

MOLECULAR GASTRONOMY

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Practicum in Foodservice Systems

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Facility: Olin College of Engineering

Abstract

Olin College of Engineering was to host a celebratory event in honor of the 10th Anniversary of the opening of the college. The celebration would center on the achievements of students from Olin College and showcase some futuristic and creative inventions of current students. The students would be holding different presentations, seminars, and performances throughout the campus. The foodservice department was asked to cater and plan the menu for this event with a focus on Molecular Gastronomy. Olin College has termed the anniversary event “Decade One.” Attendees for “Decade One” include students, alumni, parents, faculty, staff, and the community. The total attendance is expected to number approximately five or six hundred.

The foodservice department had no experience with the techniques of molecular gastronomy, and this was one of the largest events the college had asked the staff to cater. Techniques and processes of molecular gastronomy needed to be researched, equipment and food additives needed to be located and purchased, the layout and menu of the event needed to be planned, and additional staff members needed to be sourced. Much research and organization went into planning “Decade One.” Due to effective management and coordination the event was an overwhelming success.

Overview of the Foodservice System

Olin College dining services is contracted by Sodexo, a food management company. Sodexo manages and controls the resources available to the foodservice department, and the foodservice management at Olin decides how to allocated these resources. Aside from various catering and events, the primary business for the foodservice department is the singular kitchen and dining hall that provides daily meals to students, facility, staff and the community. The facility uses conventional foodservice system practices. They purchase ingredients from suppliers; these ingredients are then prepared and assembled into dishes on site at Olin College. The dishes are then cooked and served to customers. The majority of products purchased are minimally processed or pre assembled, with the exception of some sauces or gravies, and some desserts. This allows Olin College foodservice to provide high quality dishes that are served soon after preparation, flexibility in the menu items, and standardized recipes.

Olin College of Engineering is a small community in which approximately 350 students are currently enrolled. Throughout the day, the foodservice staff generally serves 900 – 1000 meals. The general manager/foodservice director at the facility is Dave Nadreau. The staff at the facility also includes Bill Kelly, the executive chef, and approximately a dozen chefs, cooks, and other food handlers. See attachment 1 for the staff organizational chart.

Dave’s manager at Olin College, Joanne, asked him to cater and plan the menu for “Decade One.” Joanne specifically asked for the menu to center on the food science technique of molecular gastronomy. This request for a molecular gastronomy theme encompasses the mission of Olin College, which is to “prepare students to become exemplary engineering innovators who recognize needs, design solutions, and engage in creative enterprises for the good of the world” (1).

Molecular gastronomy is a futuristic application, and the “cooking is characterized by being experimental and usually highly scientific, often resulting in new combinations of foods, and application of sophisticated culinary process” (2). Just like techniques in molecular gastronomy, Olin College strives to encourage students to think outside the box, be imaginative, and be the engineering pioneers of the future.

Facility Needs

The problem the Olin College foodservice team faced was how to cater an event of this magnitude while incorporating the molecular gastronomy theme with little background knowledge of the techniques. Additionally, the foodservice team desired to display the techniques of molecular gastronomy in an accurate, efficient, and intriguing way to guests of the event. Since molecular gastronomy is a relatively new technique and is just beginning to become more mainstream, a good deal of time was needed for preparation and research on the topic. The foodservice department was given a budget of \$20,000 for the event, and it was estimated that approximately 500 guests would attend.

Before the foodservice management could begin planning the menu for the event, a lot of research had to be done on the science of molecular gastronomy. Management had to familiarize themselves with the processes, different techniques, the many food science principles, and the numerous equipment and food additives necessary to create the molecular gastronomy dishes.

After researching the basics of molecular gastronomy, the layout and logistics of “Decade One” could be planned. Decisions had to be made about how and where food would be served to guests, and the style of service. The specific food service locations had to be determined. This planning had to coincide with the fact that Olin students would be scattered throughout the campus and academic buildings giving presentations.

Due to the research on molecular gastronomy it was evident that addition items, equipment, and ingredients would need to be specially purchased to preform the techniques. A retailer of these items needed to be located, priced, and sourced before menu planning could begin.

Next, further investigation of recipes and techniques was needed. Which molecular gastronomy techniques to focus on, and the specifics on how to perform the techniques needed to be identified. General recipe ideas, suggestions for dishes, and explanations of how to use food additives needed to be studied.

Once resources were gathered and general research was done, the menu could be planned. The menu style needed to be planned based on the layout of the event and where food would be served. Which molecular gastronomy techniques to display, and how many molecular gastronomy dishes to serve also needed to be decided. Next, the Sodexo recipe index needed to be looked into for menu planning.

Throughout this process, a staffing plan also needed to be created for the event. Based on the menu style, the number of food stations, and the type of dishes served, the number of staff necessary for the event could be estimated. Because Olin College is a small facility, it would be necessary to source outside chefs, cooks, and staff members from other Sodexo accounts or agencies. Due to the fact that the

college does not normally serve this number of people at once, it was determined that some additional kitchen equipment, serving pieces, platters, trays, etc. would need to be sourced.

Finally using the menu and the estimated customer count, production reports would be generated. These reports would be necessary in predicting food costs. Days before the event once all the final details were definite, a food and beverage order could be placed.

Explanation of Molecular Gastronomy

Molecular gastronomy is a concept that is steadily generating more interest and gaining popularity. Often mistaken for a style of cooking, molecular gastronomy can be defined as “a scientifically oriented approach towards understanding the basic mechanisms during cooking” (3).

A relatively new discipline, molecular gastronomy, was popularized and introduced to the general public in 1988 by Herve This and Nicholas Kurti. They originally labeled the science “molecular and physical gastronomy.” In 1992 they held the International Workshop on Molecular and Physical Gastronomy,” introducing the topic to chefs and scientists from all over the world (4). This conference was a huge success and is now held every two years. In 1998 after Kurti’s death, This shortened the title to molecular gastronomy, justifying that this would reduce confusion on the subject (4). This aims to emphasize that molecular gastronomy is not the same as food science, yet it “is a subset of food science that deals specifically with the transformation of food” (5).

Thanks to the hard work and innovation of This and Kurti, many chefs specializing in molecular gastronomy have emerged. Chef Pierre Gagnaire and Chef Ferran Adria are two renowned chefs who have mainstreamed molecular gastronomy through their works and restaurants (5). These chefs, along with many others, have developed a number of scientific techniques to create new dishes. The six most popular and widely used molecular gastronomy techniques include spherification, gelification, emulsification, thickening, effervescence, and transformation (6).

Spherification is defined as the “culinary process of shaping a liquid into spheres held by a thin gel membrane which visually and texturally resembles caviar” (6).

There are three different types of spherification.

- Basic spherification is the most common, and can be used to create various sized circular shapes with a liquid interior that burst when eaten. This process is completed using the additives sodium alginate and calcium lactate. Sodium alginate acts as a gelling agent, and it is used to thicken the food item that will be spherified. It is a salt removed from the viscous liquid found in the cell walls of brown algae. Calcium lactate is a salt derived from lactic acid. This substance is dissolved in water to create a calcium lactate bath that the sodium alginate spheres are added to. Using a pipet or syringe, drops of sodium alginate are placed in the calcium lactate bath and left to sit for approximately one minute. Using a strainer, the spheres are then removed and should be rinsed and are ready to be enjoyed (6).

- Reverse Spherification is similar to basic spherification, but in this technique calcium lactate is added to the food item to be spherified and a sodium alginate bath is created. This process is used when creating spheres of a thick or creamy liquid, as opposed to less viscous liquid used in basic spherification (6).
- Frozen Reverse Spherification is used to make ravioles with an entirely liquid interior. This technique works with acidic solutions, unlike basic and reverse spherification. With this technique calcium lactate is added to the food item and a sodium alginate bath is created as in reverse spherification, however there is an additional step. The calcium lactate solution is frozen in the mold before it is added to the alginate bath (6).

Another molecular gastronomy technique that is commonly used is gelification. Gelification is the method of transforming a liquid into a gel, with a range of firmness from soft or weak to hard or tough. This technique is extremely versatile and can be formed into any shape. It can also be used to create mousses, jellies, added to cocktails, pastries, puddings, custards, confectionaries, etc. There are three different food additives that can be used with this technique.

- Agar-Agar is a natural, heat resisting gelling substance found in the cell walls of red algae. To create this technique, agar-agar is added to a boiling aqueous liquid for about two minutes and then left at room temperature to set and cool. Agar-agar is best used to create gelled pearls, spaghetti, lentils, prisms, all shapes, jellies, puddings, custards or mousses with a culinary whipper (6).
- Carrageenan is a polymer fiber found in many species of red algae. It is made up of carbohydrates and potassium and calcium ions, which provide its gelling properties. Carrageenan is very versatile; it can slightly thicken a substance or form a firm gel. It can be difficult to mix into a solution, so it is best to combine carrageenan with boiling water then added to the food item to thicken. The mixture will set as it cools. It is most often used to make hot or cold jellies and mousses (6).
- Gelatin is produced by the hydrolysis of the animal protein collagen. Similar to the other substances, gelatin is dissolved in boiling water and added to the liquid mixture then left to set and cool. Unlike agar-agar, gelatin liquefies at 95° F, allowing it to melt in the mouth. Gelatin is frequently used in cocktails, entrees, pastries, and confectionaries (6).

Emulsification is a third molecular gastronomy technique. Emulsification creates a foam from a liquid substance. The additive used with this technique is soy lecithin. Lecithin is a lipid found in the cell membrane of all living things, soy lecithin is extracted from soybeans. This technique allows for the creation of foams from most any liquid, and retains flavors well. Soy lecithin is added directly to the liquid and blended. The foams can also be frozen to create a more sturdy foam (6).

Three other molecular gastronomy techniques that were not directly displayed at “Decade One” include Thickening, Effervescence, and Transformation. Thickening increases the viscosity of a substance without affecting other properties. The food additive used to thicken solutions is xanthan gum, which is produced by

fermentation of glucose or sucrose. Effervescence is the process of escaping gas and the fizzing that results. Popping sugar, a sugar containing carbon dioxide, is the food additive used to create this technique. The molecular gastronomy technique of Transformation will change the composition of a food item. Maltodextrin, and unsweetened sugar, can change a fatty oil into powder (6).

Solution

The planning and preparation for the “Decade One” celebration was lengthy and time consuming due to the fact that the foodservice team and I had very little knowledge on the techniques of molecular gastronomy. Also, the foodservice department had to base their menus and planning on the logistics of the event. The college decided that during the “Decade One” celebration there would be students giving presentations on futuristic projects and inventions they created. These student presentations would be scattered throughout the campus between three building, and the quad in the center of campus. For this reason it was logical to create three food stations, one in each of the buildings.

The foodservice management decided that each of the three venues should have their own theme. The theme at each venue would incorporate characteristics of Olin College’s programs and molecular gastronomy techniques. It was decided that molecular gastronomy techniques of spherification, emulsification, and gelification would be the focus at the three venues. The titles of each of the venues are a play on words from programs at Olin College. The spherification venue would be titled “rOLIN through the years” and feature numerous rolled food items. The emulsification venue, “KaliedeSCOPE”, would include dishes with different colors and layers. Lastly, the gelification venue entitled “I2EAT2” would consist of food items that contain two levels of flavor or layers.

In order to create the majority of molecular gastronomy dishes, special equipment and ingredients are necessary. These pieces of equipment and ingredients are not commonly purchased by the average chef, and certainly not purchased by the Olin College foodservice department. There are a limited number of suppliers of these specialty items, and they cannot be purchased at most local stores. Most items need to be purchased from Internet based retailers. However the selection and availability of these products is increasing due to general interest and increasing popularity of molecular gastronomy. Olin College purchased kits and products from the online Molecule-R Company. The products we decided to purchase included a Cocktail R-Evolution kit, a Cuisine R-Evolution kit, a molecular tools kit, and a culinary whipper. These kits contained agar-agar, sodium alginate, calcium lactate, soy lecithin, gelatin, and xanthan gum. The molecular tools included syringes, silicone tubes, pipets, slotted spoons, and measuring spoons. We also purchased calcium chloride, and additional agar-agar.

I completed an extensive research and examination of online recipes. The focus of the search was on the techniques of spherification, emulsification, and gelification. The recipe research was done based on what equipment and ingredients that would be available in the kits that were ordered. This research was dynamic and continuous throughout the whole planning process.

The general themes and ideas were gathered from recipe research, a menu outline was created. Dave decided that each station would have four categories and

serve light appetizers, larger center of the plate appetizers, deserts, and a variety of drinks. The majority of the menu was established using Sodexo's recipes. The presentation and ingredients of many recipes were modified to fit with the theme of each venue. The molecular gastronomy dishes were based off Sodexo recipes but included aspects of molecular gastronomy. Many of these dishes were complicated to plan because molecular gastronomy recipes for the items did not exist. In turn, we created a number of original molecular gastronomy dishes.

The menu was planned around the three stations, each containing four categories, and focusing on their Olin and molecular gastronomy theme. See attachment 2 for the sample menu. I created the menu in Excel so that each menu item contained a hyperlink to the recipe. The recipes were all organized by individual venue, and an addition section for molecular gastronomy recipes was included as well. I also created production reports for each venue using the predicted guest count. See attachment 3 for the production reports.

Throughout the menu planning process, a staffing plan was also created. Dave decided that each of the three venues needed a manager, an executive chef, 2 addition chefs, 2 cooks, 2 runners (to move between the venues and the kitchen to gather needed food items), wait staff, bartenders, and utility staff. This totals approximately 12 staff members at each venue, for a total of 36 positions to fill. Olin is a small facility and could only contribute about 15 staff members. Executive chefs, chefs, and cooks from other Sodexo accounts were asked to come and participate with the event. These teams of chefs were invited to come to Olin the day before the event to look over the menu, get acquainted to the kitchen, and practice their molecular gastronomy technique. Additionally, a catering agency was hired and filled the wait staff and bartender positions at each of the venues. I created a staffing spreadsheet with each venue and every position. See attachment 4 for this staffing spreadsheet. In an attempt to eliminate confusion, the executive chef and team of each venue was given a packet when they arrived. The packet I created contained a list of all their team members, the staffing spreadsheet at each venue, the overall menu, all the recipes for their venue including the molecular gastronomy recipes, and all the information for their venue's molecular gastronomy technique.

Due to the fact that the three venues would be scattered throughout the campus, but all cooking their food from the main kitchen, it was determined that addition kitchen equipment would need to be sourced. Olin College is located very close to Babson College, which is another Sodexo account. The two Colleges maintain a close relationship, and in addition to supplying Olin with many staff members, they also contributed many pieces of kitchen equipment. Some of these pieces of equipment included sheet pans, a carving station, many display bowls and dishes, chaffing dishes, serving platters, and serving dishes.

Finally, days before the celebration, an inventory and food and beverage order had to be placed. This was somewhat lengthy and time consuming because the event required many items the foodservice department doesn't usually purchase.

Results

The Decade One event was extremely well received by the guests, Joanne, the head of the event, was very pleased. Some Sodexo representatives also attended and were impressed with the techniques and display of molecular gastronomy. Additionally, Dave received numerous comments and compliments from attendees of "Decade One." This weekend was a very busy one for the college and foodservice department, it was also family weekend and a formal dinner was held at the president's house for the board of trustees. I think that the organization and planning for the event helped it to run smoothly and successfully.

The choice to focus on three molecular gastronomy techniques for "Decade One" was based on a number of factors. The topic of molecular gastronomy was foreign to the majority of the foodservice staff, and to most of the guests at the event. Each of the three executive chefs and team members had to be educated on their specific technique. As previously mentioned, equipment and ingredients to create these dishes can be difficult to find and most of the chefs did not have access to the equipment until the day before the event. Between the three venues and thirty seven dishes total, ten of the dishes included a molecular gastronomy aspect. Each chef and team was responsible for about three molecular gastronomy dishes, in addition to all their other dishes. And many of the molecular gastronomy dishes did not have specific recipes, the chefs had an outline to go by but trial and error was required to make the optimal product. To ask the chefs to learn how to create many more than three dishes in less than one day with no experience, would have been unreasonable. Using more than three molecular gastronomy techniques could have been overwhelming to the chefs and the quality of the food may have suffered.

One of the most interesting factors of molecular gastronomy is the process of creating the dish. We wanted the guests to be able to experience a glimpse of the process. Dave decided that each venue would have one action table, where the executive chef would be demonstrating one of the molecular gastronomy dishes they were serving. At the spherification venue, custard ravioles (cannolis) and melon balls for the prosciutto melon wrap were demonstrated. The emulsification venue displayed balsamic vinaigrette pearls in olive oil and pumpkin foam for the beer. The gelification venue exhibited the chocolate wind dessert.

We also wanted the customers to have information about the techniques and a resource to take home, so Dave asked me to create a white paper for each venue. The three white papers are attached as number 5, 6, and 7. Each white paper contained information about that venues technique and additives. I also used an application to create a QR code (Quick Response Code) with a youtube link that showed a demonstration of each spherification, emulsification, or gelification. The QR codes could be scanned by anyone with a smart phone who has that application, allowing them to immediately view the youtube video.

The best indication of the success of the event is that Sodexo representatives decided to use many of the molecular gastronomy techniques we presented at a conference. Some of the chefs who participated in the "Decade One" event were asked to attend the conference and explain molecular gastronomy, the techniques, and create dishes. The Sodexo representatives also requested to use the white pages I created for "Decade One."

Although the event was very successful, there were a few minor aspects that could have been improved upon. Due to the fact that the event was spread over the campus, there was some issue with traffic flow and communication. Some venues ended up being more popular due to the presentations and activities that were occurring there, which meant that the foodservice team in those venues were challenged with a large number of guests at once. In turn, one venue was very slow because there was not much going on in that building. I think that if the “Decade One” planning staff had reorganized the venues and explained to guests that there were three food locations it would have alleviated this issue. Because the venues were in different locations, and in separate buildings from the kitchen, there were some communication issues about what the chefs needed while the event was going on. There were staff members to travel back and forth, but it took about 5-10 minutes to travel between buildings and the chef in the main kitchen was sometimes not prepared for what the other chefs at the venues needed. I think that the use of walkie-talkies would have been very helpful, because cell service is not reliable in all of the buildings.

The one other small issue was related to the menu. Almost all of the molecular gastronomy food items were consumed by the guests, and some venues ended up running out of dishes. This had to do with the fact that some venues had more guests than the other. Another issue related to the menu was the lack of vegetarian, vegan, and gluten free options. The guests, excluding students, paid a fee for their ticket to this event. There were a couple comments from guests about the lack of alternative options, and there was not much that could be done for these guests. In hindsight, I think that there should have been some vegetarian, vegan, and gluten free options included on the menu or alternatives should have been prepared just in case.

The minor problems aside, the event went over very well and was a success not only for Olin College but also for Sodexo. Guests of “Decade One” were very pleased and complimentary of the foodservice staff and the display of the molecular gastronomy. The success of the event was due to the research, organization, planning, and dedication of the entire foodservice team.

Olin College 10th Anniversary Celebration

Venue	Milas Hall - food, demonstration, signature dish, beverages in lobby	Campus Center - Demo in DH, Food, display in hall, signature by screen, beverages in hall	Academic Center - 2nd floor, serve from ramps, display at one end, stations and signature in one hall and beverages in another
Theme	<i>rOLIN Through the Years</i> (rolled items)	<i>KaliedeSCOPE</i> (colorful, layers, mixed with other techniques)	<i>I2EATWO</i> (two flavors layered or strata)
Technique	spherification	emulsification & effervescence	gelification
Demonstration	two types of spheres	head on beer, mousse	globes and strings/flaps
Items will be passed out by servers or stationary: Appetizer			
Beef	beef wellington puffs	chipotle beef on tortillas w/ avocado crème	beef satay w/ sweet and spicy sauce
Chicken	cornicopia chicken quesadillas	chicken brochettes	Chicken Cordon Bleu Bites
Seafood	Potato Wrapped Shrimp	seafood crostini w/ spicy mango shrimp salsa	cool salmon canapes (MG)
Veg/Cheese	asparagus roll ups	tomato, vidalia onion, and goat cheese tart	ceaser salad stack (MG)
Pork	ham and cheese pinwheels	Antipasto Skewers with Salami	Pork Potstickers
	prosciutto melon wraps (MG)		
Items will be carved and or served by cook.			
Center of plate Appetizer		Items served with Breads for sandwich style and sauces or spreads.	
Beef	Beef Roulade	Tenderloin Au Poive	Burbon Glazed Flat Iron Steak
Chicken	Indian junk bread	Chicken Pinwheels	Carved Maple Glazed Turkey Breast

Attachment 2

Salad/Pasta	Eggplant Rollitini	chilled pumpkin soup w/ warm crème anglaise (in beaker)	chilled melon soup w/ kiwi crème
Items will be at station:			
Dessert			
Option 1	Toasted angel food cake w/ balsamic and strawberries (in petri dish)	phyllo cups with strawberries and cream	Banana pot stickers
Option 2	Cannoli with Ricotta Cream Spheres (MG)	apricot amaretto fruit cream trifle/parfait (in graduated beaker) (MG)	Chocolate Wind with Raspberry Ravioli (MG)
Option 3	Pumpkin jelly rolls	Harvest Napoleons	Kiwi & Mango Tartlets
Items will be stationary and served by ETOH:			
Beverage			
Hot	Cider, Coffee, Tea	Cider, Coffee, tea	Cider, Coffee, Tea
Cold	Assorted	Assorted	Assorted
Alcohol	White wine Spritzer with Gelled CO2 and Lime (MG)	Pumpkin Foam Ale (MG)	Layered Sangria (MG)

Olin 10th Anniversary Celebration - Work Schedule

Dave Nadreau (774) 280 -
0553

Manager	Dave Hawes	Bill Kelly	Stan	Hours Needed:
Manager Phone #		(401) 965 - 7505		
Venue	Milas Hall	Campus Center	Academic Center	
Executive Chef	Gary	Wendy	Rob	
Executive Chef Phone #	(603) 560 - 5058	(207) 356 - 4122	(802) 318 - 8001	
Chefs	Lam Abe	Solomon John	Vermont Vermont	
Cooks	Mike John	Jin Mu Zhen	Colby Colby	
Runner	Ricardo Yoslen	Mirta James	Jose Nathaly	
Waitstaff	(waitstaff) (waitstaff)	(waitstaff) (waitstaff)	(waitstaff) (waitstaff)	6 hours 6 hours
Bartender	(bartender)	(bartender)	(bartender)	5 hours
Utility	(utility)	(utility)	(utility)	5 hours
Demo Chef	(demo chef)	(demo chef)	(demo chef)	

References

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