

## BREATHING OF WINES : MYTH OR FACT ?

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The beneficial effect of allowing wines to breath is well established in the wine folklore. Many wine enthusiasts can cite wines which were closed in when first poured and which then developed into a memorable wine in the glass. Recently, this cherished belief has come under attack from several sources. This article attempts to give a more detailed and factual analysis of this subject than has heretofore been found in the popular literature. Our study indicates that breathing of wines is not myth; that wines can be improved by being allowed to breath. However, this beneficial effect seems to be more the exception than the rule.

### Folklore and Popular Literature

Virtually all serious wine enthusiasts are absolutely convinced of the beneficent effect of breathing a wine: to wit, a wine should be allowed to breath for a certain period of time before serving to allow the bouquet to develop and, for young red wines, to soften (oxidize) the astringent tannins. In most cases, this belief is derived not from objective experiments, but rather from the enthusiast's earliest wine education, either from literature or other wine enthusiasts.

When one examines the popular wine literature on breathing of wine, one is confronted with a considerable amount of humbug. Although most authors are quite specific on the proper length of breathing times, they are also quite vague with regards to exactly what the beneficial effects of breathing are. Pamela Vandyke Price (Winelover's Handbook, 1969) claims breathing eliminates "bottle stink", the staleness which is the smell of the small quantity of air in the headspace. Hugh Johnson (The World Atlas of Wine, 1971) claims the wine's scent and flavor may be doubled by breathing. Augustus Muir (How to Choose and Enjoy Wine, 1972) exercises considerable literary license in stating that breathing "... sets up a gentle activity in a healthy, living wine ... [makes it] become more alive ... a rough young wine begins to soften and tries its best to please." !!! The consensus of the literature seems to be that breathing allows the bouquet of the wine to develop, in some vague sense.

The popular literature identifies two procedures for breathing a wine: merely uncorking the bottle or decanting the wine, whether sediment is present or not. Most basic references suggest the former. Leon Adams (Commonsense Book of Wine, 1975) was one of the first to point out the inadequacy of mere uncorking for breathing purposes. He states that tasting panel results indicate no benefit from simple breathing in the bottle, attributes any improvements from such as a temperature effect, but defends the practice as one of the "pleasant bits of wine ritual that our guests enjoy." Edouard Kressmann (The Wonder of Wine, 1968) claims that uncorking for breathing could not conceivably be of any value; the surface area of wine exposed to the air is entirely too small to produce any effect. Consequently, most authoritative references recognize the necessity of decanting for breathing a wine.

Although nearly all wine references confer the beneficent effect of breathing on red wines, many connoisseurs have made the logical extension of breathing to some white wines. If breathing aids the development of bouquet (as distinguished from aroma) in red wines, it's eminently plausible that the bouquet of white wines

(particularly oak -aged Chardonnays, Sauternes, German BA's and TBA's, and such) should also improve.

Finally, there are two special cases for breathing that are acknowledged as valid by the experts in academe: 1.) Technically flawed wines with excess free SO<sub>2</sub>, undesirable fermentation odors, gassiness, and other such defects will benefit from breathing by dissipation of these off odors, and 2.) Very old wines will oxidize rapidly and thus be destroyed by breathing. Henceforth, it will be assumed that wine enthusiasts are uninterested in those of the former category and rarely confronted with those of the later.

#### Recent Literature

Sandy Haring ("Does Breathing Improve Table Wines", Wines & Vines, Sept. 1975) surveyed a broad spectrum of wine industry people on whether breathing by merely uncorking improves table wines. Responses were about equally divided between yea and nay. The query prompted some vintners to perform the experiment at regular tastings with the result that "tasters couldn't distinguish between just-opened bottles and those left uncorked for a few hours." Andre Tchelistcheff claimed this simple breathing produces "a positive reaction only for wines of heavy constitution ... only with an average bottle age of from 5-8 years as a minimum." Other vintners giving a yes (often with qualifications) included Louis P. Martini, Bob Magnani (Grand Cru), Leonard Olson (Tabor Hill), and Robert Mondavi. The negative respondents included Al Huntsinger (Geysers Peak), Joe Heitz, Philip Wagner, Gerald Asher, and Nathan Chroman. Nonetheless, it is obvious from Haring's survey that a significant fraction of those intimately involved with the technical aspects of wine are convinced that breathing offers no positive benefits.

Amerine and Roessler (Wines: Their Sensory Evaluation, 1976) were the first in the popular literature to seriously "question the shibboleth ... that wines always improve if left open before serving." Citing the above special cases, they fault the claim that breathing increases desirable odors by questioning the existence of any chemical reaction with a sufficiently high rate constant to effect a desirable odor change over the period of a few minutes to a few hours. However, these respected authors do admit the possibility that different volatilities of odor constituents may sometimes favorably change the overall character of the wine.

#### The Bernaloff Study

Finally, Alexis Bernaloff, in two recent articles ("A Corking New Wine Theory", New York, May 23, 1977 and "Don't Pop Your Cork", New West, January 16, 1978), the second primarily an elaboration on the first, makes the most comprehensive attack yet on the beneficial effects of breathing of wines. He examined four different procedures: 1.) One bottle merely uncorked an hour before serving, 2.) one bottle decanted (aerated) an hour before serving, 3.) one bottle decanted (aerated) immediately before serving, and 4.) one bottle simply uncorked and poured. His results with ten or so wines indicated that the bottle uncorked and served directly was always the preferred one, the bottle decanted and served immediately was next in preference, and the bottle uncorked an hour before serving was the least preferred. This order of preference was maintained as the wines evolved in the glass. He concludes that breathing a wine has a negative effect, reduces its intensity, and the recommended procedure is simply to uncork the wine and pour directly from the bottle, allowing the wine to develop in the glass.

### Criticisms of the Bepaloff Study

Bepaloff's articles display a refreshing degree of objectivity seldom found among popular wine writers. He has prepared his case well and it's difficult to fault the evidence. The articles do, however, contain two points that deserve further comment.

Firstly, the wine that was simply uncorked an hour before serving was always much less preferred to the one simply opened and served. Neither wine was aerated. Yet, if one is to believe Kressmann, Adams and several other studies, there should be little or no differences between the two samples. It's difficult to hypothesize such a large diffusion of volatiles thru the small exposed surface area of the neck to produce the large differences Bepaloff observed. Indeed, Bepaloff cites Emile Peynaud as stating that he (Peynaud) could detect no resulting differences whatsoever between the two treatments. Bepaloff admits to this glaring inconsistency but proffers no explanation.

Secondly, and of lesser importance, Bepaloff claims: "White wines don't have to breathe because the bouquet comes up right away, and too much aeration would just oxidize them and dull their appeal." Excluding temperature effects, it's difficult to understand why the bouquet of a white wine "comes up right away". Since the nose of a wine is the result of volatilization of various odor components, why do white wines have more volatile components than reds? If anything, white wines should be slower to volatilize due to their cooler temperature. It's also difficult to understand why a white wine should be any more susceptible to oxidation than a red over the short time period in question (a few minutes to an hour).

### The Los Alamos Study

The Los Alamos tasting group undertook a series of tastings to verify and extend Bepaloff's study. To lend validity to the results, it was decided to taste the wines as a large panel and apply appropriate statistical tests. Each panel of 15 to 18 tasters, drawn from some 100 members of the group, ranged from near-novices to extremely experienced tasters. Both red and white wines were tasted, ranging from simple wines to great wines, from young wines to old wines.

It was assumed that most wines of interest to connoisseurs will have sediment so that pouring directly from the bottle would result in an immoral degree of waste. It was assumed that the procedure of simply uncorking the bottle to breath would have, at the least, no effect, or, if Bepaloff's results are correct, a negative effect. The critical assumption was made that both bottles of each wine were identical. The wines were purchased from several retail sources in Colorado and New Mexico and always selected from the same case of wine. To eliminate the possibility of bottle variations would require repeated tastings of the same wines, greatly exceeding the enthusiasm of the group for the project.

### Methodology

Two bottles of each wine were tasted: one decanted some elapsed time before serving (the breathed sample) and one decanted and served immediately (the unbreathed sample). Breathing times were one to two hours for the white wines and two to three hours for the reds. Necessary precautions were taken with the whites to assure little or no temperature differences between the two samples. Both samples were served blind, in random order, and from identical decanters. One fault of this procedure is that any wines that may

require an extended breathing period (say 6-24 hours) would likely remain undetected.

For each wine, two questions were asked: 1.) Is there a difference or no difference between the two samples? The one-tailed test is then the appropriate statistical test. 2.) If there is a difference, which is the better sample on the basis of simple hedonic preference? The two-tailed test is then the appropriate statistical test.

This simple difference test should conclusively demonstrate that breathing a wine has a positive, zero, or negative effect. The remainders of both samples were left in the glass for 15-20 minutes and the difference test repeated. The second test should demonstrate if any breathing effects (positive or negative) are eliminated during "development" in the glass.

The 95% confidence level was used on all statistical tests. Reasonable efforts were made to suppress discussion between tasters which might bias the tests. Another obvious fault of the procedure is that the tasters, knowing the two samples to be treated differently, will have a bias against the "no difference" response; will tend to find differences in the two samples, even when none exist. Use of the triangle test would reduce this biasing but considerably complicate the testing procedure.

### Results

The following table lists the 35 wines tasted and the results. The first letters in parentheses indicate the results of the initial tasting, the second at 15 to 20 minutes later. The letter codes are:

NSVC- No statistically valid conclusions

NSD- No significant differences between the breathed and unbreathed sample

BSSB- Breathed sample significantly better

USSB- Unbreathed sample significantly better

SSDNP- Statistically significant differences between the breathed and unbreathed sample, but no preference

The wines and the results:

White Wines Franciscan Chablis 1976 - (SSDNP, NSVC)

Callaway White Mist Sauvignon Blanc 1974 - (SSDNP, NSVC)

Phelps Gewurztraminer 1976 - (NSVC, NSVC)

Chateau St. Jean Pinot Blanc 1975 - (SSDNP, NSVC)

David Bruce Lot 2 Chardonnay 1974 - (SSDNP, SSDNP)

Sutter Home White Zinfandel 1977 - (SSDNP, NSVC)

Mondavi Moscato d'Oro 1976 - (SSDNP, NSVC)

Dopff Seafood Special NV - (SSDNP, NSD)

Dopff & Irion Gewurztraminer NV - (SSDNP, NSVC)

Cave St. Vincent Sancerre 1975 - (NSVC, NSVC)

Chablis Montmain Lamblin et Fils 1976 - (NSVC, NSVC)

Pavillon Blanc de Chateau Margaux 1974 - (BSSB, NSVC)

Mersault Perrieres Domaine Comtes Lafon 1972 - (SSDNP, SSDNP)

Trittenheimer Altarchen Freidrich Wilhelm Gymn 1971 - (NSVC, NSD)

Red Wines

Fetzer Carignane 1974 - (SSDNP, NSVC)

Inglenook Charbono 1971 - (SSDNP, NSVC)

Ridge York Creek Gamay 1974 - (SSDNP, NSVC)

David Bruce Cabernet Sauvignon NV - (SSDNP, NSVC)

Carneros Creek Angwin Petite Sirah 1975 - (NSD, NSVC)

Stag's Leap Merlot 1975 - (NSVC, NSVC)

La Montano Pinot Noir 1967-1976 - (SSDNP, NSVC)

Monterey Vineyard December Harvest Zinfandel 1974 - (NSVC, NSVC)

Cuvaison Sonoma Zinfandel 1974 - (SSDNP, NSVC)

Ridge York Creek Petite Sirah 1974 - (NSVC,NSVC)  
 Spring Mountain Cabernet Sauvignon 1974 - (NSVC,NSD)  
 Chateau Pichon Lalande 1967 - (BSSB,BSSB)  
 Chateau La Mission Haut Brion 1967 - (SSDNP,NSVC)  
 Negri Grumello 1969 - (SSDNP,NSVC)  
 Negri Inferno 1969 - (NSVC,NSVC)  
 Ginestet Bordeaux Vieux 1970 - (SSDNP,NSVC)  
 Jean Gleizes Coteaux d'Ouveillan 1974 - (SSDNP,NSD)  
 Morgon Charmes Marcel Vincent 1971 - (NSVC,NSVC)  
 Beaune Clos de Coucheraux Jadot 1974 - (SSDNP,NSVC)  
 Gigondas Andre Passat 1964 - (NSVC,NSD)

To summarize the results, the number of wines in each category are:

	Initially	At 15 min.
NSVC .....	12	26
NSD .....	1	6
BSSB .....	2	1
USSB .....	0	0
SSDNP.....	<u>20</u>	<u>2</u>
Total	35	35

#### Interpretation of Results

Of the 35 wines tasted; two (Pavillon Blanc '74 and Pichon Lalande '67) were significantly improved by breathing. Also contrary to Bepaloff's results, none of the wines were significantly harmed by the breathing process. It seems apparent that the breathing process usually makes a difference in the wine initially, but the effect is either immeasurably small or depends upon personal preferences. None of the tannic red wines were significantly improved by breathing, lending support to the assertion that oxidation is not sufficiently rapid to soften the tannins over a period of a few hours. The experiment of observing the "development" in the glass was an abject failure; in most cases no statistically valid conclusions could be drawn.

#### Personal Observations

The following observations are strictly personal and should be construed as having less validity than the preceding group results.

For the Chateau Pichon Lalande '67, the unbreathed sample had a strong unpleasant musty-stemmy nose that did not dissipate in the glass over the 15-20 minute period. The breathed sample had a lighter pleasant classic cigar-box, old Cabernet nose. For the Pavillon Blanc '74, the unbreathed sample had the strong pungent earthy musty-book nose often found in older Graves whites. The breathed sample had a softer, Sauvignon Blanc fruity nose.

For the wines in which aroma dominated the nose, the samples seemed to have smaller difference than wines in which the bouquet dominated, the differences primarily one of intensity rather than character. For the bouquet-dominated wines, the differences seemed less that of intensity but more of differences of character. These observations seem consistent with Bepaloff's

In most cases, the 15-20 minute "development" in the glass seemed to reduce the differences between the two samples, but this is totally unsupported by the group results. For no wine was a dramatic "evolution" or "development" of the bouquet observed in the glass; the changes seemed minimal or, at most, a reduction of intensity.



### Physics of Breathing

This section proposes a pseudo-scientific model which attempts to explain some of the observations regarding breathing of wines. It is offered as reasoned speculation by a wine enthusiast and not as scientific fact by an oenologist.

Since the olfactory sense is incredibly sensitive, any breathing effects are most likely to be observed by that organ. This not only refers to the nose of the wine; but also the flavor, which is a synthesis of taste (sweet, sour, salty, bitter) and in-mouth odors. Physically, the odor of the wine results from the release (evaporation) of various volatile components and their subsequent transport into the nasal passages.

It seems highly likely that no chemical changes will be induced in the wine by a breathing period of several hours. Any oxidation reactions that could be driven that rapidly during breathing would probably have already transpired due to oxygenation during bottling and from the headspace (diffusion of oxygen thru the cork has recently been shown at UC Davis to be negligible or non-existent; another cherished belief demolished by the academics!), except for very old wines. By eliminating the possibility of chemical reactions, one source of increase in volatile components (and, hence, the nose) is eliminated.

The only case for a chemically-induced improvement by breathing is given by Dr. A. Dinsmoor Webb (pg. 68, Wines & Vines, Sept. 1975), and then only for very old red wines. He states that some non-odorous precursor of bouquet must have to have been formed under the highly reducing conditions resulting from long bottle aging. This precursor would then be easily oxidized by the breathing to produce a pleasant component of the total bouquet. He implies that these conditions are quite rare.

Assuming no temperature changes, it seems reasonable that as various components vaporize and disappear from the wine, the intensity of the odor components will decay exponentially with time. This assumes the glass is maintained in a quiescent condition or, more commonly, swirled vigorously to maximize release of the volatiles. Hence, it seems plausible that the total odor stimulus will consist of the sum of decaying exponentials, each with different initial amplitudes and decay rates. Since there are some 200 odorous organic compounds in wine (pg. 24, Amerine & Roessler), the total odor sensation may be quite complex. However, it seems likely that only a handful of odor constituents will dominate the nose.

This concept is illustrated in the figure for a model wine which has considerable fruit aroma and also some undesirable fermentation odors. The total nose is initially unpleasant but, as the fermentation odors dissipate leaving only the fruit aroma, the nose becomes pleasant. This is an example of a wine that improves with breathing. The recommended breathing time obviously depends upon the rapidity with which the fermentation odors dissipate. It is also noted that the intensity of the nose continually decreases with time.

The above model wine is an extremely simple example. A realistic wine may have several dozen different odor constituents that decay with time. The nose can conceivably change its character several times over a sufficiently long time period. Whether a particular odor constituent is pleasant or not is often a personal value judgement. For example, Davis oenologists and many others regard a distinguishable oak component as a negative factor; many enthusiasts do not.

Furthermore, this simple breathing model of exponentially

decaying constituents completely neglects the possibility of synergistic and masking effects between odor constituents, or the existence of odor thresholds and saturation effects. Nonetheless, assuming no temperature changes, the model suggests that the nose cannot increase in intensity with time, but does allow a change in character. This is consistent with Bernaloff's observation that the nose of the breathed wine was always reduced in intensity, but still permits the observed improvement in quality of the nose with breathing.

What the above model does not explain is the example claimed by many wine enthusiasts of a very "closed-in" nose initially, followed by a sudden "blossoming" or "developing" sometime later. Two explanations, neither wholly satisfactory, are postulated for this alleged phenomenon: temperature effects and human perceptions.

As a wine warms up in the glass, the volatile components will be driven off more rapidly. Certainly a very cold wine is known to be "dumb", it has little nose and flavor. This increasing volatilization of odor constituents due to temperature increases could explain any perceived increase of intensity in the nose. However, it's difficult to believe that any red wine, served at near equilibrium temperature with the surroundings, would display much of an effect. Unless a threshold phenomenon is present, it seems unlikely such small temperature increases would produce the dramatic effect attributed to them by enthusiasts. Furthermore, such temperature effects would be even more evident in white wines which are served at a much greater temperature disequilibrium with the surroundings. Yet white wines are seldom claimed to display such a "blossoming" of the nose.

Finally, it is well known that the human palate is a particularly flawed and unreliable measuring device. Bernaloff ascribed to Vernon Singleton the claim that "What we imagine to be improvement of a wine as we drink it through a meal is really a change in our perception." Most wine enthusiasts agree that foods can have a dramatic effect on the flavor of a wine. However, the beneficial effect of breathing is primarily an olfactory phenomenon and it would seem that the olfactory sense is considerably less impacted by food than flavors. If this "blossoming" phenomenon is as widespread as claimed by enthusiasts, it certainly would have been observed in the more controlled circumstances of a tasting where food is not a factor. And, of course, wine enthusiasts never experience any change in perceptions due to diminishing sobriety. Consequently, ascribing the beneficial effects of breathing to changes in tasting perceptions also seems lacking.

#### Recommendations

One should be extremely wary of making gross generalizations from the preceding results and discussion. Nonetheless, the foolish are seldom daunted by such admonitions.

The Los Alamos tasting results would indicate that the beneficial effect of breathing a wine is not myth; examples were found in which breathing significantly improved a sound, quality wine. However, two wines out of 35 are rather slim odds. It's highly improbable that any rules can be promulgated that would allow one to identify those few wines that do improve by breathing, without performing the actual experiment itself.

The results also indicate that breathing is unlikely to harm the quality of a wine, but will almost surely reduce its intensity to varying degrees. Consequently, the following generalization seems valid: Unless one has reason to expect otherwise, breathing of a wine is not recommended.

It would seem that if a wine would accrue any benefit from breathing, it is far safer to observe these breathing changes in the glass by drinking it over a longer time span, rather than risking a lengthy breathing period and an almost certain reduction in intensity. The philosophy of Joe Heitz seems to be the most rational: "If and as a wine changes, I want to observe those changes in my glass, not simply gulp it at the supposed moment of its apex" (pg.68, Wines & Vines, Sept. 1975).

At considerable risk, one can also propose the following generalizations:

1. A wine whose nose is dominated by fruit aroma is not likely to benefit from breathing.
2. A complex wine (many odor components) is more likely to benefit from breathing than a simple wine.
3. The older wines are the ones most likely to benefit from breathing. They are also the ones most likely to suffer from breathing.
4. The fine California wines, with their characteristic intensity of fruit, are less likely to benefit from breathing than fine European wines.
5. Wines with a pronounced character that one may find unpleasant (the vegetal smell of some Monterey wines, the hair oil smell of some Gewurztraminers, the barnyard smell of some Nebbiolos, the earthy metallic character of many aged French Chablis and Graves whites, for example) are likely to benefit from breathing.
6. Wines either known to be or frequently found to be poorly made (excess free SO<sub>2</sub>, fermentation odors, gassiness, etc.) are likely to benefit from breathing.
7. Any wine for which the previous bottle was found to be unpleasant is likely to benefit from breathing or, at least, suffer no further harm.

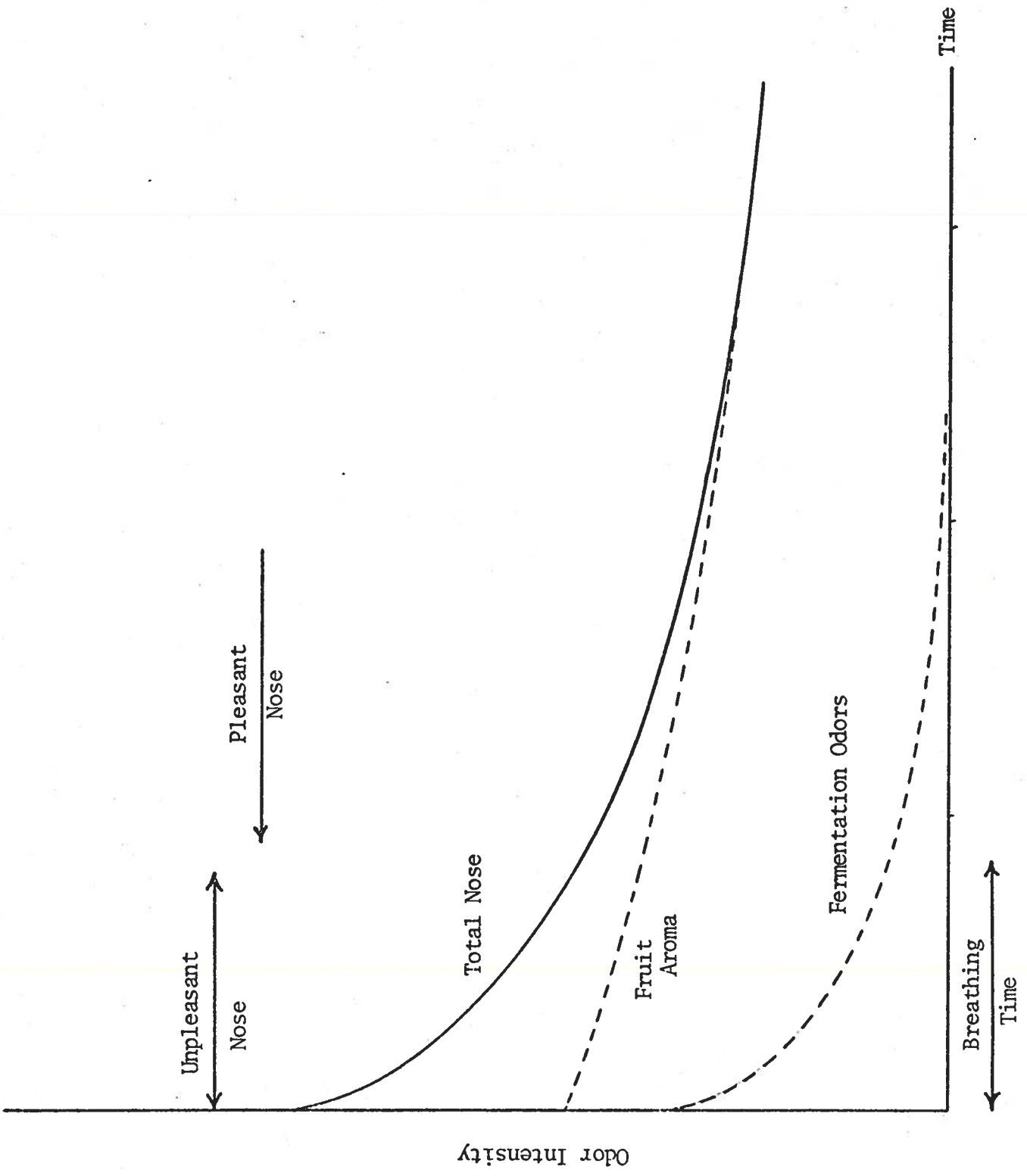
One should be cautioned that these are just generalizations, exceptions undoubtedly abound.

#### Unanswered Questions

Two important questions remain unanswered:

1. Why did the wines breathed by simple uncorking consistently show poorly in Bepaloff's study, contrary to several other more controlled experiments? The Los Alamos tastings were not designed to verify his observations and no explanations come to mind.
2. The popular literature is rife with references to wines "evolving in the glass", "developing its bouquet", "blossoming", "unfolding", "blooming", "expanding", etc., all of which imply an increase of intensity with breathing in the glass. This phenomenon was not observed in the Los Alamos tastings and again no good explanations come to mind. It would be extremely helpful if some wine enthusiast would identify a particular wine, currently available, that displays this phenomenon, so that more controlled observations could be made.





Odor Intensity for Young Fruity Wine  
With Unpleasant Fermentation Odors