Instructor’s Foreword

On his first day in my PWR course on “Food, Politics, and the Rhetoric of Ethical Consumption,” Jacob Stern established his enthusiasm for the subject matter: he vividly described seeking out gastronomic experiences that defied cultural and geographic boundaries, displaying the same culinary and intellectual curiosity that would inform his research and writing throughout the quarter. Jacob chose his research-based argument topic just a few weeks later, and as he began sharing discoveries that included dozens of sources and a variety of images that revealed the fusion of art and science in kitchens around the world, I realized that his project was grounded in a similar fusion of creativity and analysis. Though his personal experiences with food created the foundation for his interest in the course and for his final project, Jacob was eager to make claims that had relevance beyond a single meal. The result is an essay that transcends disciplinary divisions and has ramifications far beyond the seemingly rarified worlds of contemporary art and molecular cuisine that Jacob juxtaposes so compellingly.

The central premise of Jacob’s argument—that “molecular gastronomy as a movement is a rare cross between science and art that, through its artistic side, provides its executors a medium through which they can promote science to their customers regardless of national boundaries”—is an innovative elaboration on the metaphors cooks and scientists use to describe their gastronomic creations. Harold McGee, for example, notes how “molecules could be mixed much as ‘a painter mixes colours on a palette,’” and Jacob’s attention to such linguistic and conceptual frameworks is evident throughout this essay. Jacob expertly weaves together a variety of sources, from his own interview with a curator at the Museum of Contemporary Art in Los Angeles to food memoirs and scientific journals, in order to establish a complex and multifaceted argument. This is challenging work, but it is also—and perhaps most importantly—written in captivating and accessible prose. In our conferences regarding his papers, Jacob and I discussed techniques for integrating his creative talents into a rigorous academic argument. Over the course of multiple revisions, Jacob decided to grab his reader with an arresting account of his own experience with molecular gastronomy and to thread evocative sketches of that meal through his scientific, artistic, and culinary analysis. Jacob’s descriptions of dishes like “caramel corn,” a creation whose “torrent of cold cornmeal milk exploded out of the liquid nitrogen-hardened shell to create the impression of a glacier spontaneously melting in my mouth,” allow his reader to imagine the sensory and intellectual experience inspired by molecular cuisine. It is impossible to read such descriptions without wanting to read more, and thus Jacob accomplishes something similar to the process he describes, building “upon the foundation of science with culinary bricks and aesthetic mortar to the point that [he] break[s] through the clouds of the traditional boundaries of food.”

—Jenna Lay
If You Give an Artist an Apron

Jacob Stern

The discovery of a new dish does more for human happiness than the discovery of a new star.
- Anthelme Brillat-Savarin

From the moment I entered the room, the sky bar at the Mandarin Oriental Hotel in Tokyo assaulted every sense with the fact that life is full of complications and contradictions. I looked through the huge full-story windows lining the walls and saw the present flashing all around me, as I stood on an isolated mountain looking out into a sea of lights. There is nothing quite as modern as Tokyo viewed from above at night; however, the brightness belies a culture that remains largely unchanged, as salarymen and subways continue on their one-track missions for perfection all through the night. I made my way over to the little bar in the corner, known as the Tapas Molecular Bar, where the chefs were preparing dinner for six. Here, old and new clashed once again: in principle, the bar resembled a sushi bar, one of the oldest of Japanese food institutions, but, in reality, the marble table, dark wood paneling and glass accoutrements created a very contemporary atmosphere. As I sat down, I was greeted by the chef, Jeff Ramsey, a twenty-six year old man from Orange County who is not afraid to speak his mind, while being served water by a pretty young Japanese waitress who bowed as she poured and said “I have humbly committed a discourtesy” in her native tongue as she left. At once, the progressive concept of globalization, even in the realm of food, and the contrasting traditional Japanese notion, reflected in language, custom and apparently restaurant service, of women as the subservient gender wove and welded together to create a dynamic effect akin to that of milk and cocoa coming together to make chocolate. Once his guests were properly settled, Chef Ramsey introduced the meal at hand: a tour of the delights of molecular gastronomy, which he described as the use of science to enhance food. Through complications and contradictions within and without his dishes, Ramsey hoped to expand the horizons of our appreciation for food.

In this essay, I will endeavor to argue that molecular gastronomy as a movement is a rare cross between science and art that, through its artistic side, provides its executors a medium through which they can promote science to their customers regardless of national boundaries. After clarifying exactly what is meant by molecular gastronomy, as the term is often misconstrued or taken out of context, I will establish the principles of contemporary art, and link parts of molecular gastronomy to those principles. Once molecular gastronomy has been established as both a science and an art form, I will show how it acts as a means through which science can be popularized and brought to the public’s attention in a positive light. In addition, I will illustrate how molecular gastronomy, like contemporary art, breaks down the boundaries of culinary cuisines, and how this advances the cause of science. An explanation of the possible effects that the advances of molecular gastronomy might have on the future will finish the argument, making it clear that the high science of food is not, as some may say, just a passing fad.
Intrigued by Ramsey’s introduction, I peered at the first dish, which had been ambiguously named “caramel corn.” It looked a bit like a golden egg with a stalagmite of amber caramel protruding from the top. I expected this golden morsel to be solid and crunchy. As I put it in my mouth, however, it was anything but. A torrent of cold cornmeal milk exploded out of the liquid nitrogen-hardened shell to create the impression of a glacier spontaneously melting in my mouth.

Just like many advances in human history, molecular gastronomy started when a young man with unquenchable ambition decided that existing materials or assumptions were not sufficient to fulfill the needs of his contemporary society. Food is a fundamental necessity of life: everyone must eat in order to survive. Because of this unavoidable fact, the act of cooking was taken for granted for centuries. Scientists studied the compositions of ingredients and food, but the actual process of making the food was left largely untouched. Old wives’ tales developed around recipes—for example, some women believed that menstruation was a cause of failed mayonnaises—and the act of cooking became as imprecise as a presidential candidate’s campaign promises (This, “Food for Tomorrow” 1063). However, in 1988, Hervé This, a young physical chemist, along with Nicholas Kurti, officially founded a new branch of food science—molecular gastronomy—in order to counteract this vagueness. This discipline seeks to create a better “understanding of food... [of] the chemistry and physics behind the preparation of any dish” (1062). This and Kurti, along with other molecular gastronomists, have compiled a list of over 20,000 ambiguities and superstitions in the food world, which they named “culinary precisions” and have since sought to clarify methods of cooking into scientifically quantifiable steps that can be used to enhance old dishes and create new ones (This, “Molecular Gastronomy” 6). Take, for example, the process of cooking meat. Everyone acknowledges that meat tastes better when it has been salted; however, there is an age-old debate over whether to salt the meat before or after cooking. Some say the salt penetrates the meat during cooking and enhances the flavor; others say the salt just cooks off to the point that the meat will need to be re-salted. This tested this procedure by cooking meat under an x-ray machine. He determined that salt will largely pass out of most pieces of meat, but particularly lean cuts will show traces of NaCl metal remaining in the meat (This, Molecular Gastronomy 52). Rather than forcing home cooks to try methods out for themselves, This and the molecular gastronomers promote the use of experiments to determine what actually works in cooking and what does not.

The basic definition of molecular gastronomy provides a foundation upon which the architects of complex science build formulas for new and better foods. Food scientists are conducting experiments on every level. They are breaking down or analyzing even the simplest ingredients: NaCl, or common table salt, has been tested in water at different concentrations to determine just how much salt is necessary to create a salty taste (Amerine 54). The results of these tests show that at very low concentrations, regular table salt actually tastes sweet. Of course, more sophisticated elements in the world of food are also being researched. In a study analyzing the odors of organic molecules, molecular gastronomers identified the sources of the smells of carrots, cloves, cherry, cucumber, celery and walnut; these molecules could be mixed much as “a painter mixes colours on a palette” to create new and exciting flavors (McGee, “Taking Stock” 1). Even
procedures as simple as boiling an egg have not escaped scrutiny. Hervé This himself discovered that the proteins in an egg denature at 68°C, so cooking an egg indefinitely at exactly that temperature will yield a perfectly smooth and creamy result (This, *Molecular Gastronomy* 33). Through chemistry and physics, food and science are inextricably linked. Scientists have thus far experimented with everything from interactions on molecular levels to double cooking methods (using two cooking methods in succession; the possibilities of different combinations have hardly begun to be explored) with more tinkering to come (310). This experimentation opens up the possibility of unprecedented innovation in all aspects of the food world.

A group of talented chefs have taken the discoveries of molecular gastronomy and created an elite subset of the movement, commonly called molecular cuisine. Led by Ferran Adrià of elBulli in the Catalan region of Spain, this group of chefs uses “new technologies [as] a resource for the progress of cooking” (Adrià 1). Although “the aim [of their cooking] is always to preserve the purity of... original flavor,” Adrià and company consistently shock the food world with their original and sometimes even outlandish creations. Wylie Dufresne, at his restaurant, WD–50 in New York, makes “knot foie”—foie gras combined with agar gum that creates pliant duck liver that can be twisted into all sorts of interesting shapes (Maddox 1). Heston Blumenthal, one of the most famous members of the molecular cuisine posse, uses “pressure probes to detect the crunchiness of batter” in order to create perfect fish and chips at his restaurant, the Fat Duck, in England (“Molecular Gastronomy is Dead” 2). Seiji Yamamoto, operating out of Ryugin in Tokyo, arranges squid ink into a barcode, “which, when scanned, leads the PDA-toting diner to a website that explains the dish’s ingredients” (Abend 2). And, of course, Adrià himself produces flashy dishes from gorgonzola “mochi”—cheese encased in its own curd mixed with algae—to passion fruit flowers hardened by liquid nitrogen, candied, and served as an *amuse-bouche* (a bite-sized morsel served before appetizers). Each of these chefs takes the information provided to him by the molecular gastronomists, such as This and Kurti, and performs his own science to create new cuisine; some, like Adrià, even close down their restaurants for months at a time in order to conduct research. However, these chefs do not limit their research to the realm of science. They build upon the foundation of science with culinary bricks and aesthetic mortar to the point that they break through the clouds of the traditional boundaries of food and bring their Babel-like creations into the stratosphere of contemporary art.

The Art of Art

Before Ramsey set the plate down in front of me, I did not know what to expect. The menu said the dish was called “Red,” but what did that mean? After seeing the dish, though, it became clear to me. On the left side of the thin rectangular plate sat a roasted red pepper. Next to it was a piece of king crab meat, accompanied by a tomato puree. The dish had everything: cold and hot, meat and produce, objects and empty space. But everything, from the food itself to the presentation, just screamed “Red!”

Before I can endeavor to prove the connection between molecular cuisine and contemporary art, I must first lay out the precepts of the latter. Contemporary art started to surface in the late 1950s as artists began to experiment with new forms of expres-
sion. Artists like Andy Warhol and Jackson Pollock focused on the context of a particular piece, rather than its purely aesthetic value. To the untrained eye, contemporary art can look simplistic and meaningless: many people have looked at a white canvas with a single black dot in its center hanging on a wall, on sale for tens of thousands of dollars, and thought to themselves, “I could make this.” However, the value of a piece of contemporary art does not derive solely from its complexity and visual expressiveness. According to Philipp Kaiser, one of the curators of the Museum of Contemporary Art (MOCA) in Los Angeles, a piece’s meaning, and therefore its worth, “depends first on the context” in which it was created and is presented: the timeframe of its creation, the artist’s local history, where and how it is displayed, and what is displayed alongside it, among other aspects (Kaiser).

The Body Cavity Inspection Network (Node in a Corner) by Eduardo Abaroa, an entropic amalgamation of cotton swabs and plastic balls that resembles organic molecules free floating in space, embodies this concept of context as the defining function of modern art. It is not particularly impressive at first glance: anyone could glue together swabs and balls to create that design. There is no inherent artistic talent involved in this piece—nothing comparable to the painting skills apparent in a Monet, for example. The context, though, gives Abaroa’s piece true artistic integrity. The balls and swabs are ripped out of their usual functions and forced together into geometric shapes that fill the empty void of the huge space provided for the piece at MOCA. The piece could not achieve the same impression in, say, a household living room, where space is limited; however, in the specific context of the museum, The Body Cavity Inspection Network becomes artwork in the most definite sense.

In addition to utilizing a unique context, “a successful work of art expresses a reality beyond actual reality” (Gortais 1241). A piece of contemporary art is not just a canvas or a sculpture or, in the case of some of Marcel Duchamp’s readymades, a toilet; the artistic value resides primarily in the meaning beyond the object itself. Of course, this meaning cannot be separated from the context of a piece, as the context often creates the alternate reality. Take, for example, Cindy Sherman’s Untitled Film Still #6. On the surface, it is just a photograph of Sherman lying on a bedspread with a mirror in her hand. Without looking at context and seeing the alternate reality created by this picture, it is difficult to call it art. However, once the viewer realizes “the irony of Sherman posing as an actress posing for publicity pictures” and identifies the satire emanating from behind the photographic exterior of the piece—Sherman criticizes the superficiality of Hollywood through the very means used to create that superficiality—the artistic value of the piece becomes clear (Heiferman 1). Deep introspection on the part of the viewer is intrinsic to contemporary art; after all, “if something is an art piece, you have to look at it differently [than you would] a bottle of water” (Kaiser).

Contemporary art, through its embrace of subtext and context in addition to method, has broken down traditional disciplinary and national boundaries that have pervaded the art world for centuries. Before contemporary art, each art movement had a clear hub from which it originated and spread: Impressionism and Surrealism started in Paris, Dadaism was conceived in Zurich, and German Expressionism began in Berlin, just to name a few. In contrast, contemporary art has no one clear central nucleus. Warhol started pop art (which in effect popularized the contemporary art movement) almost simultaneously in both New York City and Los Angeles, and now contemporary art springs freely from London, Berlin, China, Los Angeles, and countless other cities across the
world (Kaiser). This fact can be traced to the disciplinary openness of contemporary art. Before, artists were either painters or sculptors; there was no room for artists of other persuasions (Kaiser). With the canonization of contemporary art, however, the previously insular definition of artist became open to all sorts of creators: Jackson Pollock proved through his work (such as No. 5, the most expensive art piece ever privately sold) that painting does not have to have a linear focus, and Cindy Sherman, along with others, made photography into a legitimate art form. Within the boundaries of the contemporary movement, as long as a piece represents something beyond its physical self, it can be considered art. Some artists have even expanded their tools from paint and a brush or marble and a chisel to include light, sound, or space. Through this extension of what can be considered art, “we see and understand that the world is vaster than it is said to be” (Gortais 1241).

Although the contemporary movement has made art more inclusive to the point that there seems to be no central set of guidelines for its creation, art in all of its forms can still be boiled down into sets of generic principles. One of these, put forth by Bernard Gortais, a French artist and professor at the University of Evry, partitions art into five aspects: space, points and lines, constructions and rhythms, colors, and time-image perception (1244-1246). Space is the area that contains the art; this can be a canvas, a volume of air taken up by a sculpture, or an entire room, as in the case of the Abaroa piece. Points and lines create the piece itself, while color fills the gaps between those points and lines. The points and lines coalesce to form different constructions within the piece, which interact with one another in unique and dynamic rhythms like gas molecules colliding in a closed container. Finally, these aspects all come together to create a relationship between the piece and the viewer, who perceives different aspects in different orders and different ways depending on his perspective. These rules can apply to all forms of art, from contemporary art to neoclassical paintings, with the specifics changing from piece to piece. They even apply to one of the most often overlooked art forms: molecular cuisine.

Edible Art

When Ramsey asked who would be willing to eat the Blue Hawaii first, I enthusiastically volunteered. The meal had been so spectacular up until this point that I was eager to experience what came next. Ramsey presented me with the dish: a pile of blue crystals that resembled cotton candy, served with a spoon. He said to eat it quickly, and all at once. I took the substance as I would take medicine: swiftly and in one motion. It tasted like a winter’s chill. I looked around and saw the other diners laughing hysterically; I did not understand why. Finally it hit me: smoke was billowing out of my nose like a dragon’s.

As Ferran Adrià so aptly states in his “Synthesis of elBulli Cuisine”—a manifesto of twenty-three aspects that define molecular cooking—“a culinary language is being created which…establishes a relationship with the world and language of art” by the major players of molecular cuisine (Adrià 1). Every dish served according to the precepts of molecular cuisine can be reduced down to its basic artistic elements. The plate is the space; chefs can and do use different initial spaces, from traditional circular plates to long, skinny, rectangular plates to elaborate multi-tiered cupboards of food, just as
contemporary artists experiment with canvases and rooms. Within the boundaries of their space, molecular chefs play around with ingredients, flavors and temperatures, the food equivalents of points and lines. These are the most basic tools that a chef has to construct his masterpiece, and they vary immensely in nature: some are hot, some are cold; some are sweet, others are sour. Chefs work these basic instruments of art into complex combinations, creating aesthetic and flavor-related amalgamations to shock and/or please the consumer. These combinations of flavors, temperatures and ingredients, found in the components of a dish, correlate to constructions in contemporary art; how these constructions are arranged on the plate creates a rhythm akin to one found in a specific artwork. Some dishes have more traditional, accepted rhythms and constructions (like a bowl of fettuccini Bolognese), while others have more startling and original combinations (like a dessert of crunchy vanilla crepes arranged over a cold barley crème at David Kinch’s restaurant, Manresa). Finally, the texture and overall aesthetic appearance of the dish combine to create a relationship with the consumer. The diner will see the dish and make a correlation in his mind as to how it should feel and taste, but may be surprised upon putting the food in his mouth. This creates a time-image perception in the mind of the eater, which chefs can exploit to create new experiences for their audiences.

Molecular cuisine, like contemporary art, distinguishes itself from normal food through the manipulation of context. “Decontextualisation, irony, spectacle [and] performance” are at the very heart of molecular cuisine, allowing its products to transcend normal food and become art (Adrià 1). Take, for example, one of the final dishes of a meal at Adrià’s restaurant. The dish, from the perspective of space, color and construction, looks like a chocolate truffle. However, once the eater engages in time-image perception by eating the “chocolate truffle,” he realizes that not everything is as it seems. The points and lines of this dish include a chocolate shell, of course; this produces the illusion that the piece of candy will taste like chocolate. However, the shell is not filled with chocolate at all; rather, it is filled with liquor infused with the essence of real white truffles, thus producing a “truffle truffle.” Adrià takes the white truffle out of its usual context of garnish on pasta or risotto and forces it into a piece of candy, creating art with positive shock value to rival in absolute terms the pure surprise produced by seeing Marcel Duchamp’s first toilet in a museum. Like that of contemporary artists, the work of molecular chefs does not derive its meaning entirely from an isolated end result; the procedure used to make the dish and how it is presented mean just as much as the dish itself.

Molecular cuisine’s relationship to contemporary art also expands into the realm of the abstract. Just as the use of context allowed art to branch off into a greater number of less traditional disciplines, molecular cuisine has expanded the repertoire of what can be created in a kitchen and considered gastronomic art. Jeff Ramsey’s Blue Hawaii is not food in the traditional sense. It has little to no nutritional value: no proteins, no carbohydrates, not even any fats. It is merely smoke, taken out of its vapor form and thrust into the context of a solid and onto its new space, a plate. Because of this, it is now food, in the most abstract way. As new avenues of cooking are steadily opened up, chefs like Heston Blumenthal are suggesting that the molecular food world is “quite close to throwing out the theory of five tastes,” as taste can now be perceived in so many contexts (This, “Molecular Gastronomy is Dead” 3). As Adrià claims in his Synthesis, “the barriers between the sweet and savory world are being broken down” (Adrià 2); through
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dishes like parmesan churros and roasted red pepper geles, molecular chefs are creating new and intuitively contradictory tastes that conjure “a reality beyond actual reality” (Gortais 1241).

A Tree of Knowledge

Ramsey brought out a spoon with a little ball of what looked like beige cream perched on top. It was perfectly spherical, its unblemished exterior reflecting the light from above like a diamond; it looked almost regal. What a shame to eat this opal of beauty, I thought to myself. But I did, of course, since nothing in this meal should be put to waste. Out of the flawless exterior of the beige shell surged a tide of miso soup, the simplest of Japanese dishes, one that is enjoyed by almost everyone in the country, rich or poor, famous or nameless.

Both molecular cuisine and contemporary art provide plenty of opportunities for their respective audiences to actively participate in the interpretation process; however, neither art form can achieve its fullest potential if this procedure is completely unregulated. It is “completely impossible” to view contemporary art without a bias, since the art is meaningless without a knowledge of its context and the context must be provided by some source outside the viewer (Kaiser). This source, be it the artist himself, a museum curator, an art dealer, or the museum itself, will inevitably have its own opinions about or interpretations of a given piece, which it will naturally pass on to the viewer. In an article describing Cindy Sherman’s work in a Museum of Modern art publication, Marvin Heiferman, a guest curator and professor of photography at Bard college, uses his expertise to inform potential viewers of Sherman’s intentions. He emphasizes the “ingenuity and playfulness” of her work, and makes clear Sherman’s influential advancement of the “power of photography, and…issues of feminism, psychoanalysis, and performance” (Heiferman 1,3). Heiferman uses his position as the purveyor of information not only to provide the context necessary to appreciate the art, but also to put a positive and optimistic spin on Sherman’s work that will hopefully cause more people to go see the photographs. Experts like Heiferman and Bernard Gortais, whose system for analyzing art is the ultimate example of an attempt to direct interpretation, give the art that they describe meaning by telling their audiences how they should perceive the art in question.

Experts in the cooking world use similar methods to direct the common understanding of their food. Chefs like Ferran Adrià at the top of the molecular pyramid emphasize that their food is to be “enjoyed and interpreted by reflection,” but also set forth the parameters in which that reflection must take place (Adrià 2). Adrià emphasizes the novelty of his cuisine, from the mixing of sweet and savory to the “veritable revolution” occurring in the world of first courses and desserts (1-2). Heston Blumenthal notes that he “do[es] not pursue novelty for its own sake”: he just uses new techniques and methods to supplement the old ways of cooking, and his “delicious and stimulating dishes” are meant to be enjoyed as such (“Molecular Gastronomy is Dead” 2). In his cookbook, Thomas Keller, the chef at the French Laundry in California, “uses the words ‘precision’ and ‘repetition’ in ways that reveal [the] quasi-spiritual relationship to cooking” that he wishes to pass on to his customers (Moskin). As the members of the pantheon of their
art form, these chefs set the tone for the appreciation of their food, showing their audiences the path towards gastronomic appreciation.

Following the lead of the true experts, self-proclaimed experts try to create their own arguments about the art at hand to further the appreciation of the art by those less knowledgeable. The “Anyone else fed up with ‘molecular gastronomy’?” feed on chowhound.com provides a microcosmic example of the organic development of this grassroots rhetoric. The bloggers try to frame molecular cuisine in a context of good vs. evil, with members on both sides trying to influence people who do not live to eat. Some, like Kagey, make the claim that molecular cuisine is “interesting but not necessary” (Chowhound 1); others, like Flynn 1, cite the fact that elBulli is “often rated as the best restaurant in the world” to promote the movement (2). Regardless, these middle men and their equivalents in the art world act as a pipeline between the real experts and the average consumer, bringing context and bias down to the people from on high. This tree of knowledge that grows from the master’s trunk, through the branches of the dedicated followers, and out to the leaves of the general consumers introduces new people to the art forms, which absorb new perspectives and give life to understanding and innovation.

A Bridge to Somewhere

There are few things that I love more in this world than Wagyu beef, and Ramsey’s version was the most spectacular I had ever had. Cooked in a sealed bag in a pressure cooker for twenty-four hours at a precisely mandated temperature, the prime beef came out perfectly cooked. This alone would have made for a delicious dish; however, Ramsey, as usual, went above and beyond the call of duty. He used a drop of benign liquid nitrogen to make the beef “sizzle,” as though it had just been taken off the griddle. The sizzling sounds, in contrast with the perfect, tender texture of the beef, created a harmony of flavor and feeling that amounted to the perfect meat dish.

Since it is both a form of art and a form of science, molecular cuisine serves as a bridge between the two wildly different pursuits. Although I have already made comparisons between contemporary art and molecular cuisine, which is specifically the part of molecular gastronomy that aims to create high-flying dishes at high-flying prices, it is important to note that molecular cuisine is in fact a subculture of molecular gastronomy. Every single molecular dish that qualifies as a piece of art uses some scientific principle that has been identified and applied by molecular gastronomers. The Blue Hawaii takes advantage of the freezing point of condensation in the air and the extremely low boiling point of nitrogen, which requires that liquid nitrogen be kept at very low temperatures. The success of parmesan churros relies on the fact that the fatty cheese can be mixed with starches and still be fried to a golden crisp. The “truffle truffle” can only be made because the organic molecules that compose the essence and odor of white truffle can be infused into liquor and overpower the alcohol’s taste and smell. The science of food, when applied properly, connects science, the basis of all fundamental actions and interactions, to the highest of all cultural endeavors: art.

Perhaps more important, though, is the fact that molecular cuisine’s artistic aspects bring science into direct contact with people it would hardly be able to reach otherwise.
Scientists and artists generally do not hang around each other very often, and their disciplines do not generally go together in the public eye. As such, art and science each have distinct reputations. Art is the pinnacle of civilized human achievement, since it represents the perfection of leisure activity, which is proof that humans have conquered the basic necessities of survival. The art world is a high risk, high reward society: the most successful members obtain obscene riches, while those who are left behind make next to nothing. These rewards appeal to people's innate sense of adventure, drawing the consumers of the art into the stories of those who do succeed through a desire for their own artistic success and the subsequent consequences. Since these stories are inherent in the art (as part of its context), the viewer becomes enmeshed in the art, its maker, and its history, bringing product and consumer together to create an experience like blue and yellow combining to make green.

Conversely, science does not carry as positive a connotation. Science is often equated with nerds and a lack of originality, because it is the study of what happens in the world of base survival (which art manages to transcend). It does not come up with anything new; rather, it discovers the truth behind what already exists. Science is by all means a necessary discipline, because it allows humans to understand and better conquer their surroundings (thus facilitating art); however, for the most part people are just not as interested in science and its proponents, so scientists are not as famous as artists. In addition, the range of pay for scientists is far more stable than that of artists, eliminating some of the adventure and risk that comes with life in the art world. Because of the lack of profound connection between scientist and science, since the science exists before the scientist discovers it, the recipients of scientific knowledge do not become as engaged as they would with art, and a distance develops between scientists and students. What little popularity science does have derives from art in other forms, such as science fiction novels. The discrepancy in appeal between art and science creates a cycle that drives more people towards the former and away from the latter, thus harming our potential as a society.

Molecular gastronomy helps to counteract this imbalance. When people eat molecular cuisine, they are “eating ‘chemistry’” (This, “Food for Tomorrow?” 1064). Some particularly scientific cooking procedures are even named after famous scientists, though most people do not know it: the process of whipping egg whites with oil and cooking them in a microwave to produce a gel is named after Josiah Willard Gibbs, an American physicist, while “cooking” an egg by immersing it in alcohol is named after Antoine Baume, a French chemist (1064). Through experimentally developed dishes such as these, science is forced upon the public through their everyday food, thus hopefully ameliorating the negative stereotype that science currently carries. This process is streamlined by the fact that the practitioners of molecular cuisine have attained fame as artists. Granted, due to the sheer cost of eating at one of these chefs’ restaurants, most people do not experience direct exposure to molecular cuisine. However, the sheer volume of articles about and interviews with molecular chefs in popularly digested sources as diverse as the Wall Street Journal, the New York Times, and Le Monde overrides this lack of direct exposure. Combined with the chefs’ visibility and credibility within knowledgeable food circles such as chowhound, this publicity allows molecular chefs to emphasize the virtues of science in the context of food in more widely accessible ways, bringing further awareness of and appreciation for science to the hoi polloi. Newspaper interviews
have led to talk shows and even the mass release of “cookbooks” that showcase the chefs’ art with beautiful pictures while also providing complicated and impractical recipes with as many as twenty-two sub-procedures each (Moskin). Each of these steps brings the chef and his science one step closer to the average eater who might never have the chance to dine at elBulli or any of its peers.

These endeavors to bring science to the masses through food have been, on the whole, successful. Taking the chowhound blog as a sample for the food loving population as a whole, it is easy to tell that people who were never excited about science before tasting molecular cuisine have become interested in the science of molecular gastronomy, regardless of whether or not they approve of it. The creator of the thread in question, diropstim, is an art major. After eating “someone else’s ‘experiments,’” however, he was intrigued enough to start a thread on molecular gastronomy (Chowhound 1). A blogger by the pseudonym of cayjohan, on the other hand, acknowledges that molecular gastronomy (through the arm of molecular cuisine) is “expanding our knowledge of the world” through experimentation, even though he thinks food will always revert to a simplistic and natural state (3). Similarly, a poster named celfie believes “we should applaud the fringes for their daring passions” (6). This state of mind is particularly productive for society as a whole, as it fosters risk taking and innovation in realms that can enhance society in—perhaps—more meaningful ways than food alone can. Molecular gastronomy has played its part by bringing this sentiment to the fore and paving the way for other scientific disciplines to court the approval of the mainstream in nations around the world.

**Outsourcing Food**

If Ramsey’s meal were a college applicant, it would have had no trouble getting into even the most selective universities based solely on the sheer diversity of its dishes. He included everything from a Greek salad (artistically deconstructed into its components) to a condensed New York cheesecake (made along the lines of the caramel corn) to a Japanese Kyoho grape (provided alongside a fake grape made of a liquid nitrogen-hardened shell filled with slushy grape juice). Ramsey gave me a tour of various national cuisines—through his own looking glass, of course—while I sat comfortably in my chair.

The languages of both science and contemporary art know no national boundaries. However, for centuries food, like traditional art, was defined by its native land’s specific national culture. Even today, “citizens in developed countries still cook almost the same way as their ancestors did centuries ago,” as remnants of these habits and prejudices remain (This, “Food for Tomorrow” 1063). As national cultures became definite and defined after the middle ages, national cuisines reflecting those cultures began to develop. In France, a customer can go to a restaurant or bistro and order simple yet elegant dishes like moules frites, oysters or sole meuniere—“a large, flat[, whole] Dover sole that [is] perfectly browned” (Child 18). This style of cooking, with its lack of waste and simple combinations of elements, reflects the “thrifty Gallic ‘save everything’ quality” that pervades French culture (24). Similarly, a recipe for Old Virginia Mince Pie, written in rhyme, shows the parallels between American cuisine and American customs. Some of the lines reflect good qualities: the line “worth and beauty need no frill” demonstrates Americans’ respect for results and individualism over aristocratic privilege (Longone...
88). Some of the lines reflect less desirable qualities: the line “things that grow in foreign lands may have been packed by germy hands” is rank with the distrust of immigrants that has been unfortunately prevalent throughout America’s history (88). Likewise, a meal at Urasawa, a Japanese restaurant in Los Angeles, is a tour through the intricate caves and crevices of Japanese culture. Urasawa, the chef, takes his mountain of toro the size of a small turkey and cuts out small pieces like a diamond cutter creating a high-grade gem. To the horror of any American guests in the room, he throws away most of the extra-premium fish. Urasawa does not operate on a save-everything basis or think that worth and beauty need no frill; rather, in accordance with his culture, he seeks only perfection and aesthetic purity.

Food is not only a reflection of national culture; sometimes it defines national culture. Certain dishes can come to be identified so strongly with a given country that they become a part of the culture, and subsequent aspects of the culture are built around them. Take, for example, lamingtons (sponge cakes with chocolate icing and coconut) in Australia. In Mem Fox’s children’s book Possum Magic, an Australian possum has become invisible and can only get his corporeal body back by eating Australian foods. Bit by bit he regains his identity by eating native foods like “mornay and minties [and] a vegemite sandwich” until finally he eats a lamington and becomes fully visible (Daniel 278). Here, the foods create the national identity, both inside and outside the story. While geographically specific foods have distinct nations of origin, by no means are they exclusive to their respective birthplaces. Food can and does travel the world—an enthusiastic diner can order sushi in Chile and paella in Mongolia—however, ethnic foods always retain their national nametags. Sushi is Japanese no matter where it is eaten.

Like contemporary art, molecular cuisine transcends the national confinements that are normally associated with food. Adrià in his Synthesis acknowledges that “regional cuisine as a style” is prevalent and “enriches [the food’s] relationship with its environment”; however, he holds that “products and preparations from other countries [should be] subjected to one’s particular style of cooking” (Adrià 1). He and the other molecular chefs have taken this maxim to heart, as any one molecular meal draws upon national influences from around the world. A single meal at elBulli offers everything from olive oil capsules (very Mediterranean) to a mint leaf embedded in a hard yogurt casing topped with curry (Indian in nature) to gorgonzola mochi (a completely original and nation neutral dish). Molecular chefs do not use fusion, the mixing of aspects of different national cuisines in their entirety, to make new dishes; they are not “making sushi out of couscous” (Chowhound 12). Rather, they make new dishes in new contexts independent of cultural boundaries. And while Adrià is considered the “godfather of the Spanish (and global) avant-garde movement” (emphasis added), by no means is Barcelona the only hub of molecular gastronomy (Burnett 2). Like with contemporary art, centers of molecular cuisine have sprung up all over the world, from Japan (Tapas Molecular Bar) to England (The Fat Duck) to the United States (WD–50). The international nature of molecular cuisine is a reflection of the international nature of both molecular gastronomy and science as a whole. The molecular chefs build upon the achievements of one another like scientists in a given field, driving the art and science of molecular gastronomy to ever-higher heights. Using its inherent popularity (due to its artistic side), molecular gastronomy not only utilizes but also promotes the sharing of ideas to people who might be otherwise entrenched in nationalistic protectionist tendencies.
The Other Side

The menu indicated that the next dish would be lamb chops. Great, I thought, I love lamb chops, but how will this dish be molecular? My question was quickly answered. The lamb chops came out looking beautiful: double-thick and perfectly browned. Ramsey said they were the finest lamb chops a chef could get in Japan. I stuck my knife into the chop to cut myself a bite, and I thought I had cut an artery: juices squirted everywhere. It turns out Ramsey had cooked the chops in a carefully calculated manner such that the juices had been retained in the meat, creating an incredibly juicy and tender piece of meat.

While many chefs and consumers propagate, enjoy, and appreciate molecular gastronomy in its different forms, some do not support what they see as the molecular blasphemy of their peers. Opposed to the use of scientific impurities, such as liquid nitrogen, in their food, these chefs prefer to cook as they always have: along national lines with fresh, local produce. Some of these chefs are content to cook their own way and let molecular cuisine coexist with other styles of cooking; others, however, are not so passive. Santi Santimaria, a rival of Ferran Adrià in the northeast of Spain, claims that the molecular chefs are “a gang of frauds who work to distract snobs...the only truth that matters is the product that comes out of the earth, passes through the ovens and is defecated” (Abend 1). This impassioned defense of purist cuisine, while at the extreme end, sums up the criticisms against the molecular chefs’ tampering with nature. Purist cuisine focuses on the primitive aspects of cooking, with organic materials and bodily functions working together in harmony to create the ultimate gastronomic experience; to its executors, anything else is superfluous. At his three Michelin star restaurant, Can Fabes, Santimaria holds on for dear life to his principles, serving rustic yet refined dishes like octopus salad, suckling pig and lobster tail surf and turf, and incredible fresh bread. He is trying to polarize the food world into those who “continue to use...fresh produce” and those who “opt for using additives,” with the molecular chefs on one side and more traditional chefs—such as himself, Urasawa, and Daniel Barber, who operates a restaurant in New York called Blue Hill that only uses produce grown on its farm—on the other (Burnett 1).

Partly as a result of Santimaria’s and Barber’s incendiary comments (Barber called molecular cuisine “effete, precious [and] egotistical” at Madrid Fusion in 2007), a backlash against molecular cuisine can be seen fomenting among some consumers. Diners who have read or heard the comments of Santimaria or Barber or other such chefs go into molecular restaurants with a degree of skepticism: one foodie writer watched in horror as his cynical date rejected some of Dufresne’s famous fried mayonnaise at WD~50 just on principle (Maddox 2). Some patrons even voice criticism of their own. One of these, Das Ubergeek, wrote on the chowhound blog: “I don’t eat foam. I don’t need to be experimented on” (Chowhound 3). Like many of his peers, Das Ubergeek would rather eat a hearty dish of chicken parmesan than be subjected to what he sees as the erratic musings of the molecular chefs (3). Some have even gone so far as to suggest that molecular gastronomy is “a sign of a doomed civilization, of Food Gone Too Far,” as it could eventually lead to meal pills that eliminate the joys of eating altogether (Moskin).

These criticisms actually help to keep molecular gastronomy vital and fresh. Together, the opponents and proponents of molecular gastronomy weave a dynamic argu-
ment, with each side producing fresh ideas, fresh defenses and, most importantly, fresh dishes—after all, the proof is in the pudding—to stay one step ahead of the opposition. According to John Stuart Mill, “he who knows only his own side of the case knows little of that”; by providing a counterargument, the gastronomic traditionalists are helping to spur the molecular chefs and their supporters to bring their art to higher heights via a food race to rival the space race (Mill 35). For example, when Ferran Adrià presents a dish of hot/cold clam chop suey, Santi Santimaria feels compelled to retort with pure raw razor clams in fish broth; this in turn spurs Grant Achatz of Alinea in Chicago to use clams with fillets of ice fish to construct a dish that resembles a live ice fish. Though the traditionalists may disagree, they are aiding the development of the food science they so adamantly oppose as molecular gastronomy continues to expand the horizon of what is possible in the kitchen.

A Bright Future

The final dish of Ramsey’s extravaganza was the most impressive. In name, it sounded innocent enough: “Fruit.” He gave us each a plate of fruit, with a couple of pieces each of lime, lemon, grapefruit, orange and strawberry. He told us to eat two pieces of fruit; it was good fruit, but nothing out of the ordinary. Next, though, Ramsey gave us a little red fruit, and told us to eat it and roll the seed around in our mouths. After this, I put a piece of lime in my mouth; it tasted like a sweet drop of ambrosia from Olympus. I looked at Ramsey with bewilderment in my eyes. He explained that the little berry, called miracle fruit, chemically disables the bitter and sour taste buds on the tongue, creating an incredible new sensation that alters the eater’s perception of reality.

As molecular chefs continue to explore new methods of cooking in their own kitchens, the time-tested methods that have become a part of the science of molecular gastronomy are making their way into the average home. Through the media attention and popularity provided by the artistic aspect of the movement, people are beginning to become aware of the methods and “precise and convenient appliances that make it a snap to prepare moist, tender meat and fish every time” (Mcgee, “The Science of Cooking” 2). With the help of molecular gastronomy, home cooks can consistently create better tasting and more efficient foods. Take the perfect French fry, for example. Before the efforts of Adrià and company, people may have had to serve soggy fries with their ribs on the Fourth of July for lack of a consistent methodology, and who likes soggy fries? With the help of the discoveries of molecular gastronomy, however, at-home chefs can now learn that the perfect fry is cooked for seven minutes at 180°C and then again at 200°C until it is golden brown (This, Molecular Gastronomy 193). With the help of molecular gastronomy and its artistic dissemination process, the soggy French fry could be officially eradicated from the home.

Molecular gastronomy is a hybrid between science and art that helps connect average people to science across the world. There is no limit to what the science of food can achieve, since it is such a relatively new and untapped scientific discipline. Already, more research is pouring into the realms of molecular interactions to try to discover new flavors and culinary sensations. It has been found that different sensations are felt on the tongue in a set order—pain, bitter, sweet, salty, then sour (Amerine 41). Imagine what
molecular chefs could do with this information: pretty soon, Jeff Ramsey might come out with a dish called “roller coaster” that slows down the sensation process and goes through a tour of every one, from spicy pain to citrusy sourness. In addition, scientists have discovered that one molecular arrangement of Tolylyurea (an organic molecule with a 6-carbon ring) tastes bitter, while the movement of a methyl group from the third position on the ring to the fourth position makes the same Tolylyurea taste sweetish (67). It is possible that, at some point, a molecular chef like Heston Blumenthal could find a way to alter the molecular structure of radicchio, a bitter leafy vegetable, to make it taste sweet. According to Adrià’s synthesis, “the technique-concept search is the apex of the creative pyramid” for molecular gastronomers, so this drive for more science and new ways to present it will not soon come to an end (Adrià 1). The artistic presentations and new contexts used to accompany the culinary discoveries will advance at a proportional pace, and more and more receptive eaters will be drawn into this mesmerizing amalgamation of art and science, where each supports the other. Complications and contradictions will cease to be detrimental and puzzling, and will instead start working together with the grounded facts of science to open up new pathways of perception and understanding for everyone involved.

Works Cited
Works Consulted

Appendix A

Eduardo Abaroa
The Body Cavity Inspection Network (Node in a Corner), 2007
abaroa 2.html.webloc

Cindy Sherman
Untitled Film Still #6, 1977
http://www.moma.org/exhibitions/1997/sherman/jpgs/sherman06.jpg
Marcel Duchamps
*Toilet “ready-made,”* 1917
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Jackson Pollock
*No. 5, 1948*