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Beyond the Wine Menu: Understanding Flavor and Taste Perception as a Factor in Pairing Wine and Dessert

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Beyond the Wine Menu: Understanding Flavor and Taste
Perception as a Factor in Pairing Wine and Dessert

By: Cristina Vazquez

Cristina Vazquez

Honors Thesis

Proposal:

Beyond the Wine Menu: Understanding Flavor and Taste Perception as a Factor in
Pairing Wine and Dessert

Abstract:

My thesis will explore vinotypes, a method used to distinguish a wine taster's sensitivity, which will be defined further, and an understanding of the physiology of taste and flavor perceptions in pairing wines with desserts. I will explore this topic by examining the evolution of man's original perception of wine throughout history, leading to how wine is perceived today. Specifically, I will focus on the three prevailing theories, which will help me identify the main factors in creating a successful pairing. The first theory is based on sommelier Francois Chartier's understanding of how molecular gastronomy affects one's flavor perception. I will then contrast Chartier's theory with a recent study developed by The Monell Chemical Center. The Monell study focuses on the concept and importance of fatty, smooth, and astringent mouth feels and how they affect our perception of taste. This will then lead me to Tim Hanni's theory that individuals have a specific vinotype determined by their personal taste perceptions. I will be conducting primary research in the form of an experiment, eliminating the biases from psychosocial factors, which are the factors outside of the tasting that could sway a person's perception of the wine. I will compare individual's reactions to pairing wines with three different types of desserts that will each represent one of the theories listed

above. I intend to challenge what most wine enthusiasts believe are proven successful pairings. One such pairing being challenged is that of red wines, such as Californian Cabernet Sauvignon, with rich chocolate desserts. By analyzing this data, I will draw conclusions about which factors are most essential when considering pairing wines with desserts.

Chapter 1: The Evolution of Wine

As pastry chefs, we pair wines to food and desserts to enhance the consumers' experience. Like culinary arts, wine and the study of sommelier could be considered an art form. But how did the collaboration of food and wine pairing begin and, more importantly, why do so many consumers feel so intimidated by the subject? As I began to study the theories and components of pairing, I found that gaining historical background information on wine made it easier to understand each theory. Before branching out to modern day theories, it is important to gain an understanding of western society's evolving perception of wine, how wine originally became an important factor in the food industry, and most importantly when the focus on food pairing with wine began.

To gain an understanding of how wines are paired with food today, it may be helpful to understand how the evolution of wine and food pairing took place. The history of the perception and consumption of wine and the rise of the wine industry strongly influences how wine's popularity has become prevalent in society today. As time passed, and the evolution of dining out progressed, wine and food pairing became not only an important economic factor in the restaurant industry but a respected art form that

heightens the customer's experience. But where did the concept of pairing food and wine come from? How did society once view wine before it became popular? How did wine become a staple on menus in restaurants all over the world and especially in America? One can begin to find answers to these questions through wine's historical evolution and its role in a meal. The first part of my thesis will explore the history of the perception of wine and its consumption and the evolution of pairing philosophies.

One prevailing theory is that ancient and religious views on wine have influenced the ways it is perceived today. Most historians believe that the history of wine began in the regions of Iran, Georgia and Mesopotamia. Mesopotamia, was hot and dry therefore was not successful in growing grapes. Ancient wine makers found a way to import the grapes from the Caucasus region, present day Iran, by carrying them through the mountains in clay jars. These wine jars were transported through the Middle East, the Levant and as far as Egypt. The jars were even often found in royal tombs for the dead to enjoy in the afterlife. In Georgia, clippings of vines were encased in silver and placed in the tombs with the dead in hopes that their spirit will be able to later on grow vines in heaven. These ancient rituals illustrate how sacred wine was believed to be. In ancient Egypt, limits were placed on the area of viticulture because the consumers of wine were primarily royalty and the high priestly caste. Most people were deemed unworthy to consume sacred wine and feel its mind-altering effects, which the Egyptians believed offered them a closer connection to the gods (Johnson 33).

The ancient scriptures of these religions also provide us with a glimpse of how wine was perceived. Some religions perceived wine as a sacred beverage that shouldn't be consumed for other than religious practices. However, royalty, priestly castes and

aristocrats who had regular access to wine did indulge. Its psychotropic effect was attributed to “the gods.” The consumption of wine was recognized to have both beneficial social effects, if consumed in moderation, but also a negative effect if overindulged. Although the land in parts of the Middle East was ideal for growing vines, and drinking alcohol prior to Mohammed was prevalent, the Muslim religion forbade the consumption of wine. Concerned by the negative effects of wine Islam considered humans unworthy to drink wine until they were with God in heaven. In Jewish traditions, wine was and is consumed weekly during Shabbat. Shabbat celebrates Saturday as the holiest day of the week. During Shabbat, it is believed all should abandon outside distractions, such as the use of technology, and commit to only spiritual practices. This spiritual gathering begins with Friday night dinner where the family gathers to read prayers and connect spiritually to God. During Shabbat everyone, including children, drink wine as part of their spiritual practice. The use of wine in a ritual is similar to the Catholic tradition of consuming wine during mass as part of the Eucharist. Wine symbolizes the blood of Christ. Humans are deemed as being worthy, and through wine they are connected to the Divine (Johnson 33).

Although consumed weekly and because it was considered to be sacred, wine was considered to most not to be a recreational drink. An example of this is the story about Noah in the Old Testament. When God punished the world with a massive flood, Noah was instructed by God to build an arc to save two of every species of animal and humans to rebuild a new and better world. The first thing Noah did once he landed his arc on dry land was plant a vineyard where he then made and drank wine. Noah became drunk and was found naked in a tent by his youngest son. Discouraged by his father’s

behavior, the youngest son covered Noah's nakedness. Once Noah woke up, he was enraged and cursed his youngest son and his progeny. Although this story is complicated and many interpretations have been discussed, it is a clear indication of the power that wine had and how it could be a sacred symbol for rebirth and a new beginning. It also illustrates how wine was feared for its mind-altering effects that could strip someone of his or her morality (Johnson 32).

Due to the lack of knowledge of the science of fermentation, ancient civilizations such as Greece, Rome, and Egypt, believed that the physical effects of consuming wine resulted in a form of divine intervention, rather than the biological transformation into wine. It was the ancient Greeks that began using wine for purposes other than just its sacred use. The Greeks cherished wine but not only for religious purposes. The Greeks learned that by blending their wine with water, in a minimum of 1 to 5 (1 part wine 5 parts water), all harmful pathogens were killed, which made their water drinkable. They also viewed drinking wine more than a 50 % blend to be barbaric. After realizing that water could be made safe by adding wine to it, as a safer option, the consumption of wine became widespread among the general population. This expanded the role of wine and consumption of wine as a more utilized beverage and not just a sacred drink. The practice of wine consumption as a non-sacramental habit became even more widespread in the Roman world as well. Romans built aqueduct systems to bring fresh clean water from springs far way from populated areas, and perceived wine to be a beverage for enjoyment (Johnson 33).

Despite sacred values placed on wine and the blend that made wine drinkable to the masses, the actual quality of the product was very low in comparison to today's

standards. In Hugh Johnson's *The Story of Wine*, he shows an image of an ancient Egyptian hieroglyphic displaying the winemaking process. Johnson points out in the ancient drawing that "we see no sign of filtration" (Johnson, 31). He also comes to the conclusion that "probably some sort of a strainer held back the bigger particles of stalks and skins in the trough but the fermented wine must have included a fair amount of solid matter." (Johnson 31-32). It is this type of evidence that points to the poor quality of the wine. It was not until the last one hundred and fifty years that the quality of wine improved. Arguably, it truly wasn't until the last 40 years that high hygienic standards, involving stainless steel anaerobic fermentation and better scientific understanding that the overall quality had improved into today's standard.

Historians such as Paul Lukacs view and discuss the history of wine in a different way than the chronological evolution Hugh Johnson suggests. Lukacs simply proposes that the ancient history of wine is one that consisted of poor quality wine that was improperly stored and transported. In his book *Inventing Wine: A New History of the World's Most Ancient Pleasures*, Lukacs draws the distinction between *Vin ordinaire*, table wines, and *Vin fin*, which are the fine wines. He states, "for in truth these triumphant moments were simply that-a moment, brief and limited with only select wines from select areas displaying glory" (Lukacs 127). There were very few types of decent wine available even for the elite. The majority of wines would go bad fairly quickly due to lack of proper storage, resulting in the growth of bacteria. Lukacs then focuses the history of wine on more recent years, discussing how the quality of wine really didn't start evolving until the 19th century.

The quality of wine was significantly affected by the lack of proper storage and exposure to air, which provided a medium for the growth of acetobacter. This would oxidize the wine, quickly turning it into vinegar. Most authors believe, like Lukacs, that most *Vins ordinaires* were wines that already had started to show strong signs of volatile acidity. It was first during the Enlightenment Period, and then during the Industrial Revolution, when science truly became the spark that improved wine standards. With the English rediscovering, in the 1650s, the manufacturing of heavy glass and its benefits, bottles became the medium for distributing wines for *Vins fins*. By the mid 19th century, Louis Pasteur was commissioned by the French government to study yeasts and discovered their roles in the fermentation process. With a new understanding of fermentation and the effects of oxygen with bacteria, Pasteur soon realized that acetobacter would change wine into vinegar through the exposure of oxygen, light, and heat. The storage of wine in a glass bottle provided a means to control the growth of bacteria. Louis Pasteur discovered that in order for bacteria to grow it needs air, light and heat. Bottles with colored glass limited excess light exposure. Filling bottles to the top reduced the factor of excess oxygen as well. It was also recommended that bottles be stored flat, so the cork would stay and keep moist and sealed, and stored in a cool environment where the glass would keep the temperature consistent. This also caused the shape of the bottles to change so they could be laid on their sides and stored properly. With heavy glass bottles being used, wine could be easily distributed, stored, and served without becoming rancid.

Coincidentally the evolution of wine runs parallel to the evolution of the restaurant. Since the 17th century, French cuisine and dining standards was the guiding influence on

the western culinary restaurant world. The first restaurant emerged in France after the French revolution. Only the elite and upper class were able to indulge in such establishments. As the middle classes grew, the demand for more restaurants developed. This led to a great need for better meals and service, not merely of foods but beverages as well; especially wine. Wine, being prevalently grown in France, was naturally selected to be a suggested offer served to this clientele to accompany their meals. However, there needed to be educated personnel to select and serve wines for customers. A new position was needed for restaurant that could purchase store and sell wine to this ever-growing segment. The word *sommelier* originated from the French word used to name designated court servants who were responsible for transporting supplies. Over time, the word evolved to represent a steward who was responsible for stocking and serving wine, beer and spirits.

In France, it made sense to pair wines primarily to the regional cuisine from where the wine originated. One could argue that cuisines evolved based not only on what ingredients were locally available but their synergy to the wines being produced there. This evolved into the logic of pairing a wine from a specific region, for example a Burgundy wine, with dishes traditional to the Burgundy region. This practice was prevalent until the end of the 20th century. As a result, Sommeliers' expertise tended to be fairly narrow and primarily reflected a single region of wines, such as knowing the wines of Burgundy very well but being fairly unknowledgeable of other regions or countries.

The professional role of the sommelier became a certifiable practice in Britain, through the Court of Masters Sommeliers, in 1969. This changed the standards for sommeliers because Britain was and had been the center of the wine trade from the 18th

century to nearly the present. It not only had access to wines from many countries and regions, but was also the dominant market for wines until the last decade. Sommeliers would learn and practice pairing for all different types of wines. Today, through his or her knowledge, a sommelier needs to be able to recommend a wine to match any particular dish for every type of customer.

Along with the development of the railroad in Europe in the later part of the 19th century, the previously accepted rules of pairing to a particular region began to drastically change. The railroads enabled the access of different regional wines to Parisian restaurants. Because of the availability of many different wines, the demand and wine market began to expand. Slowly, with the ability of wine to be transported and distributed efficiently other than just near the seaports, restaurants began to evolve and offer a wider range of wines from different areas. This changed the menus, the pairings, and even the type of customers. With the market blossoming, slowly the middle and lower economic classes had growing access to different wines.

In the United States, wine originally was not a popular beverage because it could not be grown successfully due to phylloxera, a microscopic pest native to the eastern US, that killed the European vine. Only the wealthiest of the early colonists had access to wine because it was extremely expensive to import and therefore viewed as aristocratic. Prior to World War II, due to the large influx of southern European immigrants wine was perceived as an “immigrant’s drink” and not truly American. Competing alcoholic beverage industries in the US painted the practice of drinking wine as “feminine” at a time when society frowned upon women drinking any alcohol. Overall, wine drinkers had a negative reputation and those who overindulged in any alcohol would be referred to as

“winos”. Eventually the wine market made advancements, especially in areas like California. California had the ideal wine growing climate and with the Gold Rush of 1849 drew vast numbers of immigrants, especially Italians and other Europeans who drank wine as part of their culture. However, events such as the San Francisco earthquake and fire of 1906, prohibition, and the Great Depression caused two significant developments. First, Americans became used to second-rate alcoholic beverages, and secondly, there was a significant decline in wine consumption while spirits and the cocktail culture became synonymous with sophistication.

It wasn't until after World War II, when soldiers came home from Europe, that our country became significantly more interested in wine. World War II exposed American soldiers to European customs and quality wine, allowing the wine market to grow in demand back once they returned home. Although France was considered the culinary leader in the restaurant industry, the traditional pairing values and rules that worked in France could not be applied to the “melting pot” of cultures in America. The traditional logic of pairing by region simply didn't work anymore in the US, a country with a melting pot culture of food. The problem with the old pairing paradigms was the result of the evolution of mixed or fusion cuisines and American regional cuisines. With the wine markets expanding in areas such as California, slowly the United States began to measure up to the quality of most old world wines from Europe.

In 1976, to celebrate the bicentennial, a blind wine tasting was held, later referred to as The Judgment of Paris. This event occurred in Paris, France, where French wine experts in a blind tasting rated California chardonnays and cabernet sauvignons over their own red Bordeaux and white Burgundy wines. An American journalist for the

Associated Press reported on this event, which was then carried throughout the world. This event caused the initial shock wave within the wine world, which inspired other wine makers, not just from California but all over the world, to create and improve their own wines. If Californians could best top French wines, why couldn't Chileans or Italians do even better?

Society's views and thoughts of wine pairing have changed with the growth of the wine industry and production of wines from so many varied regions. Many people came up with their own personal options on pairing rules and guidelines that spread and became known overtime. Some, like Tim Hanni, took a closer look into the cause and effect of wine pairing. It wasn't until the major market boom in California that Hanni and others began to investigate the scientific basis for why and how wine is best matched with food. The shift of the economic dominance in the wine trade from the UK to the USA was reflected by the wine ratings of Robert Parker. Parker created a grading system for the quality of wine called the 100-Point System and judged the 1982 vintage of Bordeaux to be a great vintage when other English writers had denigrated it. When US investors took his advice and purchased great quantities of this vintage and it became apparent that this was indeed a great vintage, it seemed the mantle of wine authority had passed from the UK to the US. Parker sparked an interest, and people listened and began to make money off his suggestions. Given the increasing number of choices available to both wine investors and consumers, and their insecurity in their own judgment, they listened to so-called experts like Parker and used them as the basis for wine pairings. Furthermore, these perceptions of wine helped to mold the wine market into the industry it is today.

Chapter 2: The Modern Day Approach To Wine and Wine Pairings

Today, we are in a new place of discovery where wine enthusiasts are bold and inquisitive. Some believe that past influences of the Wine Revolution are responsible for why drinkers today choose a red wine over a sweet white wine. Red wines are considered more traditional, resembling the original sophistication of a healthier European culture. When America's wine culture initially began, sweet fortified wine, which had been enhanced with residual sugars from the addition of spirits prior to the completion of fermentation, were preferred over dry or tannic wines. This made the majority of the wines being produced at this time to be considered sweet. This could be why sweeter white wines are considered the Americanized version of what wine should really be, and often viewed as the novice wine drinker's introduction to a more sophisticated wine palate. This could also easily correlate with the American movement away from sugary, fatty foods, into a leaner more organic, European style of cuisine found in most high-end restaurants.

Today countless books on wine pairing appear on shelves describing the modern perceptions of wine pairing with food. For example, wine enthusiast and author Chris Hambleton creates a mix-and-match guide to wine pairing in his book, *The Wine Planner*. This book provides a plethora of information from proper wine tasting practices, foods to avoid when drinking wine, different grape varieties in wine and what flavors they produce, and of course a large range of examples of perfectly matched pairings between food and wines. For example, he guides readers to pair Syrah, high tannin medium bodied red wine, with a dark chocolate mousse. "The rich dark chocolate is set

off really well by the rich black pepper in the wine” (Hambleton 40). Based on books, like *The Wine Planner*, social media posts, and spreading information by word of mouth, the notion of pairing red wine and chocolate has become one of the most thought-of pairings. Other books like, *The Wine Lovers Dessert Cookbook* by Mary Cech and Jennie Schacht, mention pairings of wines with tropical fruit notes, like a Chardonnay or specific Rieslings, with a dessert containing tropical fruit such as a tropical fruit blended crepe. “Select a late harvest white wine or an ice wine with enough body to match the cream and sufficient acidity to accent the fruit filling” (Cech 92). This is a common theory of pairing, matching a specific flavor through your dessert. Cech and Schacht’s book provides specific examples of “recipes and pairings for the perfect glass of wine”. Books today on wine pairings do not label matches as right or wrong but are found to offer examples of the standards of pairing wines to foods and desserts.

The use of social media is also a major contributor to the spread of these standards. Today, younger consumers are looking to social media as an influence in helping them choose between wines. Whether it is through Twitter or Facebook, or a more formal posting in a blog, everyone with access to the Internet can access this information. Bloggers like Madelyn Folly, a writer for the blog Wine Folly, blog about their specific experiences with recipes and pairings. They open the blog up to the media so others can access their observations and post their own. With over 23, 000 likes on Facebook, and 6,000 recommendations on Google, it is clear that people are interested in and are listening to these recommendations.

Along with social media bursting, winemakers around the world are altering traditional fermentation processes to create different tastes and flavors from the grapes.

Through subtle changes in the wine making process one could alter tastes and enhance different flavor notes creating various styles of wine. Each grape variety now could have many different options of flavor profiles. With the new varieties of wines being presented in the market, more pairing options are becoming available. With these new ideas, many professionals have been studying their own theories on wine pairings with foods.

Whether it has been scientifically based or psychologically based, new data suggests that a successful food/wine's pairing can be determined by several different factors. From a consumer perspective, is flavor synergy or molecular pairing the most important? Or, is mouth feel or how smooth a wine is the most important factor? Or, is maintaining the integrity of the wine and the food the most important so that a consumer gets to drink and eat the wines and foods they like without them being substantially changed?

In my thesis, I will explore these prevalent approaches represented by François Chartier, The Monell Chemical Center, and Tim Hänni. Each approach represents different theories to wine pairing that I will later test through my experiment. Before evaluating each approach to pairing, one must understand the basic terminology and its uses. For example, the term "taste" is defined, in Tim Hänni's *Components of Food and Wine*, as "a primary sense comprised of the basic sensations of sweet, sour, bitter, salty and umami"(Hänni 3). The term taste is often confused with its correlation to flavor. Flavors are defined as "a composite of the sensations of olfaction (smell), taste, touch, chemesthesis (chemical irritation of the trigeminal nerve endings such as the burning irritation of many spices) and psychological factors"(Hänni 3). The approach Tim Hänni's theory takes, which I will explain later in my paper, mainly deals with the cause and effects of taste perception while others, like François Chartier, only focuses on

flavors. The first theory delves into molecular gastronomy. This theory proposes that similar flavor molecules in food and wine achieve a successful wine pairing.

Chapter 3: Molecular Gastronomy and its effect on Flavor Perception

François Chartier is a Canadian sommelier from Quebec who worked for Ferran Adrià, the head Chef at the El Bulli, which was the most highly rated restaurant in Europe for many years. The bulk of his research focuses on the categories of molecular gastronomy and the science of flavor perception, “We must understand the chemical reactions that govern food and wine pairings” (Chartier 27). Molecular gastronomy is a branch of food science that explores the chemical and physical changes that food undergoes through cooking and consumption. The science of Gastronomy then blends with the science behind flavor perceptions because it looks into the chemical and physical changes within the molecular structure of our food that impacts our flavor perception. According to Chartier, the key to a successful wine pairing is in understanding the molecular makeup of both food and wine, and then matching them accordingly.

Although Chartier may write and express seemingly scientific views about food and wine pairings, he personally views himself as an artist. He compares this molecular form of flavor perception to symphonies in his most recent book, *Taste Buds and Molecules: The Art and Science of Food Wine and Flavor*. He begins his book by relating how we taste to experiencing a well-orchestrated musical performance. There are a couple of songs well placed together that keep the listener intrigued throughout the whole show. Each song consists of planned verses that allow each instrument to harmonize and enhance each other’s role within the song. Then, there are the notes to each verse, those individual pieces that make up the tiniest fraction of the symphony.

Although a small fraction, it is the way in which the notes interact with each other that creates the effect of the overall performance. Chartier uses this analogy to compare the molecules in food that interact with the molecules in wine creating a well-balanced pairing. “Scores and notes are to music as food and aromatic molecules are to gastronomy. Their power to unleash sensory pleasures essentially depends on the chef’s orchestration”(Chartier 19). Placing the power in the chef’s hands implies that we must pair wine according to the molecules that are present in our food.

After years of extracting specific molecules from wines and their specific grape varieties through various experiments, along with monitoring the molecular changes that occur after the fermentation process, Chartier claims to have found correlations. He found correlations between flavor molecules in wine and the flavor molecules in spices, fruits and vegetables, which comprise many of the foods that we eat. He studied the chemical reactions that our sensory taste cells undergo when these specific molecules combine. Chartier believes in a form of molecular compatibility that comes through flavors when food and wine share similar molecules. Although it is a form of matching, Chartier believes it could be the key to a successful wine and food pairing.

For example, in America today the trends of “tex-mex” and spicy food are sweeping the nation. Dissecting a spicy cuisine, he extracted molecules from a commonly known and used ingredient found in most spicy dishes, the chili. Although there are 350 known types of chili peppers they all share similar molecules. Capsaicin is the fiery molecule that is found in chilies. “Chili peppers of the *capsaicin annuum* family, the most wide spread variety of hot peppers, are rich in various volatile compounds that give them their aromas and flavors” (Chartier 177). Interestingly enough, capsaicin does not have a

physical effect on the taste buds. Similarly the molecules found in tannins, the drying bitter flavors found in mostly red wines, do not have a chemical effect on taste buds either. In other words, these particular molecules are not the cause of the interpreted “physical burn” you may feel with spicy foods or high tannin wines. Surprisingly enough, the combinations of these molecules result in a contrasting reaction. “Rather it has a neurological effect on the brain via the nerve endings, known as trigeminal receptors, provoking the secretion of endorphins, hormones associated with well being” (Chartier 178). Experimental results determined that Capsaicin, like molecules found in tannins, release these endorphins to counteract the heat and intense bitter flavors allowing us to tolerate and enjoy the pairings. This could also explain why some people enjoy consuming overly spicy or tannic food and beverages.

Chartier also determined that like fats, alcohol could have a positive effect in balancing the “burning” feeling of spicy foods. In similar areas of study, Meilgaard Civile Carr brings up his thoughts on the flavor perception of spicy foods in the second edition of his book, *Sensory Evaluation Techniques*. “The trigeminal response to mild irritants (caused by the heat of peppers, spices, or the high concentration of sucrose and salt) may contribute to, rather than distract from, the acceptance of a product” (Carr 17). He concludes that a wine with a slightly higher alcohol and tannin content could pair nicely with a spicy dish that contains chilies (A contention that is diametrically opposed by Tim Hanni.). “This underlies the importance of serving wines that are highly expressive, in both aromas and tastes, with dishes that contain hot peppers”(Chartier, 180).

The research gathered by Chartier seems to support the fact that there is a correlation between the molecular makeup of food and wine when dealing with flavor perception during pairings. Although considered to be valid by many, Chartier's theory has also been questioned. One could say that Chartier's theory, although makes sense, may be too complicated and unpractical to be considered the underlying factor of successful wine pairings. This leads me to a second approach that comes from The Monell Chemical Center. The Monell Chemical Center, located in Philadelphia, is a group of committed scientists determined to explore and understand all aspects of the human senses including taste and flavor perception. Their most recent experiments show that flavor perception could be affected by astringent, represented by using the example of the astringent qualities of black tea, and fatty mouth feels which could be described as the smooth feeling most people enjoy in wines.

Chapter 4: Taste Perception through Fatty and Astringent Mouth Feels

Wine and cheese, one of the more classic pairings cited, is a supporting example of the theory that mouth feel is an important factor in food and wine pairing. As a mixed approach between the emphasis on taste and flavors, the Monell Chemical Center believes that it is the contrast between fatty and astringent mouth feels that creates a balancing effect of compatibility between wine and food. Through a recent experiment, they researched the physical results of the impact of fat on the perception of astringency. Astringency is the term used to describe the drying sensations that take place in the mouth due to specific foods or wines. For example, they specifically tested different extracts of foods that ranged in astringency to see the effect they left on the consumer

while eating: “After establishing that weak astringents could elicit strong astringency with repeated sampling, we asked subjects to rate fattiness and astringency, after ingesting pieces of fatty food (dried meat) alternating with multiple sips of one of two rinsing solutions (tea or water). Astringent rinses affected oral sensations. In particular, the perceived fattiness was less pronounced after drinking tea than after drinking water.” (Monell Chemical Center). This means that the effect of the fatty mouth feel does not overpower an astringent, but it actually balances the experience of the pairing without drying out the mouth or overwhelming it with a pronounced fatty mouth feel. “These observations support the hypothesis that these sensations oppose each other perceptually and lie at different ends of an oral rheological/tribological sensory spectrum.” (Monell Chemical Center.) Opposites, like fattiness and astringency in this case, attract. The combination of astringent wine is important in this combination because it will dry out the mouth and therefore “cleanse the palate.” Followed by a bite of food that contains a fatty mouth feel, the mouth will begin to salivate and begin to lubricate itself once again presenting a fresh sense of flavors with each bite. (Monell Chemical Center)

Although this approach to pairing is highly supported by scientific evidence in the experiments performed by the Monell Chemical Center, some may consider it a minor factor and not the key influence that constitutes a successful wine and food pairing, overall. “Work is still required to determine how different wines, teas and acidic foods, such as pickles and sorbets, vary in their efficacy of ameliorating oral fatty sensations during meals, and whether differences among individuals in the degree of cleansing effect by astringents is linked to their respective differences in oral tactile sensitivities.” (Monell Chemical Center.)

The next approach that I will analyze, supported by Tim Hanni's theory on the cause and effect of taste and the understanding of vinotypes, attempts to fill in the gap between the extreme hypotheses that Chartier's molecular theory and Monell Chemical Center's study present. Tim Hanni's approach is logical and provides evidence that supports his theory on cause and effect between tastes. But Hanni also advocates the importance of the taster and his or her preferences, which both previous theories have lacked.

Chapter 5: Cause and Effects from taste, and the understanding of Vinotypes

Tim Hanni has been a major influence in the wine world for many years. He is the first American to become a master of wine, an English-based certification that could be considered the most rigorous wine based certification in the world. He has worked with countless people and scientists to come up with new ideas about wine pairing. His point of view on wines stems from studying cause and effect when dealing with taste. A common example of cause and effect could be the experience of having a glass of orange juice right after brushing one's teeth. Only the acidity of the juice is accentuated by the astringency of the tooth paste and other tastes of the juice, such as sweet, are diminished. In his academic journal, *The Components of Flavor and Wine*, Hanni discusses five tastes and how they interact with each other. The Five tastes are: sweet, sour, bitter, salty, and umami. Most of the taste one could relate to except for the newest addition of recognized tastes called umami. The Japanese label "umami" as a taste that correlates with MSG in foods, providing a "good" taste relating with savory or delicious.

The first taste that Hanni identifies is sweetness. Normally we associate

sweetness with sugar. However, many do not realize that the taste of sweetness can come in many forms. Most food items have natural sugars that add to the balance of food pairings. Sweetness is an extremely important factor when dealing with wine and food pairings. “Sweetness in food will increase the perception of sourness, bitterness and astringency of the wine while making the wine appear less sweet (more dry), stronger and less fruity” (Hanni 5). This is extremely important regarding my own personal experiment because I am pairing wine with desserts. The sweetness level of the wine must be greater than the sweetness of the food or the food will bring out the bitter and sour tastes of the wine.

Acidity is often correlated with a sour taste. Acidity can provide the mouth-watering effect. This taste is the opposite of sweetness and could be considered the most important within wine pairing. Tim Hanni’s theory of cause and effect demonstrates how certain tastes balance each other out. For example, a sweet taste diminishes the perception of a sour taste. “Combinations of sweetness and sourness in food can cancel each other out depending on the concentration level of each. If one or the other dominates the wine will react according to the basic formula” (Hanni 7). Overall, according to Hanni, one must not only find a balance but also work on canceling out unwanted tastes. The consumer can then perceive more of the flavors rather than just the basic, harsh tastes.

Bitterness can often get confused with the astringency or sourness, but they are not the same. Bitterness can often be found within the skin of foods similar to tannins. “Food with bitter components seems to increase the bitterness of a wine served with it. Make sure that the herbal-smelling Sauvignon Blanc chosen to serve with the dish with

lots of fresh herbs does not push the bitterness of the wine over the top” (Hanni 10).

Unlike sourness, sweetness enhances a bitter taste in wine. The taste that can cancel out the perception of bitterness is the sour/acidic salty taste. “Bitter, sweet and umami flavors in food will increase the perception of bitter elements in wine. Sourness and salt in the food suppress bitter taste in the wine” (Hanni 10).

A salty taste can often be connected with savory. Saltiness in wine pairing is important because it does what sweetness cannot; it cuts the tannins in wines. Saltiness is the taste that ,when paired with wine, can take a bold dry tannic wine and cut back allowing more of the wine’s flavor notes to come through within the pairing. One could relate this to the use of salt in everyday cooking; salt brings out flavors within foods. “As foods become more salty, they tend to increase in their own flavors and neutralize bitter and sour tastes of the wine tasted after the salty food”(Hanni 10). Saltiness can also work in conjunction with other tastes like umami to help neutralize the bitterness in wine.

Umami is a newly recognized fifth taste. “ Umami was identified by the Japanese researcher, Ikeda, in 1908 as the taste in *laminaria japonica* seaweed, used as a component of soup stocks in Japanese cuisine, and was associated with glutamate (monosodium L-glutamic acid)” (Hanni 11). Umami is naturally found in all foods and described as the “good” taste. Some examples of umami could be found in meats and fish, especially in dried meat. “Foods high in umami seem to increase our sensitivity to bitterness in wines and create a "metallic" taste”(Hanni 11).

Tim Hanni’s Cause and Effect Theory is based on the ways that tastes enhance and cancel each other. But Hanni seems to complicate his own theory of taste perception

in his most recent book on food and wine pairing *Why You Like the Wines You Like*. The title alone illustrates Tim Hanni's true approach to wine pairing. When all is said and done, the science that is behind the canceling or enhancement of tastes doesn't matter; the individual taster can only deem wine pairings successful.

Why You Like the Wines You Like introduces vinotypes as one of the many factors in wine pairing. A vinotype is defined as “the sum of the physiological and psychological factors that determine your unique wine preferences and values”(Hanni 19). Everyone has his or her own unique vinotype, ranging from hypersensitive to tolerant. Someone who is hypersensitive will loath anything but a sweet wine. They are extremely sensitive to tannins that relate to bitter tastes. Someone who has a tolerant vinotype will adore a full-bodied tannic wine because they do not as easily perceive themselves as someone who is sensitive or hypersensitive. Between those two extremes there are many categories and sub categories one can fit under. For example, after taking an online test created by Tim Hanni, found in myvinotype.com, I determined that I am in-between sensitive and hypersensitive. This means that I prefer sweet wines but still could enjoy somewhat off-dry, and I am not prone to liking wines high in alcohol or tannin.

Tim Hanni believes that the philosophy of pairing can be completely revamped with an understanding of personal vinotypes. “In short we would be working together to restore a greater sense of hospitality to the wine community, eliminate the specter of the stereotypical wine snob and offer a greater diversity of effective personalized ways to guide consumers to wines they will love” (Hanni 14). Many other approaches to wine and food pairing differ because they only consider the balance between food and wine rather than the preferences of the individual consumer. Hanni believes that “we match

the wine to the diner, not the dinner”.

Although to Tim Hanni the deciding factor of whether a pairing is successful or not involves vinotypes, he also believes there are psychosocial and other factors that alter a person's own personal preferences. When choosing a wine to be paired with their food, social pressures, inherent character traits or even misconceptions can influence a consumer. For example, I did a small experiment involving my own brother. My brother has Asperger's, a mild form of Autism. Tim Hanni believes that people with forms of autism are more predisposed to a hypersensitive vinotype (Hanni 23). This is a prime example of how certain aspects about ourselves, or even our childhood, could predispose us to becoming sensitive wine drinkers. For me, this was proven true after giving my brother a glass of a stronger, higher alcohol, Port wine. Although the Port was sweet, my brother was unable to distinguish any flavors or aromas other than an “obscene amount of alcohol.” After taking the online exam, he proved to be hypersensitive as well. Ironically, if one were to ask him his favorite beverage, he would say whiskey. How then could someone hypersensitive to a Port wine prefer something even stronger like whiskey? This is an example of how other outside psychosocial factors come into play with Tim Hanni's theory in altering one's own personal preference.

“Wine is for women, not men.” “Red is for more experienced drinkers and white is for novices.” “If you like sweet wines, you do not truly appreciate wine.” These are examples of the many psychosocial factors that change our own perceptions and way we view wines. Like my brother, people will believe certain things and base their likes and dislikes upon their personal palates. This concept is seen to recognize believing the illusion presented. Sommeliers may present the illusion that one wine pairs better than

another; therefore you believe them and enjoy the wine pairing, although you initially might not like the wine. The cost of the wine can influence your choice as well. Yes, there may be a slight change in quality, but if a person is told they are drinking the best most expensive wine, they will prefer that wine to a cheaper one (Hanni 36). Although one's personal preference can be swayed by outside influences and psychosocial factors, Tim Hanni does recognize that our taste buds do evolve over time. Our vinotypes are made up by our perceptions of taste. With our knowledge and growth in appreciation towards wines our perception and tolerance can change (Hanni 135).

Tim Hanni presents many different factors relating to wine pairings along with the other two theories I previously discussed. It is clear that one can struggle in finding the key to a successful pairing. Although many experiments and research on this subject have been conducted before, I will attempt to test and compare these three theories alongside each other in a new experiment.

Chapter 6: The Experiment

Although each approach to wine pairing that I have previously mentioned has been thoroughly tested before, I decided to challenge each theory on food and wine pairing through an experimental tasting to determine their accuracy. I am a Baking and Pastry Major and therefore designed my experiment to include three wine pairings with desserts that represented each approach I researched. With a group of thirty-eight students I was able to gather individual reactions to each dessert, which they recorded on a guided tasting observation sheet that I provided. (See appendix for tasting observation sheet and recipes)

Pairing 1:

My first pairing was a sweet white wine, Moscato (the Italian, Muscat) paired with an orange jasmine fruit tart. Moscato sparkling wine is light in body and intensity with high carbonation and is fairly sweet including acidic qualities, ripe fruit, citrus and floral notes. The fruit tart contained a simple sugar dough tart shell with thyme, to add a slight herbal component to the taste, filled with an orange jasmine mousse. The mixture of citrus and floral matches the notes found in the wine. This relates to the concepts that I previously touched upon, at the end of chapter two, regarding the simplistic standards of pairing that are spread across the media currently through books and blogs. These standards illustrate how we can pair through basic matching of flavor notes directly. This theory also supports Tim Hanni's theory on cause and effect, which states that a dessert cannot be sweeter than the wine. Moscato is a sweet and acidic wine; therefore although there is initial sweetness the acid will cleanse the palate and cause one to salivate and want more. To demonstrate Tim Hanni's fundamental beliefs in cause and effect, I purposely reduced the sugar content in my dessert mainly to intensify the slight citrus, floral, and herbal flavors in the tart. The dessert is therefore not as sweet as the wine, which according to Tim Hanni is hypothesized to be a good pairing.

Pairing 2:

The second pairing strictly represented Francois Chartier's molecular approach to wine pairing. I chose a Cabernet Sauvignon that is a dry red wine known for its deeper fruit and oaky notes, but most importantly for its tannins. I paired this with a dark chocolate cayenne truffle that contained a spiced chocolate ganache, which provided a

trigeminal effect, coated in dark chocolate. According to Chartier, the molecular compatibility between the cayenne and the molecules in the tannins would constitute a successful pairing.

Pairing 3:

Finally, my third pairing represents the studies done through the Monell Chemical Institute. For this pairing I chose bual medium fortified Madeira. Madeira is fortified dessert wine from Portugal, which contains high alcohol content, nutty and buttery notes, and has an extremely sweet finish. I paired this with a savory cheese puff, which contained a hazelnut pate choux (cream puff shell) filled with a Gruyere and goat cheese cream. I chose these flavors because the nuttiness in the pate choux would compliment the nuttiness found in the Madeira. Also since the Madeira is known for its creamy mouth feel, the cheese filling would accentuate the smooth sensation on the palate. I also chose those two distinct cheeses to offer saltiness and complex flavors that would match the full body of the wine. As found by the Monell Chemical Institute, the mouth feel and fat content of both smooth wine and dessert would make a pleasant pairing for the taster.

I also tested the importance of Vinotypes by utilizing a large range of students, ranging from hypersensitive to tolerant tasters. Each student enrolled in the classes involved within my experiment has taken Tim Hanni's online vinotype test prior to the class. Therefore it was easy test each vinotype by following the student's results, matching them to their vinotypes tendencies.

Finally, I tested the role that education plays in cultivating an individual's

taste perception. My experiment participants were students that specifically were studying wine and sommelier ranging in levels of experience. I was able to gather the reactions from novice wine drinkers in a fundamentals wine class, which teaches the basics about wine and wine pairings. I then went to a slightly more advanced class and provided the same wines and desserts. I held the last round of my experiment with a senior level sommelier class, whose curriculum mainly focuses on food and wine pairing alone. This touched on Tim Hanni's theory that through further education and appreciation for all different styles of wine we could alter our own personal preferences and taste perception.

I also accounted for other factors mentioned in Tim Hanni's approach to pairing. My experiment was conducted as a blind tasting. The students did not know the type of wine they tasted. This helped to eliminate any bias caused by the perceptions the participants had about each wine, allowing them the chance to simply taste and focus on the pairing alone. To test the perception altering affects that Tim Hanni's theory presents, I added a twist to my testing the importance of price in regards to perception of quality. I randomly selected fifteen students and revealed the price of each wine on their tasting sheet. I priced the first wine at \$12 the second at \$90, and the third at \$25. Hanni's theory suggests that the taster will subconsciously prefer the higher priced wine associating it with better quality and, furthermore, better taste.

Wine pairing is a complex subject to create an experiment around. I was personally unsure that any of the theories would actually be supported. Prior to the experimental phase my concern was that I wouldn't get diverse enough results to obtain a clear conclusion as to which approach was more effective. I personally favor Tim

Hanni's approach mainly because it focused the most on the taster. I believe that we can just like or dislike something and that there could be many factors responsible for those reactions, such as outside psychosocial factors or having a specific vinotype. Although I believe in Tim Hanni's theory, I also fear that food and wine are two complex art forms that may never be able to have an exact formula for successful pairing. Hopefully through this experiment, one can draw a clearer understanding of what is most likely to be enjoyed by the taster.

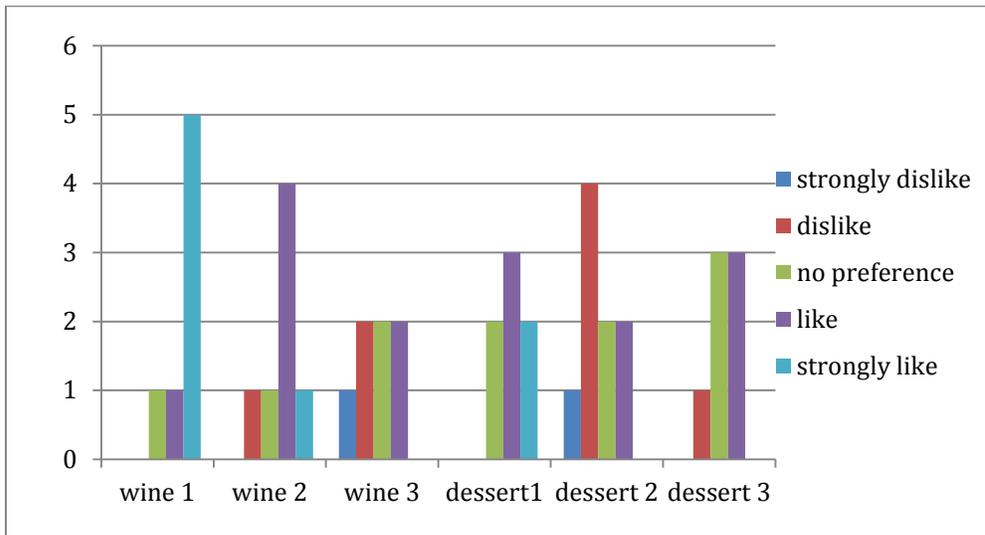
Chapter 7: The Results

Students with hypersensitive vinotypes:

Hypersensitive vinotypes are the least tolerant to any bitterness, acid, alcohol, or tannins in wines, usually preferring sweet wines. Out of the 38 students only 9 categorized themselves as hypersensitive in total. The students were asked to first sip the wine and rate it on a 1-5 scale (1 - strongly dislike, 5 - strongly like). They were asked to rate the dessert individually as well on the same scale. They were then asked to take a second sip of the wine and record whether they thought the dessert enhanced the wine, had no change, or made it worse. Below I have placed my data in charts along with color-coded graphs. Out of the total 9 hypersensitive students, this set of data illustrates 7 hypersensitive tasters that did not have prices listed on their tasting sheets therefore allowing their results to be strictly based on their own taste perception without the influence of outside psychosocial factors.

	Wine 1	Wine 2	Wine 3	Dessert 1	Dessert2	Dessert 3
Strongly dislike	0	1	1	0	0	0
Dislike	0	2	4	1	0	1
No preference	1	2	2	1	2	3
Like	1	2	0	4	3	3
Strongly like	5	0	0	1	2	0

Hypersensitive Graph:



	Pairing 1	Pairing 2	Pairing 3
Better	4	0	2
No Change	0	2	3
Worse	3	5	2



Based on these results overall, I was not surprised by the outcomes. The numbers show classic signs of hypersensitive drinkers with higher numbers for the first wine, Moscato, since it is the lightest and most approachable out of the three. The other two wines were very intense in flavor and high in alcohol compared to the Moscato. As for the desserts it was also predictable that the highest numbers were for the tart considering it was the lightest dessert.

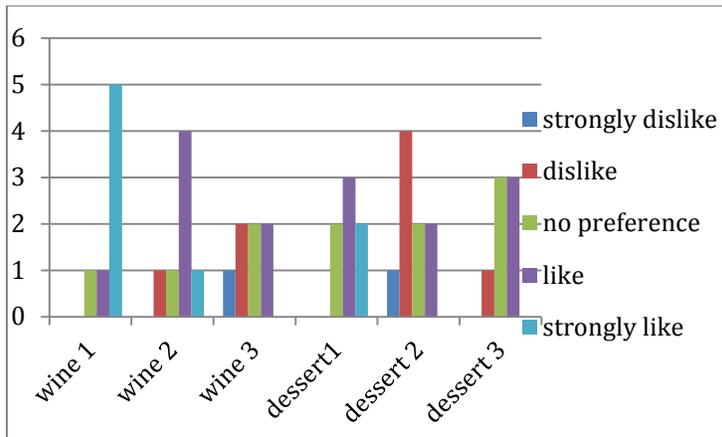
Most importantly, the results of the pairings revealed the success of each approach. The statistics revealed that a higher percentage thought the dessert in the first pairing enhanced the wine. Uniquely enough the second pairing received a huge percentage of a worse outcome and no one thought the pairing was successful. Following, the third pairing, which best represented Monell Chemical Center's approach, was almost equally split between whether it was better, the same, or worse.

Students with sensitive vinotypes:

The next group identified themselves as sensitive. Sensitive is the broadest vinotype because it lies in between hypersensitive and tolerant. This vinotype makes up the largest percentage of the experiment subjects numbering 23 individuals. They are also the most diverse group because they have a broad range in their own personal perception. Out of the 23 sensitive candidates this data displays 13 that were not given the prices on their tasting sheet to sway their perceptions. Once again the data is presented below in tables and color coded graphs.

	Wine 1	Wine 2	Wine 3	Dessert 1	Dessert 2	Dessert 3
Strongly dislike	0	1	1	0	0	3
Dislike	0	1	2	1	2	4
No preference	0	6	2	1	5	3
Like	6	5	5	5	2	2
Strongly like	7	0	3	6	4	0

Sensitive Graph



	Pairing 1	Pairing 2	Pairing 3
Better	4	0	2
No Change	0	2	3
Worse	3	5	2



As portrayed by the graphs, there are no predictable results for individuals who identified themselves as sensitive. Based off the data given I would say on the spectrum of sensitivity this group had a tendency to possibly be more hypersensitive than tolerant because most preferred the Moscato over the other two more intensely alcoholic and tannic wines. As for the desserts, the results were also scattered although a majority tended to favor pairing number one once again, rather than two and three. Lastly, I present the results of the tasters' preferences for the pairings. Considering the range in taste preferences within this group, the graphs show slightly similar results favoring the first pairing. Although both pairings two and three had higher results of improvement after tasting the dessert together with the wine.

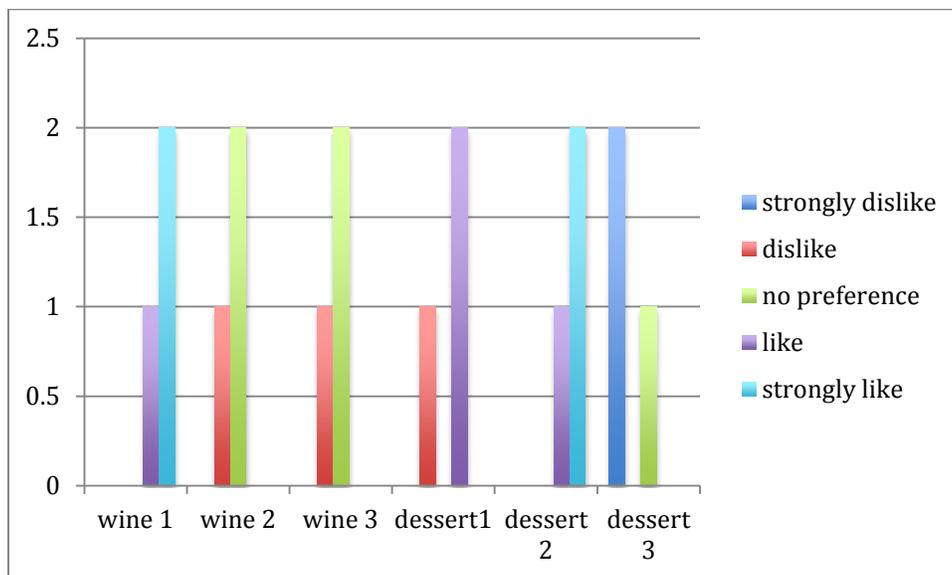
Lastly, I present the results of the tasters preferences for the pairings. Considering the range in taste preferences within this group, the graphs show slightly similar results favoring the first pairing. Although both pairings two and three had higher results of improvement.

Students with tolerant vinotypes:

The remaining individuals in my experiment identify themselves as tolerant, meaning they are extremely tolerant to the tannins, alcohol, and acidity in wines. Oddly enough this is the smallest group out of my experiment, only containing 6 individuals. This data will only represent the three individuals that did not have the prices listed within their tasting sheets. The data will be displayed in numerical tables and color coated charts within the same format as the previous data.

	Wine 1	Wine 2	Wine 3	Dessert 1	Dessert 2	Dessert 3
Strongly dislike	0	0	0	0	0	1
Dislike	0	0	0	0	0	1
No preference	0	1	1	1	1	0
Like	2	1	1	2	2	1
Strongly like	1	1	1	0	0	0

Tolerant Graph:



	Pairing 1	Pairing 2	Pairing 3
Better	3	0	1
No Change	0	1	2
Worse	0	2	0



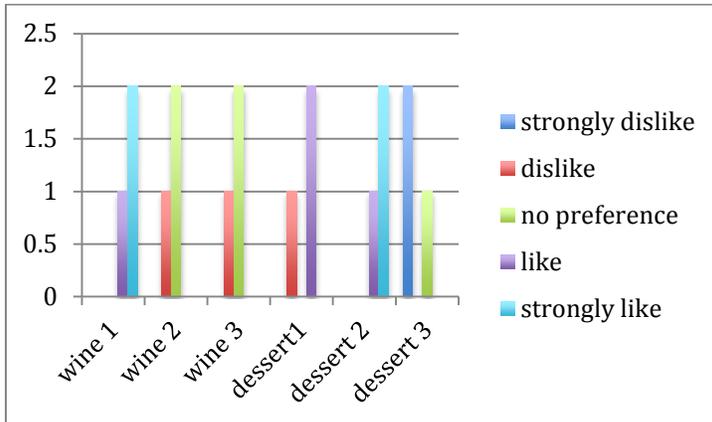
Although the scale was smaller than the other two vinotypes, I believe that the data recorded for the tolerant tasters that were not influenced by pricing was the most surprising of the three vinotypes. Regardless of their notoriously bold vinotype, most people still enjoyed wine number one. Wines two and three both received the most positive results compared to the perceptions of the hypersensitive and sensitive vinotypes. Puzzlingly enough, the tolerant individuals favored the first two desserts but not the savory components in dessert number three, which received no positive feedback.

Interestingly, pairing number 1 received 100% improvement. Even more shocking is that a higher percentage viewed the second pairing, which included the tannic qualities tolerant vinotypes enjoy, as a worse pairing with the chocolate truffle. Lastly the third pairing received little change to the enhancement of the wine.

My next set of data will show the results of the remaining students that were given tasting sheets with listed prices. According to Tim Hanni, there should be a noticeable difference between the graphs if you compare them to the data previously listed without the influence of the psychosocial factor of pricing. I will begin by assessing the results of the skewed tasting sheets from the hypersensitive group.

	Wine 1	Wine 2	Wine 3	Dessert1	Dessert 2	Dessert 3
Strongly dislike	0	0	0	0	0	0
Dislike	0	0	1	0	0	1
No preference	0	2	0	2	0	0
Like	2	0	1	0	1	1
Strongly like	1	0	0	0	1	0

Hypersensitive \$ Graph:



	Pairing 1	Pairing 2	Pairing 3
Better	2	1	0
No Change	0	0	1
Worse	0	1	1

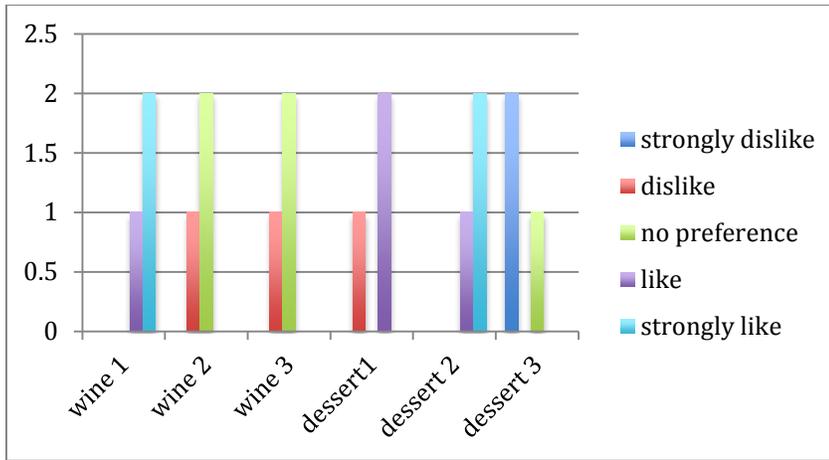


Compared to the previous data recorded by the hypersensitive individuals there is an obvious change in wine number two. Normally, hypersensitive people do not like a bolder tannic red wine yet the two individuals recorded that they liked it once they saw it was listed at \$ 90. The dessert and overall pairing increased as well compared to previous hypersensitive data. Of course the first wine and dessert remained the same with positive results with the pairing. Although wine number three was in the medium price range I did not notice much inflation on the results of the pairing.

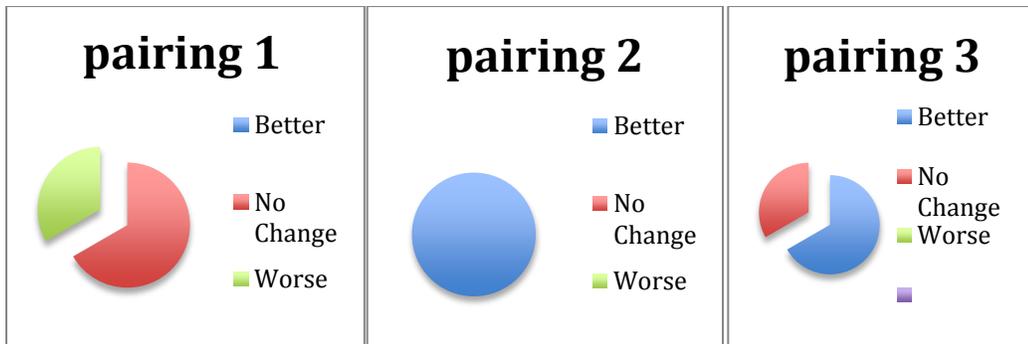
My next results will display those who were sensitive and had the priced tasting sheet. Out of the 15 whom had been given the priced out tasting sheets 10 of the sheet were identified as sensitive vinotypes. Along with being the largest identified vinotype, it also the most diverse in results. Unlike the hypersensitive group the larger number of people will provide a better example if psychosocial factors play a major factor in wine pairing.

	Wine 1	Wine 2	Wine 3	Dessert 1	Dessert 2	Dessert 3
Strongly dislike	0	0	0	0	0	0
Dislike	0	0	1	1	0	4
No preference	0	5	2	4	0	4
Like	8	3	2	3	4	1
Strongly like	2	2	5	2	6	1

Sensitive \$ Graph:



	Pairing 1	Pairing 2	Pairing 3
Better	5	3	5
No Change	2	2	3
Worse	3	5	2

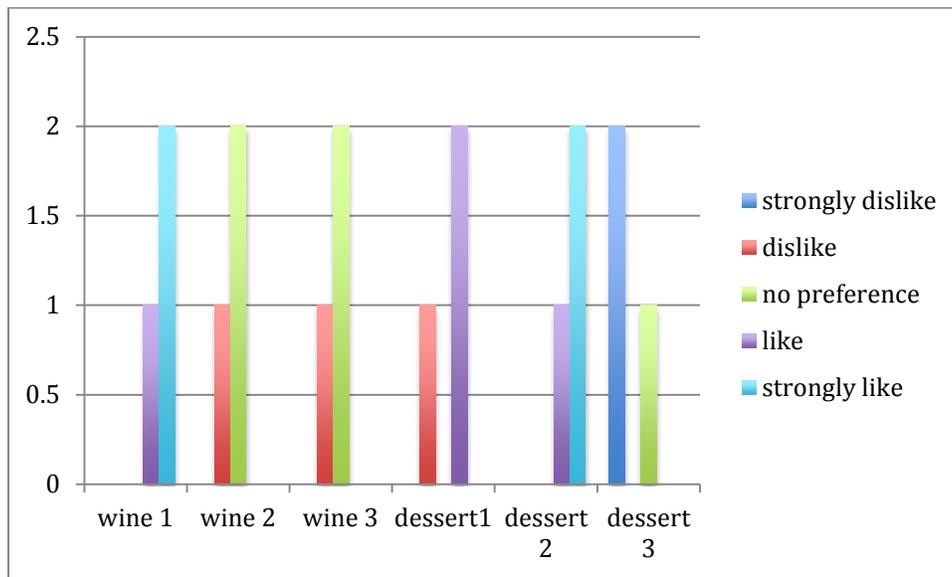


The data in these charts display a similar message as the hypersensitive data. Wine one still remains the most popular in all categories. Although it is evident that the improvement within wine number two has shifted once again; sensitive tasters are again choosing the higher priced wine to have more positive results than before. Once again wine number three along with its dessert and pairing seem to have remained around the same percentages.

Lastly, I will display the data based on the tolerant response to the priced-out tasting sheet. Although there are only 3 individuals that fall into this category it is still half the original group that identified themselves as tolerant tasters. Although tolerant and able to handle the bolder flavors, the psychosocial factors should have the same effect on them as they did with the other two vinotypes.

	Wine 1	Wine 2	Wine 3	Dessert 1	Dessert 2	Dessert 3
Strongly dislike	0	0	0	0	0	2
Dislike	0	1	1	1	1	0
No preference	0	2	2	0	0	1
Like	1	0	0	0	2	0
Strongly like	2	0	0	0	0	0

Tolerant \$ Graph:



	Pairing 1	Pairing 2	Pairing 3
Better	0	3	2
No Change	2	0	1
Worse	1	0	0



Although I hypothesized that the results would be similar I believe that one can really see a difference in the tolerant tasters that had the skewed tasting. In these results, wine number one still remains the favorite but the pairing received negative feedback only for the first time. Also, the third wine received higher scores than it had the entire experiment. Being the most expensive, it got a 100% improvement in the pairing but remained negative in the other two categories similarly to the third wine.

Along with the simple chart I had each student fill out, I also gave them the opportunity to write notes and answer two short questions. I asked if they could alternate any of the pairing, which wine and dessert they would change using their knowing on wine pairing why they would do so. After reviewing all my data carefully and reading all the comments made I believe I have come to a conclusion as to which approach creates the best wine pairing.

Chapter 8: Conclusion

After completing my experiment, I was very surprised with the results. Although I'm sure there were ways I could have refined my experiment to provide more accurate results, it is clear that my original hypothesis was correct. I believe that there could not be determined an exact science or definite rule to wine and food pairing.

Wine two, the Cabernet Sauvignon, represented François Chartier's theory on molecular compatibility by being paired with the dark chocolate cayenne truffle. It was the least popular pairing and overall scored low even with tolerant tasters who naturally prefer tannic and extreme flavors. It did not gain any popularity until the price of the wine was made expensive, proving Tim Hanni's theory on psychosocial factors, but even

then it wasn't fully enough to sway most people on the wine pairing itself. Although after reading comments why this pairing didn't work, it did provide evidence slightly proving Chartier's theory about the correlation between spice and tannin. Comments like "The heat of the wine was kicked up" and "I tasted more tannin and spice" supports that there is a significant compatibility between spice and tannin; but it more so supports Hanni's cause and effect that alcohol and astringency will intensify the perception of heat. Because Chartier's rule does not apply to every one supporting compatible molecules as the key factor to wine pairing, it cannot be relied on as the main factor to creating a successful wine pairing.

Another surprising response was regarding wine number 3, Madeira, and the hazelnut cheese puff pairing. Monell Chemical Institute describes why food like cheeses, nuts, and fat based foods would pair nicely with smooth wines due to the importance of mouth feel. Unexcitingly, the results showed a fairly neutral and balanced reaction no matter which vinotype. There were slight fluctuations but the majority did not hate or love the wine, the individual dessert, or the pairing of the two. Although the numerical data remained neutral, the lack of comments for the section is what led me to conclude that mouth feel is important, but it cannot be the determining factor to all wine pairings either. Also, when asked about alternating the wine pairings at the end of the survey, 90% agreed they would change the third pairing. Basing wine pairing on mouth feel alone isn't specific enough to satisfy all the different types of tasters.

The most positive results were between the Moscato and orange jasmine tart. This pairing supports Tim Hanni's theory on cause and effect because of its balanced sugar levels between wine and dessert. Also considering the audience was predominantly

hypersensitive-sensitive, it makes sense that more people would enjoy pairing number one over other pairings. The data shifted once the Moscato was priced at \$12, making the results more mixed with positive and negative feedback. Interestingly enough, although most people enjoyed the pairing, most people agreed they would exchange dessert number 3, the cheese puff, with dessert number one. This reaction could be due to another cause and effect factor that the acidity in the tart will help cut the sweetness of the Madeira better than the puff.

Throughout the results of the experiment, it is possible to conclude that Tim Hanni's theory has been suggested accurate over Chartier and Monell's views. The results of the experiment clearly support Hanni's cause and effect theory by the reactions to all the pairings in which taste were brought out by the wine in either positive or negative ways. The evidence also clearly shows the tendencies Hanni describes for each vinotype to be correct, that people who are hypersensitive they are not going to like alcoholic, tannic wines, which a tolerant taster would enjoy.

Tim Hanni is also correct in his theory on psychosocial factors, which is why I cannot fully commit that there is a definite rule to food and wine pairing. On the top of one of the pages a specific wine pairing stood out, when asked to write his or her vinotype, an individual wrote "you cannot place my vinotype in a box." Now this could be viewed as an independent's stand against conformity, or arguably an example that some cannot be fully designated into a category due to other reasons. There is no way to exactly predetermine whether and individual will perceive and enjoy a pairing because as people we can manipulate what we believe and want to enjoy. I used the common psychosocial factor of price but there are stronger outside factors I cannot test like

people's personalities and prior experiences that they may correlate with a certain pairing. For example, if someone in my testing audience once had a horrible experience while eating hazelnut dessert, then pairing number three might have brought back those memories therefore translating to a negative response. So I conclude that although wine and food pairing is a broad challenging concept that may never have an exact rule for pairing, Tim Hanni's theories on cause and effect and vinotypes are the best place to start in constructing a successful wine pairing or suggestion, while always considering the outside psychosocial factors that may effect the overall reaction of the taster.

Appendix

Table of contents:

- Recipes Used... 46- 48
- Blank sample work sheets... 49- 50
- Actual gathered data...51-86
- Works cited

DARK TRUFFLES

Yield:	3 lbs., 2 oz. 200 truffles	1,418 g 200 truffles
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INGREDIENTS:

	U.S. Standard	Metric
Couverture, dark, semisweet	2 lbs.	907 g
Cream, heavy	1 lb.	454 g
Corn syrup	2 oz.	57 g
Couverture, additional dark, semisweet, tempered (for dipping)	As needed	As needed

METHOD OF PREPARATION:

1. Gather all the ingredients and equipment.
2. Scale ingredients.
3. Chop the couverture into small pieces.
4. Scald the heavy cream and glucose. Remove from the heat.
5. Add the chopped couverture to the scalded cream.
6. Whisk smooth.
7. Wrap well and cool to room temperature.
8. When the ganache mixture is cool and set, transfer it to a bowl and mix using a rubber spatula until the texture and color lighten.
9. Using a pastry bag with a round tip, pipe 3/4-in. (1.9-cm) round dots of ganache onto parchment-lined sheet pans.
10. Place the truffles in the refrigerator and allow them to set to marzipan consistency.
11. Temper the dark couverture.
12. Remove the truffles from the refrigerator when set.
13. Wearing gloves, place a small amount of tempered couverture in one hand, pick up a truffle with the other hand and roll the truffle gently between the palms to coat evenly.
14. Return the truffles to the sheet pans and allow them to set at room temperature.
15. Using a dipping fork, dip each truffle in tempered dark couverture.
16. Immediately place the truffle on a wire rack.
17. Using two forks, roll the truffle three to four times on the screen to develop a spiked texture.
18. Using two dipping forks, place the truffles on parchment paper.

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Notes:

- Add Spice to Taste
- Temper chocolate to temperatures
- Spike Truffles

PÂTE À CHOUX

Yield: 3 lbs., 3 oz. 1,447 g

INGREDIENTS:

	U.S. Standard	Metric
Butter, unsalted	8 oz.	227 g
Salt	.25 oz.	7 g
Sugar, granulated (optional)	.25 oz.	7 g
Water or milk (whole)	1 lb.	454 g
Flour, bread	10.5 oz.	298 g
Eggs, whole	1 lb.	454 g

METHOD OF PREPARATION:

1. Gather all the ingredients and equipment.
2. Scale ingredients.
3. In a heavy-bottomed pot, boil the butter, salt, sugar, and water or milk.
4. Add the flour and stir until the mixture cleans the sides of the pot.
5. Remove from the heat and place the mixture in the bowl of a stationary mixer fitted with a paddle.
6. Mix on medium speed while adding the eggs gradually. Fully incorporate each addition before the next.
7. When the mixture is the correct consistency, place it in a pastry bag with the appropriate tip and pipe the desired shapes onto a parchment-lined sheet pan.
8. Bake in a 375°F (191°C) oven until brown and the interior is dry.

Formula Variations:

Éclairs
Swans
Profiteroles
Paris-Brest
Gâteau St. Honore
Croquembouche
Beignets Soufflé

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Notes:

- Convert flour to 60 % Hazelnut flour
- Reduce Sugar by 25%

FROZEN
DESSERTS

LAMINATED
DOUGHS

MERINGUES &
SOUFFLES

MISCELLANEOUS

PASTRY DOUGHS
& BATTERS

PIES & TARTS

QUICK BREADS

SAUCES &
STRUPS

Rosemary Tart dough:

4 oz. sugar

32 oz. flour

16 oz. sugar

Thyme to taste

Method of Preparation:

- Cream butter and sugar
- Add dry
- Roll out to desired mold then bake at 350 till golden brown.

Cheese Filling

- 16 oz. heavy cream
- Gruyere cheese (grated) to taste
- Goats cheese to taste
- 1 pinch salt

Method of Preparation:

- Whip cream to a soft peak.
- While whipping add grated cheeses to taste
- Add salt.
- Pip and fill cream puffs.

Orange Jasmine Bavarian

175g	Heavy Cream
2 ea	Gelatin Sheets
80g	Milk
20g	Sugar
70g	Egg Yolks
3 full	Orange zest
.5 oz	Jasmine tea leaves

Method:

- Bloom gelatin in ice water.
- Whip cream to medium-soft peaks and set aside.
- Put the milk, zest, and jasmine and half of the sugar into a heavy-bottomed saucepan and bring to a boil.
- Whisk together the remaining sugar with the egg yolks.
- Temper the hot milk with the yolk mixture, and return the pot to the heat.
- Cook until the milk reaches 175°F and add bloomed gelatin.
- Cool mixture to 80°F, and fold in whipped cream in three stages.

Your Vinotype:

Please follow the directions and fill in the chart accordingly

1= you hate it 5=you think its great

- First Grade the wine 1-5 if you like the wine on its own or not.
- Grade the Dessert 1-5 if you like it or not.
- Take another sip and see if the desert enhanced the wine or made it worse. (B for better N= For no change W= worse)

Wine Sip 1 1 2 3 4 5	Wine Sip 2 1 2 3 4 5	Wine Sip 3 1 2 3 4 5
Desert 1 1 2 3 4 5	Desert 2 1 2 3 4 5	Desert3 1 2 3 4 5
Second sip 1 B N W	Second sip2 B N W	Second sip 3 B N W

Using your knowledge about wine and pairings please answer the following two questions

1. If you had to choose one dessert tasted today to pair better with one of the wines, which pairing would you change?
2. Why would you pair those two together?

Your Vinotype:

Please follow the directions and fill in the chart accordingly

1= you hate it 5=you think its great

- First Grade the wine 1-5 if you like the wine on its own or not.
- Grade the Dessert 1-5 if you like it or not.
- Take another sip and see if the desert enhanced the wine or made it worse. (B for better N= For no change W= worse)

Wine Sip 1 \$12	Wine Sip 2 \$90	Wine Sip 3 \$25
1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Desert 1	Desert 2	Desert3
1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Second sip 1	Second sip2	Second sip 3
B	B	B
N	N	N
W	W	W

Using your knowledge about wine and pairings please answer the following two questions

3. If you had to choose one dessert tasted today to pair better with one of the wines, which pairing would you change?
4. Why would you pair those two together?

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