

PRAISE FOR

Wine Myths, Facts & Snobberies



“If you love science or if you love wine, and especially if you love the science of wine, this book is for you! Daniel takes a complex process and distils the essence with didactic skill and imagination. Drink it all in to your heart’s content.”

–JOE SCHWARCZ, Ph.D, Director,
McGill University Office for Science and Society

“This is an excellent, detailed work on the science behind wine and winemaking that delves deeply into the subject matter.

It answers all of the common questions with uncommon technical detail, and makes a useful reference tool for anyone who has made or is considering making wine, professional sommeliers, as well as highly inquisitive wine drinkers.”

–JOHN SZABO, Master Sommelier (MS), wine writer

“This book is a authoritative distillation of much of the latest science on the healthy benefits of wine. I strongly recommend *Wine Myths, Facts and Snobberies* to everyone who is interested in both the *art* and *science* of wine.”

–JOSEPH C. MAROON, M.D., author of *The Longevity Factor: How Resveratrol and Red Wine Activate Genes for a Longer and Healthier Life*

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Techniques in Home Winemaking
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Kit Winemaking
The Illustrated Beginner's Guide
to Making Wines from Concentrate

Wine Myths, Facts & Snobberies



81 QUESTIONS & ANSWERS ON THE SCIENCE
AND ENJOYMENT OF WINE

Daniel Pambianchi



Véhicule Press

Published with the generous assistance of the Canada Book Fund
of the Department of Canadian Heritage.

Cover design: David Drummond
Technical editors: Arthur Harder and Dr. Ariel Fenster
Set in Minion and Filosofia by Simon Garamond
Printed by Marquis Printing Inc.

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LIBRARY AND ARCHIVES CANADA CATALOGUING IN PUBLICATION DATA

Pambianchi, Daniel
Wine myths, facts & snobberies : 81 questions & answers
on the science and enjoyment of wine / Daniel Pambianchi

ISBN 978-1-55065-283-3

I. Wine and wine making—Miscellanea.

I. Title. II. Title: Wine myths, facts and snobberies

TP548.P36 2010 641.2'2 C2010-9000779-4

Published by Véhicule Press, Montréal, Québec, Canada
www.vehiculepress.com

Distribution in Canada by LitDistCo
www.litdistco.ca

Distributed in the U.S. by Independent Publishers Group
www.ipgbook.com

Printed in Canada on 100% post-consumer recycled paper.

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You can follow Daniel Pambianchi's work on his website and blog at <http://www.TechniquesInHomeWinemaking.com/blog/> and on Facebook by becoming a fan of Techniques In Home Winemaking.



Disclaimer

This book contains commentaries related to the science of wine, including winemaking, wine tasting, and wine and health. It offers opinions, presents scientific and medical research, some conclusive and some inconclusive, and expert knowledge from academia, the wine industry and literature. However, the information contained herein should not be construed as professional advice for the diagnosis or treatment of faulty wines or health problems; readers should always consult with qualified enologists for winemaking advice or medical doctors for any matter related to wine and health.

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Acknowledgements

This book spans several fields of science, some perhaps not so scientific; nonetheless, it involves consultations with and reviews by many, many experts, from winemakers to microbiologists and chemists to nutrition experts and neurosurgeons. I wish to specifically acknowledge the tremendous support of, and technical reviews by, Arthur Harder, a consulting winemaker to wineries in the Niagara region in Ontario and head winemaker at Maleta Winery; my chemistry professor and French wine aficionado Dr. Ariel Fenster from the Office for Science and Society at McGill University in Montréal, Québec; and Dr. Eric L. Gibbs of High-Q, Inc. who relentlessly crusades for PET bottle technology. I am also indebted to my dear friend Angela Campbell who meticulously reviewed the manuscript, and Fred Couch whose photography and photo-editing experience was invaluable. And of course, this project would not have been possible without the continued support of Simon Dardick and Nancy Marrelli, publishers of Véhicule Press, and their team. To each and every one and all my readers, and in the name of knowledge and good health, I raise a glass of (good) wine and say Thank You.

Preface



WINE IS A FASCINATING SUBJECT. With its rich history dating back more than six thousand years and wine's current cultural status as a "higher" and healthier beverage, it is fraught with tradition, myths, beliefs and snobberies that span how to farm vineyards and grow grapes, how to make wine, how to serve it, and the health benefits of drinking wine—some are true, some aren't, and some are plain unbelievable, bordering on laughable.

With our knowledge of natural and pure and applied sciences, we can now explain and demystify traditions and snobberies, and debunk myths and beliefs. We certainly don't have all the answers on what is a very complex subject, but we can postulate reasonable hypotheses.

The objective of this book then is to provide commentaries, based on this scientific knowledge of wine, on facts, myths and snobberies encountered in our everyday interactions with wine. The commentaries are based on questions often posed to me as part of my work in the wine industry, notably during wine tours and tutored tastings, and my own curiosity that have lead me to research topics.

But be forewarned; many opinions and beliefs, whether scientifically proven or emotionally charged, are controversial. And so it is with this fascinating art of anything and everything that is wine.

So pour yourself a glass of wine, sit back, and enjoy the read; you may want to keep the bottle close-by.

About Wine-speak and Scientific Terminology



WINEMAKING—what some call *viniculture*—and the wine business have been greatly influenced by Europeans, particularly the French, who have developed an extensive wine vocabulary. To a large extent, French, Italian, German, Spanish and Portuguese terms from these Old World wine regions are still used in their original native language within New World wine regions while others have been translated. But some European words are often more accurate in their original language or simply cannot be translated; the best example is the use of the word *terroir* (see page 13 for the definition) for which no other language seems to have an appropriate translation to define the concepts. For these reasons, I have chosen to include such terms in their original language, in italics, and provided translations now commonly used in the English language. And because of the European influence on global winemaking, I provide all units of measures using the Metric system (also known as the International System of Units or *Système International d'Unités* (SI) in French) along with conversions to the U.S. system in parenthesis.

Likewise, every branch of science has its own specific terminology, language and form. In this book, I refer to any living

ABOUT WINE-SPEAK AND SCIENTIFIC TERMINOLOGY

organisms and microorganisms by their binomial names, in italic as is standard practice, according to current taxonomy (the classification of living organisms) rules. Binomial names are often derived from Latin or Greek words. On the first occurrence of a binomial name, the complete genus and species names are provided, and then the genus name is abbreviated as is usually done; for example, most wine yeasts belong to the species *Saccharomyces cerevisiae*, and is abbreviated to *S. cerevisiae*. Note that the genus name is treated as a proper noun, i.e., the first letter is capitalized, and the species name is treated as a common noun. It is often also more common to refer to organisms by 1) their species name only when the genus is understood—for example, winemakers talk about *vinifera* grapes in reference to *Vitis vinifera* grapes; or by 2) their more popular genus name when species are secondary—for example, winemakers refer to the yeast responsible for imparting a barnyard smell to wine as *Brettanomyces* in reference to *Brettanomyces bruxel-lensis*.

And there is also a lot of chemistry involved in understanding wine science. Here too, terminology can be overwhelming as various names are used by laypeople, winemakers, scientists, and professional agencies to describe the same compound; for example, what we all know as *vinegar* is commonly referred to as *acetic acid*, although it is also known as *methanecarboxylic acid* and *ethanoic acid*, as defined by IUPAC (International Union of Pure and Applied Chemistry) standards. IUPAC names tend to be more descriptive of the actual molecular structure and can be more useful in certain contexts. Here, we use a combination of both common and IUPAC names as usage varies between winemakers, wine chemists and enophiles.

Wine and Winemaking Science



ALTHOUGH WINE HAS BEEN MADE since the early days of civilization, some six thousand or more years ago, winemaking is still largely considered an art as the science of winemaking only started taking shape in the second half of the nineteenth century.

Winemaking, the art, is steeped in tradition in Old World wine regions, mainly western European countries with France having the most influence with their concept of *terroir*. Terroir refers to the amalgam of vineyard location, soil composition, microclimate, viticultural and winemaking practices all interacting to produce wine specific to the region or even to a vineyard parcel and which cannot be replicated anywhere else—or what some define as a “sense of place.”

Winemaking, the science, was really born in 1857 when French chemist and “microbiologist” Louis Pasteur (1822–1895) proved that yeasts were in fact living organisms and that these were responsible for what he termed *alcoholic fermentation* in the production of wine from grape juice. Pasteur’s new theory was in sharp contrast to Dutch naturalist Antoni van Leeuwenhoek’s (1632–1723) hypothesis that yeasts were not living organisms, which he first observed two centuries earlier in 1684 using a microscope he had developed.

In post-Prohibition years, Americans and immigrants that had

settled in the U.S. at the turn of the twentieth century rekindled interest in winemaking and re-launched the wine industry in America. However, it was not until the second half of the century that significant scientific research and development took place in New World wine regions such as the U.S. and Australia. In the nascent globalization of wine, the New World spearheaded technological changes fueled by a strong desire to make better wines akin to the best wines of France and to become world players in a fast growing market.

Enology, the science and study of winemaking, has since progressed tremendously to provide an ever-increasing understanding of the complex chemical reactions that not only transform grape juice into wine but also involve the causes of many kinds of spoilage. A friend once remarked that winemaking had become too “clinical,” referring to the extensive use of science and laboratory analysis at the expense of the art. Perhaps so, but I believe in scientific progress, and particularly in winemaking where ultimately the goal is in understanding wines better and making better wines.

In this section we examine various aspects of viticulture and winemaking to understand what science has revealed and snuff out myths.

Wine Styles



I AM REMINDED OF THE HILARIOUS quote from a fictitious scene unfolding in a restaurant and the patron asking for the wine list: “*Monsieur!* We have red wine and we have white wine,” replied the waiter.

To those not partial to wine, some might wish it would be that simple—red or white. But life is not simple nor is it uninteresting, and wine would be just a boring, inconsequential beverage if it were not for its complexity and the plethora of styles. Wine is much more than just a drink or even a drink to complement food.

Wine is a mystical elixir that fosters friendship—or what Jonathan Nossiter (director of the film *Mondovino*) describes in *Liquid Memory* as “a vector of exchange between human beings,” and conviviality, good health, and joie de vivre, unmatched by any other food or beverage. Every bottle has a story, whether it is about the vineyard, the vintage, the winery’s or winemaker’s reputation or label or perhaps even a special purchase from that memorable vacation in wine country. It is also the most adaptable beverage. It can be drunk on its own as an aperitif or for a fireside tête-à-tête, with food, with or as dessert, to celebrate a special occasion or to enjoy with a fine cigar or chocolate. There is a plethora of kinds and styles to suit any occasion or palate—from dry whites and full-bodied reds

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to rosés and off-dry or medium-sweet whites, sparkling wine, Icewine, Port, Sherry, oaked, unoaked, and organic wines. Technical know-how and technology aside, styles are only limited by the winemaker's creativity. But creativity requires setting aside those biases rooted in tradition.

In this section we answer questions often asked about the different kinds and styles of wines, the differences between wines in the same category, such as Port, and how these are produced. In the section *Wine Service*, we will look at why certain wines are best enjoyed with certain kinds of food.

WINE STYLES



Lees being stirred in a barrel of Chardonnay wine.



Frozen Vidal grapes on the vine ready for harvesting to make Icewine.

Wine Faults



YOUR GUESTS ARE COMFORTABLY seated at the dinner table waiting to be delighted by your culinary talents but mainly by your wine selection. After all, you have been praising and hyping *that* special bottle of wine—the one you proudly made or brought back from your last trip to Tuscany—waiting for the right occasion to be opened. With all eyes on the bottle, you engage into a soliloquy of superlatives to build up more suspense as you carefully remove the foil and uncork the bottle with that music-to-the-ear pop. Everything is perfect. You pour yourself a splash into a big goblet. You take a quick sniff. The look on your face quickly changes from cheerful to troubled and your guests can sense something is wrong. You take a sip, swoosh it in your mouth, but the taste confirms your worst fears. The wine is “corked.” It smells musty, sort of like wet newspaper, and it is devoid of those promised fruity aromas. What a disappointment! How to explain this to your guests?

This is not an uncommon occurrence quite unfortunately. So often, especially when expectations are set high, a bottle of disappointingly flawed wine can send you in a frenzy searching for causes at the root of the problem. Whether the wine is corked, oxidized, smells of barnyard, or perhaps of rotten eggs, you are suddenly at a loss trying to understand what happened, even more

so if *you* are the winemaker. It is a wine aficionado's or winemaker's worst nightmare.

Given wine's complex chemistry, biochemistry, and microbiology, it is highly prone to a range of instabilities that can suddenly or serendipitously translate into faults or spoilage. The winemaker's duty is to process wine to avoid such faults or spoilage that could occur under normal conditions but the bigger challenge is protecting wine that is subjected to abnormal conditions, such as stored in a refrigerator for an extended period of time or, quite the opposite, the bottle is stored in the trunk of a car on a hot summer day.

In this section, we will examine some of the more common wine faults and try to understand where they originate. This should help you assess whether or not to return with confidence a faulty bottle to the sommelier when dining in a fine establishment.



I understand the concept of oxidation in wines and I can recognize an oxidized wine but what is meant by “a wine is reduced”? I am sure it has nothing to do with how much wine is left in the bottle.

MOST WINE DRINKERS can recognize an oxidized wine—it takes on nutty-like aromas and the color shows brown hues in reds and golden hues in whites but it seems that only experienced wine tasters can detect—or know about—reduction. Let's examine the underlying chemistry to see what is happening.

Oxidation is a chemical reaction where a substance loses electrons or which may acquire oxygen or lose hydrogen atoms. Reduction is the inverse—that is, a chemical reaction where a substance gains electrons or which may lose oxygen or gain hydrogen atoms. To the chemist, oxidation and reduction are more precisely an increase and decrease in oxidation number, respectively, but we will use the former definition for simplicity. An oxidizing agent is known

WINE MYTHS, FACTS & SNOBBERIES



Chateau Montelena's 1973 Chardonnay placed first at the 1976 Paris Tasting.



The Vino-Lok[®] glass closure. Could this be the closure of the future?

Wine Service



Wine appreciation is often described as snobbish. Who can blame the critics? After all, serious aficionados can spend considerable time swirling that lusciously *über*wine in their mouths before they swallow and then describing it with endless poetic prose, speaking of the wine as being fruit-forward and stylish with intertwined layers of sweet exotic fruit, a soupçon of black currant and oodles of *frutta di bosco* aromas framed by subtle earthy flavors, buttressed with firm though well-integrated tannins and a lingering finish. Then there is that whole bottle uncorking, decanting, and serving ritual that one must consider.

In this section, we will examine some topics of practical importance on the science of wine service and appreciation and demystify certain rituals.

Do Riedel glasses really make a difference in the taste of wine? Should wine be decanted? And what is all the fuss about choosing the “right” wine for specific foods?

Read on.

Winecraft or Witchcraft?



IT IS OFTEN SAID THAT WINEMAKING is part art and part science. Surely any craft as old and as intriguing as winemaking holds an element of artistry but when the expression of personal convictions and scientifically unsubstantiated claims blur the line between art and science, the art can sometimes border on the paranormal and the science on witchcraft. The huge disparities in beliefs and wine-making methods, now coupled with the green movement and sustainable agricultural practices, have created diametrically opposed camps in winemaking philosophy.

This extends to wine appreciation too. Gizmos and gadgets flooding the market and which promise to enhance the wine tasting experience seem to be taking a life of their own.

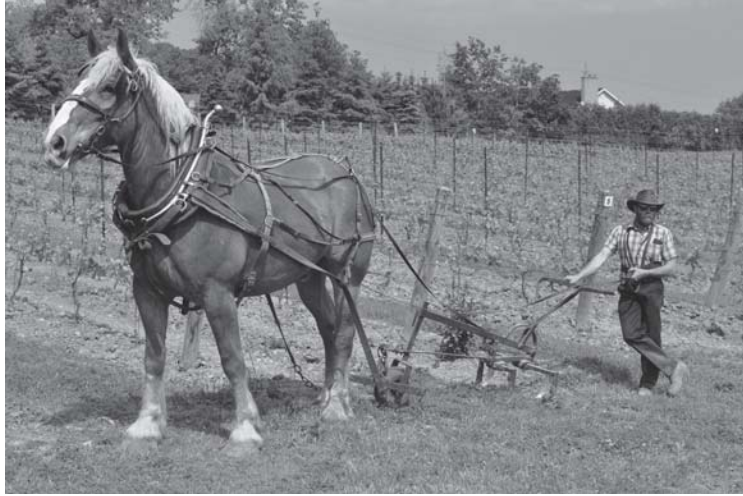
So how serious is biodynamic farming and winemaking?

Does the cycle of the moon affect winemaking?

Do “wine enhancers” or wine magnets alter or improve wine?

These are a few of the topics discussed in this section.

WINECRAFT OR WITCHCRAFT?



Traditional viticulture currently practised at Tawse Winery, Ontario.
Courtesy of Fred Couch.



Dung-filled cow horns being prepared for eventual burial in the vineyard.
Courtesy of Montinore Estate.

Wine and Health



THE USE OF WINE AND OUR STRONG convictions of its health benefits, abstainers and teetotalers notwithstanding, are probably as old as wine itself dating back to the first civilizations in the ancient world. In Mesopotamia ca. the third millennium BC, the Babylonians believed wine to have medicinal and therapeutic effects and it was considered so pure and free of contaminations that it was preferred—along with beer—over water. In Ancient Egypt more than two thousand years BC, wine also became a common ingredient in “prescription drugs” for curing a variety of ailments. The drugs were formulated using other ingredients too, such as water and particularly those derived from medicinal plants.

And stories abound from the Far East where the Chinese would lace wine with animal parts to concoct drugs to cure just about any ailment. Even Hippocrates, the father of medicine who had a keen sense of physiological and metabolic reactions in the human body not only used wine as a prescription drug in Ancient Greece but also pioneered it into an antiseptic for treating wounds.

The link between wine and its medicinal and therapeutic benefits grew stronger through the various eras and Middle Ages up to modern times. So compelling was the link that following the decreasing death rate of convicts and migrants who were treated

with wine aboard Australia-bound ships in the early part of the nineteenth century, it spawned the founding of vineyards and wineries by British doctors throughout the rest of the century. Many such wineries have grown into global businesses responsible for some of the largest wine outputs in the world. For example, Lindemans and Penfolds were founded in the early 1840s by Drs. Henry J. Lindeman and Christopher R. Penfold, respectively.

But as wine became integral to religions from Biblical times and the evils of alcohol took root in societies, wine—its health benefits and sociological impacts—became very controversial and spawned the anti-alcohol temperance movement in colonial America. In 1916, federal health authorities removed alcohol from the *United States Pharmacopeia (USP)*, the authority responsible for implementing and managing standards for all prescription and over-the-counter medicines as well as health care products manufactured or sold in the United States. Then in 1920, the Volstead Act was enacted under the Eighteenth Amendment to the United States Constitution making the manufacture, sale, importation, and distribution of alcohol illegal which lasted until 1933 when the Twenty-first Amendment was ratified to repeal National Prohibition. During Prohibition, consumption of alcohol and homemade wine for personal use was still allowed though each state and often towns or counties were left to implement further control according to local needs. Wine for sacramental and medicinal uses was also exempt. In Canada, provinces had already started implementing prohibitory laws in 1917.

Much research on the health benefits of wine has been documented particularly since the nineteenth century. But the temperance movement had been strong and gained renewed momentum in the 1980s in advocating the evils of alcohol on public health. Mothers Against Drunk Driving (MADD), a now very influential organization, was first founded in 1980. Then during Ronald Reagan's first presidential term in the 1980s, First Lady Nancy Reagan launched the "Just Say No" drug awareness campaign which naturally

WINE AND HEALTH

included alcoholic beverages. Senator James Strom Thurmond, whose daughter was killed by a drunk driver in 1993 and whose wife later became addicted to alcohol, was a long-time, staunch anti-alcohol advocate. He led the offensive responsible for implementing (in 1988) the now-familiar warning on labels of all wines sold in the U.S. The ATF (Bureau of Alcohol, Tobacco, Firearms and Explosives, now the Alcohol and Tobacco Tax and Trade Bureau, or TTB) text reads as follows:

GOVERNMENT WARNING: (1) According to the Surgeon General, women should not drink alcoholic beverages during pregnancy because of the risk of birth defects. (2) Consumption of alcoholic beverages impairs your ability to drive a car or operate machinery and may cause health problems.

But there was a major turnabout in 1991 when French scientist Dr. Serge Renaud made public his theory of the French Paradox which observed that the French suffer a relatively low incidence of coronary heart diseases (CHD), which is the major cause of death in industrialized countries, despite having a diet relatively rich in saturated fats found in, for example, eggs, dairy products and particularly cheese, and meat. Renaud's work catapulted sales of red wine in the U.S. and a renewed interest in the health benefits of wine when CBS aired its *French Paradox* TV segment on *60 Minutes* that same year. The French Paradox, the countless epidemiological studies and laboratory studies and experiments, such as those by renowned Kaiser-Permanente cardiologist Dr. Arthur Klatsky make a strong case in asserting the J- or U-shaped relationships between the consumption of alcohol and mortality rate. More specifically, these have demonstrated that moderate alcohol consumption resulted in a lower mortality rate compared to abstainers and teetotalers or heavy alcohol drinkers. As well, moderate consumption has also been linked to a lower morbidity (disease) rate.

Moderate consumption is generally defined to represent 14 g of pure alcohol (ethanol) per day which can be obtained from 148 mL (5 fl oz) of twelve-percent-alcohol wine—careful with that “two glasses a day” guideline—or from 355 mL (12 fl oz) of five-percent-alcohol beer or from 44 mL (1½ fl oz) of forty-percent-alcohol spirit. And to enjoy and maximize the health benefits of moderate drinking, consumption must be daily and not averaged out by, for example, drinking seven times the recommended amount at one Saturday-evening party, and should be part of a balanced diet and healthy lifestyle including regular exercise.

As of 1999, wine destined for the U.S. market could then be labeled by TTB approval with a *directional* health-related statement directing consumers “to consult [their] family doctor about the health benefits of wine consumption” or to request the U.S. Department of Health and Human Services’ (HHS) and Department of Agriculture’s (USDA) published *Dietary Guidelines for Americans* “to learn the health effects of wine consumption.” But Senator Thurmond and temperance advocates such as the Center for Science in the Public Interest (CSPI) and MADD struck again and effectively forced the TTB in 2003 to defeat directional statements on labels on the grounds that these were inherently misleading and confusing and gave the impression that the government endorsed the health benefits of alcohol consumption which encouraged consumers to imbibe further. After all, the whole premise of alcohol control is that wine as well as beer and distilled spirits have been considered intoxicating beverages and not medicines.

The wine industry with the support of such trade organizations as the Wine Institute and the American Vintners Association (AVA) lobbied the federal agencies for more substantive health-related claims and reached a compromise of sort. Henceforth, under the authority of the Federal Alcohol Administration Act (FAA Act), the new TTB regulations stipulated in part that:

WINE AND HEALTH

A specific health claim on a label or in an advertisement is considered misleading unless the claim is truthful and adequately substantiated by scientific evidence; properly detailed and qualified with respect to the categories of individuals to whom the claim applies; adequately discloses the health risks associated with both moderate and heavier levels of alcohol consumption; and outlines the categories of individuals for whom any levels of alcohol consumption may cause health risks.

Such requirements have made it almost impossible to obtain approval to include health claims, directional or substantive, on labels or in advertisements particularly that claims must contain a disclaimer “advising consumers that the statement should not encourage consumption of alcohol for health reasons ...” According to Richard Mendelson in *From Darling to Demon: A Legal History of Wine in America*, not a single health claim has been approved by the TTB since the regulation came into effect.

But there is hope. There has been vast progress in the last decade on the health benefits of moderate wine consumption. Though we—except for anti-alcohol advocates—have been thirsty for more good news on the role of wine on our health, research is nonetheless far from conclusive given the often contradictory findings and the breadth of malaises, illnesses and diseases on which wine is believed to have effects. The list ranges from heart diseases, strokes, cancer, dementia, including Alzheimer’s disease, type 2 diabetes, to arthritis and osteoporosis, and yes, even erectile dysfunction just to name a few. But a great deal of focus has naturally been on cardiovascular and neurodegenerative diseases.

In this section we will examine the science of the complex interactions between wine and health that are so near and dear to our hearts—literally.

WINE AND HEALTH



Late 19th century ad in *The Cosmopolitan* extolling the virtues of *Vin Mariani*.



Many believe Champagne, oysters and chocolate to be aphrodisiacs.

Wine Frauds



THE LURE OF EASY MONEY has not escaped the wine world where turning wine into profits is an elusive goal. There is an adage in the industry that says, “To make a small fortune in the wine business, you must start with a big fortune.” How true!

And so it is that unscrupulous “business” people resort to adulteration and other tricks to increase sales and generate more profits. There have been many attempts to “cut” (dilute) wine with water to increase output, a practice known as *mouillage* in French, to add flavorings or even toxic substances to increase mouthfeel, aromas or “quality,” or to use grape varieties of lesser quality instead of a premium variety declared on the label. In a scandal unearthed in 2008, E.&J. Gallo Winery had purchased more than thirteen million liters (3.5 million gallons) of “Pinot Noir” for their *Red Bicyclette* label from a Languedoc (France) wine merchant. French authorities convicted the cheaters with what amounted to a slap on the hand given the magnitude of the scam.

The high-end wine market has not been spared. So-called collector wines, highly sought for their high resale value, not for drinking pleasure, can fetch dizzying prices at auctions. In the heyday of the tech boom, the fine wine market grew at an unprecedented pace particularly in non-traditional Asian markets. These factors

combined to spawn a counterfeit industry. There were those who bottled cheap wine under the guise of a premium label and some who even forged labels. It was big business. It was so big in fact, that auction houses and collectors had to go through great lengths to authenticate the origin—or what is called *provenance* in wine-speak—of highly praised bottles. Great strides have been made in analytical and laboratory methods to help establish provenance and authenticity, some of which are routinely used by regulatory bodies to control wine production and sales in their appellations. Protecting appellations is serious business.

Consider the latest black eye suffered by the Italian wine industry and the scandal involving premium Brunello wines from the 2003 to 2007 vintages from a handful of top estates in the DOCG (*Denominazione di Origine Controllata e Garantita*) appellation of Montalcino in Tuscany. DOCG regulations stipulate that Brunello di Montalcino and Rosso di Montalcino wines be produced strictly from one hundred percent Sangiovese grapes. Those estates' Brunellos and Rossos were found to contravene this regulation as they contained other varieties. Whole productions were impounded until the investigation would complete or were simply declassified to a lower appellation that allows other varieties to be blended though these would sell at much lower prices.

Here, we review some specific cases of fraudulence, some of which became international public-relations nightmares for those trying to protect their long-established image of world-class wine producers and the role wine science played in the ensuing investigations.

Epilogue



SO WHAT DOES SCIENTIFIC research and development have in store for the wine industry? What can we expect to see in the next decade or two, or more?

First and foremost, we can expect medical researchers to zero in on the benefits of red wine consumptions by establishing an unequivocal cause-and-effect relationship between wine constituents and health benefits. Hopefully, this will encourage the population to incorporate wine as part of everyday meals and a healthier lifestyle and that wine becomes accepted as a food. That means that the nutrition and health czars governing public policies develop more informative guidelines to allow wine producers to state nutritional facts and make substantive health claims on labels. Surely it will be a tough balancing act with social responsibility tipping the scale heavily. But the long-term health benefits of responsible, moderate drinking will surely reduce the existing heavy burden on our health care systems.

Secondly, advancements in the science of enology will help wine-makers better understand the chemistry of wine and what makes a good wine so that we can implement better viticultural and wine-making methods. The primary objectives of good winemaking are to make better and better wines and reduce the occurrence of faults. Unfortunately, some of these changes enabled by science will rub

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