

Archaeological Wines: Analysis and Interpretation of a Collection of Wines Recovered from the *William Salthouse* Shipwreck (1841).

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A collection of wines from the William Salthouse shipwreck formed the basis of a project to re-examine the methods of recovery, conservation, analysis and interpretation of archaeological wines. The most controversial aspect of the project being to find a new way of interpreting wines as material culture, by reinstating the artefact with some of its original meaning and value. Sensory analysis was used to provide a qualitative description of the wines and in conjunction with chemical analysis, to attempt to identify, document and describe the wine styles. Research was undertaken into the methods of interpretation of chemical and sensory analysis and the application of those interpretations to archaeology. Techniques of conservation and recovery were trialed and assessed. The project has resulted in a re-examination of the theory and methods of conservation of wines and a critical investigation of the efficacy of past wine analysis for archaeological interpretation.

INTRODUCTION

In 1994 Heritage Victoria (formerly the Historic Buildings Council and the Victoria Archaeological Survey) embarked on a project of conservation, analysis and interpretation of a number of bottled alcohols from the *William Salthouse* shipwreck. The department's archaeological collection contains more than 150 bottled alcohols from shipwrecks with the *Salthouse* bottles making up the bulk of the collection. These have been subject to various analyses and treatments since they were raised in 1983–1984 and the subject of two other research projects.¹ This most recent project was stimulated by the need to find new techniques of conserving the wines, which led to a re-examination of the previous analytical results and the interpretations of those results. This required research into what is meant by 'wine style' and the means of determining wine style, the gaining of a rudimentary knowledge of the history of particular styles and most importantly, a re-evaluation of the interpretation of wine as archaeological artefact.

The *Salthouse* bottles had been in storage for several years when they were removed for a routine condition assessment and found to be rapidly deteriorating. Many of the bottles were leaking, packaging materials were stuck to the glass and a strong odour of vinous gas was evident through the wax cover over the corks. The previous conservation methods had been less than successful, the cork seal had deteriorated under the wax allowing the wine to leak and exposing the wine to oxidation. While examining the conservation treatment history, it became evident that the previous chemical analyses,

undertaken to identify the wine, had not been conclusive. The chemical analyses had been conducted on an haphazard basis with an incomplete sample, using different laboratories and varied, unidentified analytical techniques (Lee 1983; Lee 1984; Dunne 1990; Bruer 1990). The interpretations of the chemical analyses as made by the chemists conducting the tests did not seem to have been critically examined by the previous researchers. There appeared to be an acceptance on trust of the methods employed — the quantitative analysis of the wine composition, applied to the only prescribed circumstance in the chemists' experience, that of modern wines identified by their relationship to vaguely defined 'styles'.

It seemed quite implausible, to the author's mind, that a 150 year old wine diluted with seawater could be adequately identified using analytical parameters that were so distant from the archaeological reality. To adequately interpret the chemical analysis required an understanding of the defining terms of style. What does an oenologist mean when they describe a wine as Muscat, Sauternes or Champagne? Are these valid terms when dealing with an archaeological artefact or even a 150 year old wine? It was thought that more chemical analysis using different, more specific techniques and a larger, more 'universal' sample, should be carried out in conjunction with conservation, before oxidation and micro-biological action altered the chemical composition of the wine rendering it unrecognisable. It was also thought that sensory analysis should be attempted in order to achieve a qualitative as opposed to a quantitative description of the wine. Although this was considered by some to be an 'unscientific' means of analysing the wine, the definition of wine style, used so liberally as a means of labelling the wines by archaeologists, is only understood by a combination of the two analytical techniques. Style is not, in the main, defined by chemical composition. The very parameters of style, used by the oenologists and adopted by the archaeologists, are defined using a combination of sensory and chemical analysis. Many of the defining, stylistic characters of wine are only recognisable through the organoleptic, or sensory analysis of wine as provided by professional tasters.

THE WILLIAM SALTHOUSE

The barque *William Salthouse* was on the first trading voyage between the dominions of Canada and the fledgling colony at Port Phillip when the boat struck a reef off Point Nepean and sank on the 28th November 1841. The wreck of the *William*

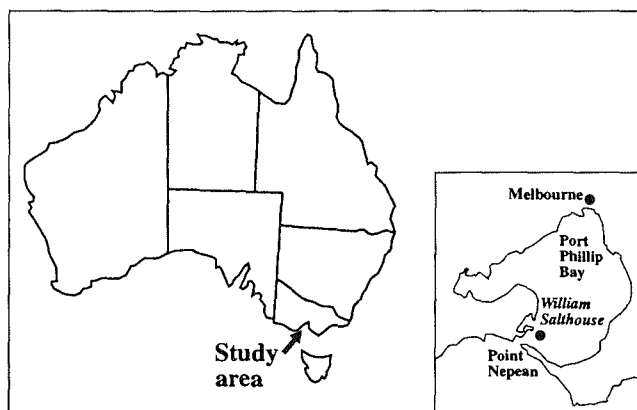


Fig. 1: Location of study area.

Salthouse now lies in 10 metres of water on Popes Eye Shoals just inside the heads of Port Phillip Bay, Victoria. When first found in 1982, the ship was sitting upright on an underwater dune, the cargo stacked on the decks in a remarkable state of preservation. The wreck was declared an Historic Shipwreck in the same year, but not before she was substantially damaged by vandalism. Part of the cargo was a consignment of alcohol picked up in Montreal. The corked bottles were an irresistible target for souvenir hunters, lured by the temptation of drinking 140 year old wine. By the time the shipwreck was excavated by the Maritime Archaeology Unit of the Victoria Archaeological Survey in 1983, many of the bottles had already been taken.

According to the out-going cargo manifest, the ship was carrying over 360 bottles of French Champagne, Sauternes and Muscat.² The in-coming manifest only lays claim to 300 bottles of Sauternes and Champagnes.³ The initial excavations of the site netted three styles of bottles which had contents intact and a fourth bottle style which was handed in during the 1995 Commonwealth Amnesty indicates that there were other bottled alcohols on board.

ARCHAEOLOGICAL EVIDENCE

When the Champagne bottles were uncovered during excavation they were found packed in large wicker baskets which each carried a dozen bottles. The bottles are typical nineteenth-century French Champagne style with heavy, green glass, a tapered body, deep basal pushup and prominent applied lip. The corks are typical of nineteenth-century French Champagne corks: over-large with a protruding head and scored marks across the top.⁴ Before the invention of the *muselet* (metal cap with wire ties), the corks, which are under a great deal of pressure, were bound in place by a *ficeleur*, where string crossed the top of the cork, cutting into its surface and creating the rounded top, and then tied round the lip.⁵

On the bottom of approximately 47 percent of the corks is stamped the letters AY in a circle. Ay is the name of a village in the Champagne region of France. There are numerous Champagne houses in the village, as it has a reputation of being home to the greatest Champagne wines in France. When the history of each Champagne house was pursued it became clear that only a few were operating in the 1830s. The House of Gosset was one of these and when approached were enthusiastic in claiming the bottles as theirs.⁶ The 'antique' Champagne bottle, which is how Gosset describes the *William Salthouse* style of bottle, is still used by them for certain prestige cuvees. Photos of their early bottles confirm that there are marked similarities in bottle style.⁷ Gosset were notable exporters to Montreal in the nineteenth century and although not all the corks have identifiable stamps, which may be explained by the stamp deteriorating (which they have been noted to do in treatment), they have maintained that the *Salthouse* bottles belonged to them. Gosset claim that their company was the only one in the mid-nineteenth century to use the name AY as an identifying mark. As they are the oldest Champagne house in the world and were the first to claim the mark as their own, this seems to be borne out.⁸ The association with the *Salthouse* has been particularly beneficial for Gosset, not least from a publicity point of view in promoting their exports here. The evidence, though not conclusive, does indicate that the Champagnes may have been Gosset, and there has been a useful and on-going exchange of information between the company archives and the department which seems to confirm the connection.

The archaeological evidence identifying the Sauternes and Muscats has been more complex and less productive (to avoid confusion, I shall refer to both styles collectively as the dessert wines). The excavation of the *Salthouse* in 1983-1984 uncovered two pine crates in the mast area, lying side by side,

filled with small wine bottles and straw packing. Both crates are made of very soft, nailed pine with black stencil markings on the sides. One crate (725-609) had the words 'MUSCAT' at one end and along the side a picture of a bottle and glass indicating fragile contents. The other crate (725-608) was identical in construction, with the words 'LICHTENSTEIN, FINS & CE CETTE' surrounded by grape leaves in clusters on one end.⁹ Lichtenstein is most likely to be the name of a wine *negociant* who was exporting to Montreal, while Cette, now spelt Sete, is a port on the Mediterranean coast of France famous for its wine markets.¹⁰ Sete is also within the heartland of the muscat grape growing region of France, which makes perfect sense in conjunction with both the out-going cargo manifest and the crate marked Muscat, but not unfortunately with the analytical evidence.

HISTORY OF SALTHOUSE ANALYSIS

In 1983 a sample of wine from a broken dessert wine bottle (number unknown) was sent for chemical analysis. The reply from the Australian Wine Research Institute (referred to as AWRI hereafter) stated that the chemical results indicated 'a sauternes-style wine'.¹¹ This classification was based on its similarity to what the oenologist defined as Sauternes (presumably modern, French Sauternes) and information from the archaeologist that the in-coming cargo list, published at the time of sinking, had included Sauternes. In 1990 more dessert wines were tested (115.3 & 115.4 and 118.7 & 118.8) and again the analytical result was interpreted as being 'Sauternes style wines'.¹² This seemed like a valid assumption, as it was always thought, according to the in-coming manifest, that the *Salthouse* was only carrying Champagnes and Sauternes. It was not until 1995 that the out-going manifest was found in Canada, and proved that the cargo had included Muscats.¹³ This throws considerable doubt on the analytical identification as the archaeological and documentary evidence now points to the dessert wine bottles found in the crates being Muscat wines.

The contents of the Champagne bottles were not analysed until 1990. Although the bottle style and cork type pointed to the contents being Champagne, the contents were reported to be beer, due to an assumed relationship to another Champagne-style bottle tested previously. This first bottle (AAP 48) had been found drifting off-site and was very similar to the *Salthouse* bottles in style, but the cork was non-bulbous and covered with lead foil, stamped with the name, 'READ BROTHERS LONDON BULLDOG BOTTLING'. It was suspected to be beer and sent for chemical testing to Carlton United Breweries (CUB) laboratory where they positively identified it as stout.¹⁴

Several samples from the *Salthouse* champagne bottles were subsequently sent to CUB with the cautionary statement that the contents were likely to be a different alcohol to the first bottle. In analysis, they were found to have few chemical parallels to either AAP 48 or to modern beers, yet the technicians still interpreted the results as belonging to an unfamiliar and atypical beer. The analytical parameters which they had used to identify the first sample had simply been extended to accommodate an identification of the new samples as beers.

Suspecting that CUB had misinterpreted the chemical results, a simple test was devised in the conservation laboratory by the conservator to determine if a beverage was grape or hops product.¹⁵ This simple test using paper chromatography will identify tartaric acid which is an organic acid occurring in grapes but few other fruits, and therefore provides a quick differentiation between wine and other beverages.¹⁶ All the samples tested by CUB and identified as 'unknown beers' were found to contain substantial amounts of tartaric acid. The experience with CUB demonstrates that

when sending wine samples to an external laboratory, the laboratory must be chosen carefully for its ability to conduct tests specific to wine, or be aware of more general tests to identify alcohol types. Choosing the right laboratory saves a great deal of money, time and misinterpretation.

Many of the simpler analytical tests carried out by external laboratories can be done in the conservation lab. Paper chromatography is one example of an effective in-house means of distinguishing wines from other beverages, or as a means of directing more specific questions to the analytical laboratory. If one already knows that a bottle contains wine or beer, analysis can be directed toward determining style or nature of the beverage, resulting in more specific and useful information; for example, determining between a dessert and table wine or fortified and liqueur wines.

SENSORY ANALYSIS

As outlined in the introduction, it was decided that if we were to continue to describe and categorise the wines using the stylistic terms of the wine industry, then we would have to find a means of understanding the *Salthouse* wines in relation to those terms. It was pointed out by the oenologists who were to conduct the chemical analysis, that in any normal testing procedure, both forms of analysis would be employed. In order to classify a substance which is described and given meaning by its sensory characteristics, such as red, white, sweet, dry, and so on, and because many of the defining, stylistic characters of wine are only recognisable through the sensory analysis of wine, it was decided that we would undertake a tasting of the wines by professional tasters.

Sensory analysis, when conducted by professional, experienced tasters, provides a description of wine which greatly enhances our ability to impart some of the original meaning onto the artefact. It increases the potential of the wines for display, educative and interpretive uses by providing a description which has a direct relationship to the artefact. Ethanol, glucose and organic acid levels mean very little even to wine buffs, but to be able to say that it 'tastes like a very mature, rich and liqueur-sweet wine', is understandable to most anyone who has drunk wine. The techniques employed by the tasters involve finding comparative sensations with which to describe the effect of the wine on their senses. We can therefore relate to those terms and gain a cumulative understanding of what the wine is like. Using the notes, descriptions and assessments of the tasters, archaeologists can find new and value-added means of interpreting wines as material culture, by reinstating the artefact with some of its original meaning and value. Sensory analysis can provide a qualitative description of the wines and in conjunction with chemical analysis, can assist to identify, document and describe the wine styles. An added benefit, which was not originally considered in the project, was that the tasting notes, in conjunction with the chemical description of the wines, can be readily assessed by other tasters and oenologists. Comparison with published tasting notes for unspoiled wines of similar age to the *Salthouse* wines has given valuable information about rates of deterioration and effect of salt, as well as clues to identification and original quality.

The tasting of 150 year old archaeological wine excavated from shipwrecks was too romantic and too novel for it to go unnoticed by the public and the media. The response to the tasting was quite overwhelming and the department had to conduct two separate tastings to cope with the amount of interest in the event. As a means of publicising and promoting an interest in maritime heritage which goes beyond boats and diving, it was hugely successful in drawing attention from people who would never normally consider maritime archaeology as anything other than inaccessible shipwreck sites.

There were two tastings, overseen by the author and Peter Leske, from the Australian Wine Research Institute. The tasters were chosen for their expertise combined with a willingness to undertake an unusual tasting exercise: Dr. Tony Jordan is an oenologist and director of Domaine Chandon; Richard Geoffroy is the principal 'mixer' of Moët et Chandon in France; James Halliday is a wine maker, professional taster and wine writer; and Robert Geddes is a Master of Wine from Rosemount wines. The tasters were instructed to conform to tasting standards as much as possible, while we had taken the unusual step in tastings of encouraging discussion. The first tasting was held in conjunction with the opening of the Museum of Victoria's exhibition, 'A Sip in Time; Being the History of Wine in Victoria'. The second tasting was conducted after the first, in a closed room over several hours. All the tasters' discussions were videotaped and a great deal of valuable information about comparative wines, bottle styles and even corks was offered by the tasters.

At each tasting six bottles — Champagne, dessert wine and one of the table wines — were chosen from the collection of approximately 100, and opened on the spot. They were chosen mainly for their firmness of cork and ullage levels which we hoped would indicate a less diluted wine. The contents were decanted into three containers and labelled immediately. One container went to the tasters, another put aside for chemical testing, and the remainder placed into permanent storage bottles. The corks were removed intact and placed into tap water. The tasters were given tasting forms designed especially for the salty wines, which asked them to describe and rate the effect of salt on the wine, as well as the usual assessments of colour, nose and taste. They were given as much information about the wines as possible, so that they would not be tasting blind. They were encouraged to discuss and argue about the wines and think about their origins. The tasters' discussions and notes, provided us with information on the level of salt which can be tolerated in a wine, descriptions of the present state of the wine, and valuable clues for identifying styles. Although not all archaeological wines can be tasted due to excessive salt and micro-biological spoilage, a tasting exercise, used in conjunction with chemical analysis, can provide a valuable qualitative as well as quantitative description of the wines.

INTERPRETATION OF CHEMICAL ANALYSIS

Chemical analysis is the normal means by which archaeological wines are identified and described. Samples are sent away to the testing laboratory and in my experience, the resulting report is often left unquestioned and unexamined for its relevance to archaeology. Wine science is a highly specialised field and as non-specialists, archaeologists and conservators are reliant on the oenologist to interpret the chemical results for us. Levels of organic acid, sugars and ethanol are not self-explanatory and require the expertise of the oenologist to provide interpretation, meaning and make judgements. The answers that we receive are partially determined by the questions which we ask of the oenologist, the information given and the type of analysis requested. It is very important, therefore, that we understand the process of oenological interpretation so that we may be more critical, that we structure the analysis to answer archaeological questions, and that we come to an understanding of the efficacy of chemical analysis to provide wine identification.

The AWRI's identification in 1983 and 1994 of the dessert wine bottles as Sauternes, rested on the recognition of chemical characteristics in the *Salthouse* wines which were similar to modern Sauternes. The AWRI scientists had been asked to identify the contents of the bottles and had been told that documents indicated Sauternes, while the stamps on the crates in which they were found indicated Muscat. The

assumption was that the crates had been reused or wrongly stamped or that the wines were mixed up (highly unlikely given the disparate value of French Sauternes and Muscats during this period).

New information from Mark Staniforth's research in Montreal has cast doubt on the identification of the dessert wines as Sauternes.¹⁷ Mark's research in Montreal has shown that there were three varieties of wine listed on the out-going ship's manifest: Sauternes, Champagne and Muscat. The combination of this new cargo manifest and some lingering doubts raised by the tasters that the wines were Sauternes, resulted in a re-examination of the interpretive methods employed by the wine scientists. Oenological interpretation of chemical analysis applies only to a prescribed set of circumstances, that is, to modern wine styles. The levels of acids, sugars and ethanol are compared to recognised analytical parameters which are based on known wine styles. With archaeological wines, these parameters become radically altered and in some cases, unrecognisable. Comparing the archaeological wine results to modern styles can therefore only be used as a rough guide and only in conjunction with historical, archaeological and tasting evidence.

In order to substantiate or disprove the AWRI interpretation, it was necessary to determine what the analytical parameters were which had led to their conclusions. When approached with the evidence indicating the presence of Muscat in the ship's cargo and the possibility was raised that the dessert wines might be Muscat, the oenologists maintained that their identification of the wines as Sauternes still held. In comparing the *Salthouse* results to modern wines, the Institute were drawing on the analytical parameters familiar to them, in twentieth-century Australia. This included modern Muscats which are fortified, aromatic wines with high alcohol and sugar levels, outside the range found in the *Salthouse* results. Historical research into wine styles in nineteenth-century France was undertaken, to determine if this was a valid comparison and if style had indeed remained unchanged. It was discovered that Muscat was traditionally an unfortified style, quite different to today, due to a vinification technique called *passerillage* which created high sugar levels and did not require the addition of spirits.¹⁸ This means, therefore, that if Muscat was not fortified, it would have a chemical composition very similar to both modern Sauternes and the tested *Salthouse* dessert wines. The AWRI interpretation then, can no longer be accepted without substantial reservations.

This is not to say that the AWRI produced flawed results. It is a problem of the interpretive process, which is fully recognised by the AWRI, in their analytical reports. Archaeological wine is an unknown quantity; the effects of salt water on the chemistry of wine have not been documented and there is practically no published chemical data of any style of wine of this age, due to the greater value of a sensory analysis in the marketplace. It is the number of unknown factors rather than the raw analytical data, the process of interpretation and the use to which those results are put, which creates problems with chemical analysis. Chemical identification of the dessert wines was based on an untested assumption: that both Muscat and Sauternes had remained unchanged as a style for 150 years, which in this case, was wrong. Until a reference of analytical profiles from archaeological wines can be compiled, the comparison to modern wines is the only interpretive method available to oenologists. The more wines that are analysed the greater the possibilities will be for more archaeologically relevant interpretations of both chemical and tasting results. The interpretation of chemical analyses then, must be examined critically in conjunction with sensory analysis, historical and archaeological evidence before conclusions about identity can be drawn.

CONSERVATION¹⁹

Archaeological wine conservation in Australia tends to concentrate on a holistic approach, which aims for preservation of the artefact as it was when found. The theory behind this aim is preservation of artefact integrity, a key tenet of conservation and archaeological principles. Maintaining artefact integrity, however, assumes that analysis and interpretation of the artefact can be satisfactorily made using an intact bottle, cork and contents. With the *Salthouse* bottles, this was not the case as the cork and contents contained more research potential than the intact artefact. Artefact treatment decisions involving three such disparate materials needs to take into account the research potential of each part and these considerations should pre-determine the treatment. This is dependent on either the archaeologist communicating their research needs to the conservator, before they commence treatment, or the conservator being aware of the special requirements of archaeological wine analysis.

All composite artefacts pose treatment problems but wine bottles are even more difficult due to the combination of cork and wine. Cork is notoriously difficult to treat, and none of the techniques attempted either in Australia or overseas has proven to be successful. Wine is fragile, complex and also very susceptible to chemical taint which adds to the difficulties of devising in-situ treatments. In-situ treatments of cork, whether using PEG, epoxy or another similar consolidant, aim to obtain an airtight seal in the bottle, to prevent the wine deteriorating and leaking. This type of treatment can defeat the purpose of conservation by contaminating and compromising the purity of the wine as an archaeological sample.

An alternative method is to cover the cork to retain moisture in the cork and therefore the effectiveness of the cork to prevent air ingress. Covering corks with a wax or parafilm barrier is not effective in the long-term for preventing oxidation of the wine.²⁰ Parafilm does not provide a barrier to air, and requires the application of an extra layer of an impermeable plastic such as *cryovac* laminated plastic to prevent any oxygen reaching the wine. This technique of *cryovac* over parafilm is now being trialed by Heritage Victoria's conservation laboratory.

The most effective way to retain sample purity is to remove the wine that is needed for analysis, at the first treatment stage. Most chemical analyses only require 20–50 mls of wine, while a sensory analysis requires 20–30 mls. If the wine bottles are to be used for display and interpretation, the samples could be removed prior to a permanent seal being applied to the cork. The 100 or so *Salthouse* bottles which were decanted during this project, could no longer be stored or preserved effectively as intact artefacts, without destruction of the valuable contents and corks. As there is no fail-safe method of preserving wines intact, decanting wine bottles is at this stage probably the only means of ensuring that some archaeological value is preserved. It is common practice in the treatment of intact bottles from overseas shipwrecks, to decant as soon as possible after raising.²¹ In order to carry out desalination of the interior of the bottle, desalinate and consolidate the cork and note any identifying marks, and sample the wine for analysis and preserve it from oxidation, decanting at this stage is the only effective means of conservation (decanting methods can become quite complex, and so will not be covered in this article).

FUTURE ANALYSIS

Not all wine bottles can or need to be decanted, nor do all wines need analysis for the purposes of identification. However conservators and archaeologists ought to seriously consider decanting a sample of the wine at an early stage, to ensure that if analysis is needed in the future, it will be in a

good state. Although archaeological wine analysis is still imperfect and in its infancy, it has an enormous potential. At the present time the wine sample can only be analysed for its chemical composition. In the future, we may be able to track the origins of the wine through its chemical make-up. The wine industry in France are developing techniques for fingerprinting wines. A database of regional soil types will match the soils to the wine, identifying the origin of the grapes. Other databases being developed include DNA profiles of grape varieties and databases of carbon and hydrogen ratios used to indicate soil profiles. We do not know if any of these techniques will work with archaeological wines, but it puts a very strong case for us retaining our samples, in the best possible condition, for future analysis.

RECOVERY

Recovery of bottled alcohols and foodstuffs from shipwrecks requires planning and preparation in advance. Raising wines to the surface has the same effect as with most other artefacts — once the delicate state of equilibrium that they have reached under the water is disturbed, deterioration is rapid. Bottled alcohols can be ruined before they even reach the surface. Champagne and beer bottles have been known to burst their corks when they are raised, while in other bottles the cork can be drawn into the contents, letting in sea-water and then air. Precautions must be taken to ensure that once the bottles are disturbed that their fabric and contents can be recovered intact.

The obvious solution is to seal the bottles while they are in-situ, with a fabric which will hold the cork in place and prevent air and water ingress. One such recovery method has been tested by the Maritime Heritage Unit of Heritage Victoria, while recovering Champagne bottles from the *City of Lonsdale* shipwreck. The divers were asked to test a prototype *in situ* sealing system made from latex. A pliable latex sheath, which is water and air tight and made in the conservation laboratory, was pulled over the cork and neck of the bottles and held in place with plastic cable ties. Latex as a material is easy to work with, cheap to make and easily manipulated in cold water. It has a life span of approximately one month in daylight and so can provide conservators and archaeologists with valuable time in which to make treatment and analysis decisions, before worrying about deterioration of the wine. As a material, it is however an unknown quantity in contact with the cork, wine and glass as it contains minute quantities of ammonia. More research into its chemical properties is required.

CONCLUSION

The conclusions reached in this project have less to do with 'answers', 'scientific facts' and 'truths' than formulating new methods and attitudes to archaeological wine analysis and finding new means of interpretation of wines as archaeological artefacts. This new attitude attempts to incorporate and re-invest the essence or original meaning of the artefact into the archaeological interpretation. In order to achieve this value-added interpretation, sensory analysis was utilised as a technique of analysis. Many people, in the conservation and archaeological profession, when hearing about this project, have been heard to misuse the term 'subjective' in levelling criticisms at sensory analysis as a technique of investigation, as if the interpretation of a set of figures was not. Even more implausibly, the word 'unscientific' is used as a description of sensory analysis, as if science was the only validating critique and field of enquiry when dealing with archaeological artefacts. In this project, it was found that sensory analysis in conjunction with chemical analysis provided thorough description and in some cases, identification of the *Salthouse* wines and that in using both techniques, we were able to provide the public and ourselves with a meaningful interpretation of archaeological wines. We found that the normal methods of recovery and

conservation were harmful to the artefact and that they had to be modified in order to preserve archaeological value. The methods outlined, for conservation, recovery and analysis of archaeological wines, were all formulated with the guiding motive of enabling a more effective means of interpreting wines as archaeological artefacts.

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NOTES

- 1 Morgan 1990; Morgan & Baron 1991.
- 2 *Montreal Gazette*, June 18, 1841, p.3.
- 3 Staniforth & Vickery 1984.
- 4 Vizetelly 1882: 156-7.
- 5 Vizetelly 1882: 165.
- 6 Personal communication, 1994, 1995, with Beatrice Cointreau, Managing Director of Gosset. Conservation Laboratory Wine files, Heritage Victoria.
- 7 Wine files, see note 7.
- 8 See Wine files. Notes pertaining to Champagne House markings and history of the family Gosset.
- 9 The markings on the crates are now very faint, and can not be read clearly. When first recovered they were also hard to decipher and for this reason, I suspect that the word FINS is actually, VINS or FILS which makes more sense in the French.
- 10 Berry 1992.
- 11 Dr. T. H. Lee, Australian Wine Research Institute, 23 December 1983. Correspondence file, Heritage Victoria, Department of Planning and Development.
- 12 Bruer 1990.
- 13 *Montreal Gazette*, 1841. I am indebted to Mark Staniforth for all information regarding the out-going manifests.
- 14 Dunne 1990.
- 15 Baron & Morgan 1991.
- 16 Amerine & Ough 1980: 60-66.
- 17 Personal communication, Mark Staniforth 1995.
- 18 Berry 1992: 103.
- 19 For a more detailed description of the conservation treatments and the chemical analysis, please see forthcoming article by the author, in the Australian Institute for Conservation of Cultural Material Bulletin, 1996.
- 20 Technique of sealing corks with double layer of parafilm, attached with electrical tape, suggested to me by Ian Godfrey.
- 21 Personal correspondence, conservation laboratories of shipwrecks — *Vasa*, *Kronan*, *Steamboat Arabia*, *The Amsterdam* and *Marie Therese*. Conservation Laboratory Wine files, Heritage Victoria.

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