the vicinity of the wine jars at Hajji Firuz.

Another chemical constituent of the Hajji Firuz residues, which prevents the dreaded wine disease, made it virtually certain that the original contents of the jars had most likely been wine and not vinegar. We identified terpenoid compounds characteristic of terebinth tree resin. The terebinth tree grows throughout the Middle East, and produces large amounts of resin in Fall, at about the same time that the grapes mature. Pliny the Elder devoted a good part of book 14 of his Natural History to the problem of how to keep wine from turning to vinegar. Tree resins – pine, cedar, frankincense, myrrh, and very often, terebinth which was known as the «queen of resins» – were added to Roman wines for just this purpose.

Based on our chemical findings from two of the Hajji Firuz jars and subsequent analyses of many more wine vessels from throughout the Near East, ranging in date from the Neolithic to the Byzantine period, it became apparent that the deliberate addition of a tree resin to preserve wine predated Pliny by thousands of years. Resinated wine was also one of the most widespread human medicines in antiquity.

The Hajji Firuz evidence suggested that larger-scale winemaking had already begun in the Neolithic Period. The six jars in the Hajji Firuz kitchen, if they all contained wine, would have held 55 liters. This house was an ordinary residence, and if the amount of wine there were multiplied many times over by houses throughout the settlement, then the total quantity of wine would be much more than could be produced by gathering wild grapes. If this were true, then it was likely that the Eurasian grapevine (*Vitis vinifera sylvestris*) had been taken into domestication, like so many other plants and animals during the same period.

What makes the domesticated vine (*Vitis vinifera sativa*) so desirable is that it is hermaphroditic – i.e., male (stamens) and female (pistil) organs are located on the same plant – so it produces much more fruit on a predictable basis. This self-fertilizing plant could then be selected for desirable traits, such as juicier fruit, thinner skins or fewer seeds, and cloned by transplanting branches, buds, or rootings. This assumes that humans had discovered how to propagate the vine horticulturally, since its seeds are genetically too variable to perpetuate desirable traits and clone the plant. But how early was the vine domesticated and did it happen in only one place, perhaps at Hajji Firuz Tepe or elsewhere in the upland region of the Near East where the wild grape thrives?

The debate boils down to whether the Eurasian grapevine was domesticated in only one place at one time and then transplanted from place to place, with possible crosses occurring with wild plants in those other places at times, or whether it was separately domesticated in different places and times, including Europe (Spain has been proposed). During historical times, when viticulture was better understood, it would be expected that the wild grapevine could be re-domesticated, but was it?

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 similar investigation of the Eurasian grape would seek the ultimate progenitor of modern domesticated grape varieties.

In collaboration with colleagues in Europe and the States, we are currently developing techniques to extract ancient DNA and compare modern wild and domesticated microsatellite sequences, including nuclear and chloroplast DNA (e.g., VOUILAMOZ *et alii* 2006; ARROYO-GARCIA *et alii* 2006).

An important conclusion of the Vouillamoz paper was that a number of Georgian varieties (*Tsitska, Kundza, Tsolikouri, Chkobra/Krakhuna, Tetri, Dzvelshavi, Maglari Torina, and Otskhanuri*) show a close relationship to the western varieties *Pinot Noir, Nebbiolo, Syrah, and Chasselas*. The implication of this result is that a Near Eastern Noah Hypothesis is borne out, and that as the domesticated grapevine was transplanted westwards, there was introgression with wild vines to yield some of the modern European cultivars.

A recent paper (MYLES *et alii* 2011), using a microarray of thousands of grape genetic markers, including thousands of single nucleotide polymorphisms (SNPs) and 60 base-pair long oligo probes, similarly argues for Georgian varieties as closest to all the western cultivars included in their database. In this paper, the hermaphroditic gene has been isolated on chromosome 17. The latter sequence needs to be better defined, but together with other parts of the genome related to desirable winemaking traits of the domesticated vine, it should eventually be possible to resolve whether a single domestication in the Near East best accounts for modern European cultivars. Extraction of ancient DNA remains is also urgently needed to provide a chronology of the transplantation process and emergence of new cultivars as the grapevine traveled from east to west.

We don't know whether the Hajji Firuz wine was made from the domesticated or the wild Eurasian grape. The site lies within the modern distributional zones of the wild grapevine, so the grapevine could have already been domesticated there. However, because of its wider distribution from Spain to the oases of central Asia, other areas cannot be ruled out.

To test the Noah Hypothesis, we and other researchers have been focusing on three areas, where the wild grapevine thrives – the Caucasus Mountains, sometimes argued to be the so-called “world center” of the Eurasian grape where its greatest genetic diversity is found; the Taurus Mountains of eastern Turkey where stupendous Neolithic sites have been found recently 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.

This upland region of the Caucasus, Taurus, and Zagros Mountains are all possibilities for the earliest domestication and the beginning of winemaking. What especially makes me think that the origins of viticulture will be found here is that there is a great deal of archaeological and historical evidence for what can be called a «wine culture» gradually radiating out in time and space, from small beginnings in the northern mountains of the Near East in the Neolithic by at least 7000 B.C., to become a dominant economic and social force throughout the region and later across Europe in the millennia to follow.

You might say that we're looking for the viticultural Garden of Eden. There's a lot of territory to cover in these mountains, and the modern search has only begun a concerted investigation for about ten years in search of relevant archaeological and grapevine evidence there. What is becoming increasingly clear, however, from these combined archaeological and chemical investigations is how entrenched «wine cultures» were there as early as the Neolithic period. These are cultures 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, viticulture comes to dominate the economy, religion, and society as a whole.

It is not difficult for this audience to understand what a «wine culture» is, since you are well-acquainted with those in Italy. Since I am from Pennsylvania, I need more convincing evidence.

My trip to the Caucasus in 1998 showed me the hold that a «wine culture» could have over a people. Wine is still made there in large jars (*kwevri*) underground, and on the lees, as also attested by the numerous buried *pithoi* of Bronze and Iron Age buildings in the region. Dinners are

presided over by a toastmaster (*tamadā*), who offers up numerous toasts throughout the meal to the motherland, family, and life itself – impossible to imagine apart from wine.

The «wine culture» in the Caucasus appears to have begun in the Neolithic period, based on pottery types and the finding of grape seeds of the «domesticated» type. It reached a high-point in the Bronze Age when exquisite drinking goblets in gold and silver were produced, showing typical hunting and war scenes. The climax of such scenes is a festive banquet in which the ruler sits on a throne with cup in hand, attended by a cupbearer. This motif eventually became the standard symbol of Near Eastern and Egyptian civilization, dominated by wine, in which the king by raising his wine cup assured the fertility of the land, the prosperity of his people, and the continuation of his rule.

Unfortunately, I don't have time today to say more about our Transcaucasian research, now in progress, nor the even more exciting chemical analysis of pottery and stone jars and goblets from very early Neolithic sites at the headwaters of the Tigris and Euphrates Rivers in the eastern Taurus Mountains. In the Summer of 2004, I traveled to this latter remote area in Turkey, which appears to have been a “hotbed” of vinicultural experimentation as early as 8500 B.C. The DNA of wild Eurasian grapevines, which grow along the steep slopes of the rivers, is now being investigated. In one case, a hermaphroditic plant, whose frequency is about 5-7% in the wild population, was positioned between a wild male and female vine; an early horticulturalist would have been needed to select just such a hermaphrodite and clone it, in order to domesticate the grape.

But a recent discovery needs to be mentioned: what has been called the earliest winery, with a plastered treading floor and large underground jars to collect the juice and vinify and age it, was discovered in the Areni cave of Armenia (BERNARD *et alii* 2011).

This site, dated to ca. 4100 B.C., is only about 300 km north of Hajji Firuz where we found evidence of the earliest wine (above). Such facilities begin to be recorded increasingly in other part of the Near East after ca. 3000 B.C. and throughout later periods, including Crete, Italy, and other Mediterranean countries. Although not yet proven, a single domestication theory (Noah Hypothesis) would help to explain the gradual movement of a «wine culture» from the northern mountainous regions of the Near East to points south, east, and west – reaching the Jordan Valley around 4000 B.C., then Egypt by ca. 3000 B.C., Shiraz in southwestern Iran about the same time, Greece by 2500 B.C., and Italy and the western Mediterranean at even later dates.

In order to track these developments, my laboratory at the University of Pennsylvania Museum has become a kind of repository or «cellar» for ancient wine samples. I don't have time to discuss developments in Mesopotamia and Shiraz – you will have to consult my books and articles about that – and still be able to pose some central issues, as I see it, about Etruscan winemaking. But before we begin leapfrogging across the Mediterranean, let us briefly look at Egypt and Phoenicia, which I believe set the stage for viticulture in the west.

The wine culture spilled over into Egypt from the Eastern Mediterranean area. Like the southern Levant, the wild grape never grew in Egypt. Yet, a thriving royal wine making industry had been established in the Nile Delta by at least Dynasty 1, ca. 3000 B.C.

Numerous tomb reliefs and frescoes illustrate the vinicultural process – from picking the grapes overhead from well-trained pergolas, to stomping them out in small presses, to transferring the red-colored must to amphoras for fermentation, and stoppering the jars for storage.

Once wine had established an economic foothold in a region, usually also being incorporated into religious ritual and social custom, the next logical step was to transplant the grapevine itself, and begin producing wine locally to assure a more steady supply, at a lower cost and tailored to local tastes. This is what happened in the Nile Delta, where a royal wine industry was established *de novo* in Dynasties 1 and 2, beginning around 3000 B.C.

Egypt first imported wine from the Jordan Valley and its environs, laying the foundation for its later royal winemaking. Around 3150 B.C., one of the first pharaohs of Egypt, Scorpion I of Dynasty 0, had 700 jars containing some 4500 liters imported from the eastern Mediterranean and piled high in his tomb at Abydos, to speed his way into the afterlife.

Our analyses of the wine residues in these jars illustrates what is now possible with much more sensitive chemical techniques. DNA analysis revealed what is thus the earliest intact sequence of yeast DNA, 840 base-pairs long, likely a precursor of the bread and beer *Saccharomyces cerevisiae* (CAVALIERI *et alii* 2003).

We used LC/MS/MS to establish the presence of tartaric acid. Headspace Solid Phase Micro-extraction and Thermal Desorption gas chromatography coupled to a mass spectrometer (GC/MS) opened up a whole new world to us when, in addition to showing that the wine was resinated, it revealed that many different botanical herbs – probably including savory, wormwood, coriander, mint, sage and thyme, among others – were mixed in (McGOVERN *et alii* 2009).

We took this research a step further by testing compounds identified from the ancient wine and confirming that some of them had anti-cancer and other medicinal properties (McGOVERN *et alii* 2010).

In other words, among the many purposes of wine in an ancient culture (e.g., nutritional value, source of energy, social lubricant, mind-altering substance, economic product, etc., etc.), it also served as the principal medicine, long before the advent of modern synthetic drugs. Alcohol by itself relieved pain, stopped infection, and seemingly cured disease. Additionally, it is the perfect medium for dissolving and dispensing botanicals. We have dubbed this new project «Archaeological Oncology: Digging for Drug Discovery».

More northerly regions of the Levant, where a wine culture was probably established as early as the 6th millennium B.C., might also have been involved in the transfer of viticulture to Egypt. I have long been intrigued by the coastal region of Lebanon, referred to as Canaan and later Phoenicia, which was in close contact with Egypt by sea beginning in the Early Bronze Age (ca. 3000-2000 B.C.). My interest was aroused in 1974 while excavating at the homeland Phoenician site of Sarepta (Sarafand), one of the early Canaanite city-states along the coast, midway between Tyre and Sidon. Canaanite Jars and processing vessels were recovered with purplish deposits on their interiors, dated to about 1300 B.C. Chemical analysis, in fact our first research (McGOVERN, MICHEL 1990) on ancient organic compounds, showed that these vessel had once contained Royal or Tyrian Purple (*dibromoindigo*), a dye derived solely from certain Mediterranean mollusks for which the Phoenicians were famous. A purple-dye factory was found in the same area at Sarepta where the purple-colored sherds were excavated.

The Phoenicians were also well-known for other luxury products, such as intensely red, highly burnished mushroom-lipped jugs and juglets, which imitated metal vessels. These vessels were part of a canonical wine-drinking set. To date, no chemical analyses of such vessels has been carried out, but we know from biblical and later classical writers that Phoenicia, especially Byblos, was renowned for its fragrant wine, perhaps derived from a *Muscat* varietal – this hypothesis still awaits confirmation by DNA analysis.

Although archaeological evidence from Bronze and Iron Age Lebanon is still very limited, the famous sarcophagus of Ahiram or Hiram I, the early 10th c. B.C. ruler of Byblos, shows him in standard Near Eastern fashion, holding a cup in one hand and a lotus flower dangling from the other, as he is provided with sufficient food and drink for his journey into the afterlife. In the Ugaritic texts, we also read of funeral banquets (*marzeah*) at which wealthy landowners donated their best wines and often over-indulged. They could do no less, since even the gods were expected to drink excessively.

What appears to be happening in the earliest stages of Levantine and then Egyptian history is that the rulers and upper classes began to import wine as a costly, prestige item, not unlike what goes on today when we serve that special bottle to friends – whether a Pétus, Super-Tuscan, or Egyptian “Cleopatra”, still made in the Nile Delta. Even though it must have been like importing liquid gold, the Egyptian rulers at first had no choice but to procure the beverage from the nearby Levant with its well-established winemaking industry. The main impetus for this development was what can be called «elite emulation». Wine and special wine-drinking vessels were given as gifts to kings and

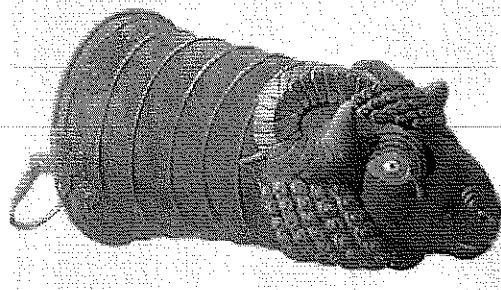


Fig. 2 – Bronze ramheaded *situla* from the Midas Tumulus, Gordion (Turkey). Nos. G2848/B1 080/MM46 (length 20.5 cm) (dating to the late 8th c. B.C.) (courtesy of Gordion Project, University of Pennsylvania Museum).

the upper class. The Pharaohs knew that rulers elsewhere in the Near East celebrated their victories with special wine-drinking ceremonies, offered wine to the gods as an evocative symbol of blood in their role as high priest, and stocked their tombs with the elixir. In imitation of this conspicuous consumption, one king after another adopted the wine culture.

In fits and starts and greatly depending on shipping expertise (for which the Phoenicians, with their «Byblos ships», were renowned), the trade in wine and the establishment of new wine industries and wine cultures then spread westwards across the Mediterranean (AUBET 1994), especially as rulers or the upper class took an interest in it and started importing it and serving it up at special events and ceremonies. During the early Iron Age, I would propose that the Phoenicians were the primary agents for the transference of the wine culture, including special serving sets and the transplantation of the grapevine. These seafarers also carried the Purple-dye industry, the alphabet, and undoubtedly many other elements of Near Eastern and Levantine culture, throughout the Mediterranean. The recent discovery of two Phoenician ships off of Ashkelon in Israel (STAGER 2005), loaded with thousands of wine amphoras being transported to Egypt or Crete from a Lebanese port, is just the tip of the archaeological iceberg. More explorations using remotely operated vehicles will likely discover much more evidence of the Canaanite and Phoenician role.

We have evidence that the wine culture probably first reached Greece by at least 2200 B.C. We identified the earliest *retsina* at the site of Myrtilos-Phournou Koryphei on the southern coast of Crete, and maritime contacts with Canaan / Phoenicia and / or Egypt could well have played a major role in this development.

More to the point, what about developments farther west? Based on my recent research into the impact of Phoenicians, Greek, and native peoples on the development of viticulture in the central and western Mediterranean, it would appear that elements of all these cultures intermingled and traded during the 8th c. B.C. at ports such as Pithekoussai in Ischia. At this site and elsewhere in Campania, Etruria, and Lefkandi in Euboea, large metal cauldrons of Near Eastern type and wine-sets comprised of kraters, filters, ladles, and above all, cheese-graters were recovered from elite tombs (RIDGWAY 1997).

The production centers for the metal cauldrons can be debated, but more important to my mind is the question of what they contained. We know the inspiration for the vessels' designs traveled from the Eastern Mediterranean to the west, since such cauldrons are illustrated in the Assyrian reliefs of Sargon II in his royal palace at Khorsabad in 714 B.C. and one of the richest burials on Cyprus – tomb 79 at Salamis – yielded cauldrons with griffin and other protomes. A particularly spectacular cauldron from Salamis was even filled with Phoenician mushroom-lipped juglets, plated in tin.

Most of the cauldrons shown on the walls of Sargon's palace very likely held only wine, since the Assyrians are known to have had extensive vineyards for making wine and this beverage is frequently mentioned in their texts. However, our analyses of residues inside Assyrian-style serving vessels (viz., lion-headed and ram-headed *situlae* – see Fig. 2) from the spectacular late 8th c. B.C. Midas Tumulus at Gordion, capital of the Phrygian empire in central Turkey, suggest that another kind of beverage could well be in view for regions outside of Assyria proper.

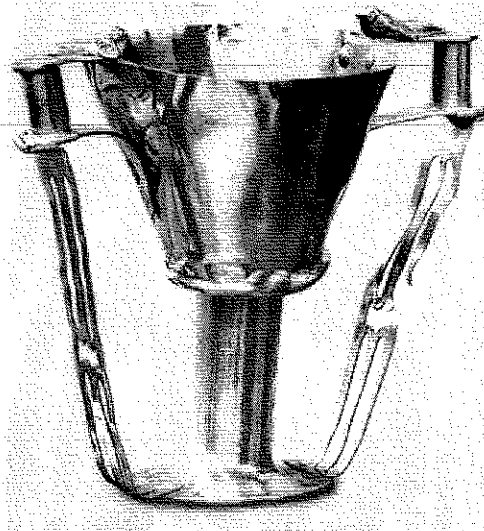


Fig. 3 – The golden cup of Nestor, as described in Homer's *Iliad* (11, 631-636), was similar to this gold vessel from Grave IV in Grave Circle A at Mycenae (Greece), dating to the 16th c. B.C. (courtesy of National Archaeological Museum, Athens).

These analyses revealed that the Gordion situlae had been used to serve a seemingly very strange beverage, combining grape wine, honey mead and barley beer.

As it turned out, such a mixed beverage was not so unusual in antiquity: palaeobotanical studies have confirmed similar mixed beverages as early as the mid-4th millennium B.C. in Scandinavia (DICKSON 1978), and it appears to have been the beverage of choice during the late 2nd millennium B.C. vessels in Crete and on the Greek Mainland, according to our chemical analyses.

Especially in regions where sugar resources were limited, the people would have started exploiting whatever was available, including berries and apples in northern Europe, and honey in most temperate regions. These high-sugar ingredients also provide the yeast for fermentation, so that saccharified barley and wheat might later be added and fermented.

The discovery of the so-called Nestor's gold cup (Fig. 3) from a royal grave (Grave IV in Grave Circle A, dating to the 16th c. B.C.) close to the Citadel at Mycenae, usually identified as the palace of Agamemnon in the Homeric epics, adds a special twist to understanding these mixed beverages. Just such an elaborate gold cup with attached figures of doves is described in the *Iliad* (11, 628-643), believed to have written down around 700 B.C. and reflecting earlier traditions. There, Nestor's mistress, Hecamede, is said to have tended a wounded soldier in the battle of Troy by serving him what was called *kykeon*, comprised of Pramnian wine, barley meal and probably honey, with goat's cheese grated on top. *Kykeon*, which can be translated as «mixture», fits our chemical profile of the Phrygian and Greek mixed beverage.

So, this is my question: is it possible that a similar Etruscan mixed beverage was being made and served from the cauldrons and kraters, which are so common in elite burials in Tuscany and illustrated together with many other standard drinking cups of foreign and native design in terracotta friezes, like those at Murlo / Poggio Civitate (CIACCI 2005)? The presence of the cheese-graters in these graves, like those found in the tombs on Euboea and made of pottery even earlier at Late Bronze Age sites in Greece, shows that these vessels probably held some kind of mixed beverage. Moreover, a female connection to such a beverage, like Hecamede, and the long-standing tradition of women serving as beverage-makers throughout the ancient world, are suggested by fibulae with attached miniature cheese-graters recovered from contemporaneous women's graves in Etruria.

There is also the amazing Rhodian kotyle with an early Greek inscription from the tomb of a young boy at Pithekoussai (RIDGWAY 1997). The inscription here explicitly mentions Nestor's cup (as well as the fair Aphrodite), so this story and presumably a mixed beverage of Greek type was a known entity in the west.

Botanical and other archaeological evidence can be cited in support of this hypothesis. For example a cauldron with a piece of honeycomb (TUREA 2005) was found in the courtyard building at Murlo (pre-575 B.C.). *Phiales* (handleless drinking-cups of Eastern Mediterranean type) and pilgrim flasks at Casale Marittimo (CECINA 1999) appear to have contained resinated wine flavored with hazelnuts and pomegranates, and more honeycomb was found inside a strange cylindrical vessel, possibly used for fermentation, at this site. Biconical kraters from 8th-7th c. tombs at Verucchio (VON ELES 2002) yielded both grape pollen and cereal grains, suggesting that something more than pure grape wine was being produced.

What I would propose is that the Etruscans already had a tradition of making a mixed fermented beverage, like other parts of Europe, including Greece. The cauldrons, kraters, and other drinking vessels from the Greek and Phoenician traders, as well as the protocol of the symposium which has its ultimate roots in the Near East, could readily be adapted to their existing customs, as the 9th century. Villanovan biconical kraters and cups also imply (DELPINO 1989).

However, rather than being derived from Greek prototypes, my inclination would be to see them as related to the cauldrons, sometimes combined with high pedestal bases, illustrated in the Assyrian reliefs (above), with probable North Syrian, Urartian, or Phoenician prototypes. Since a good case can also be made that the designs on the Etruscan silver and gilded bowls are ultimately derived from Near Eastern and Phoenician models (MARKOE 1996), why not the wine-set and its cauldron or «mixing bowl», which had such a long history in that region? My main point is that the krater or cauldron in Etruria, whatever its derivation, first held a mixed beverage.

Of course, only extensive chemical analysis of a range of native and foreign vessel types for residues will finally resolve this issue.

It cannot be ruled out that wild or even domesticated grapes were used in the Etruscan mixed beverage, since numerous grape pips were recovered from a Middle Bronze subterranean room at San Lorenzo a Greve at the gates to Florence (PERAZZI 2005).

Other sites, such as Livorno-Stagno and Gran Carro (MORI SECCI 2005), certainly show that cultivation of the grape was in place by the beginning of the Iron Age when the traders were arriving in force. In fact, to explain the beginning of the mass production of wine in Italy at this time, the most straight-forward explanation is that the knowledge and most likely, the actual transplantation of grapevines, accompanied the trading activity from the Eastern Mediterranean, along with the transfer of the alphabet, wine vessels, etc. So I would pose another question. Since Greece was still dominated by a mixed beverage, isn't it more likely that the main impetus for transplanting the grapevine and large-scale wine production in Etruria came from the Phoenicians? After all, the Etruscan amphora is modeled after the Phoenician amphora, and where a similarity of form exists, there is often a similarity of use and therefore contents.

In the early Iron Age of the Near East and along the Levantine coast, wine was clearly the preferred beverage, whereas the situation was more murky in Greece, to judge from the analyses already carried out and the Homeric *kykeon*. The answer to this question likely lies at early Etruscan coastal sites, where amphoras predominate, and at the bottom of the Mediterranean where so many shipwrecks full of wine-related pottery have been discovered and excavated (PARKER 1992; BOUND 1990).

The finding of actual grapevines embedded in soil, as part of the substantial cargo, of the 4th c. B.C. El Sec wreck (ARRIBAS *et alii* 1987), found off the coast of Mallorca, shows us that grapevines could have been transported for later transplantation. This ship also carried numerous amphoras from throughout the Mediterranean and Black Sea, *skyphoi* of the Athenian Fat Boy type, and cauldrons or buckets of types well-documented elsewhere in Europe for making a mixed beverage (PARKER 1992).

However, several grapevine fragments in soil as evidence for transplantation may be stretching the evidence, and a single shipwreck and its goods can be variously interpreted. For example, the recently excavated Grand Ribaud F shipwreck (LONG *et alii* 2002) off the coast of southern France, dated to about 500 B.C., also contained numerous grapevines, but in this case, they are believed to have been there for cushioning some 700-800 amphoras. Perhaps, grapevines were also used as cush-

ioning on the El Sec ship, but it is strange that so much soil was preserved on one example illustrated in the excavation volume unless the goal were to keep the vine alive and ready for transplantation.

It should also be noted that a profusion of Iron Age shipwrecks have now been located and excavated along the Italian and French coasts. They were so loaded up with wine-related vessels that, in a very real sense, one could say that the transfer of first Phoenician and Greek culture and then Etruscan culture in the Western Mediterranean was mediated by the wine culture itself (MOREL 1983).

In my opinion, the Etruscans thus took up the banner of the «wine culture» mainly from the Phoenicians, and to a lesser extent from the Greeks, who were more wedded to a mixed beverage, and eventually embarked upon the mass production of wine and its shipment by boat, especially to southern France by 600 B.C.

At the highpoint of this trade at the end of the Iron Age (up until 58 B.C.), it has been claimed that some 400,000 amphoras were being imported every century from Italy to France every year – at 25 liters per amphora, that amounts to 10 million liters per year, a lot of wine for a relatively small upper class (see TCHERNIA 1983; BRUN *et alii* 2004).

I could continue on with other questions, but clearly we are at the beginning of some very exciting exploration, already well represented by the goals and accomplishments of the «VINUM Project» (CIACCI, ZIFFERERO 2005).

Intensive survey will hopefully enable the winepress-type installations in Etruria to be fully documented and dated. One would also assume that more grape remains will be found inside such installations. Chemical analyses of the fine *bucchero nero* pottery types, which has the fine egg-shell thinness of Phoenician pottery and sometimes similar forms (such as the trefoil and everted-mouth jugs), will elucidate the kinds of beverages being drunk, and whether grape wine eventually came to predominate over a mixed Etruscan beverage, or even whether the latter exists at all. Ancient and modern DNA analyses should enable the transfer of eastern cultivars and their cross-breeding with wild Italian vines, whether intentionally or accidentally, to be worked out. Already, DNA analysis has rocked the world of the French AOC (*Appellation d'Origine Contrôlée*) in showing that relatively recent crosses partly account for the origins of such noble varieties as *Cabernet Sauvignon*, *Pinot Noir*, and *Syrah*. And we have recently learned that the parents of the well-known grape cultivar of Tuscany itself – *Sangiovese* – are a local varietal, *Ciliegiolo*, and *Calabrese Montenuovo* (VOUILLAMOZ 2005).

Although it still remains to be proven, a parent in Calabria, known to the Greeks as Oenotria («land of trained vines»), makes a great deal of sense. The Greek colonies in this region were renowned for their wine, and there were certainly connections between Oenotria and Etruria. Presumably, the Calabrian parent would have a more distant lineage with Eastern Mediterranean cultivars, brought perhaps by the Phoenicians. More testing is obviously needed, as is also the case for the Tuscan varietal (which was also not a wild vine at the date that the cross took place).

The history of civilization is, in many ways, the history of wine. The domesticated grapevine and winemaking was carried by the Etruscans, and later the Romans, to southern France. Relatively recently, viticulture has spread to the New World. Almost every New World wine, with their infinite varietal range of tastes and bouquets, ultimately derives from the Eurasian species of the mountainous Near East transplanted or crossed again and again. Each culture (whether Egyptian, Iranian, Israelite, Greek, Italian, or Californian) has its own story to tell about its relationship with wine and the vine. Together, they form a truly remarkable history of a truly remarkable plant and its product intertwining itself with human culture throughout the world.

I hope that these few remarks will have given you a glimpse into the marvelous world of ancient wine, particularly from a Near Eastern and Eastern Mediterranean perspective, and raised some questions that we can pursue by further discussion and research in our search for the origins of Etruscan viticulture.

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