The development of a novel Note by Note dish “Local Eater’s Deconstructed Apple Pie”

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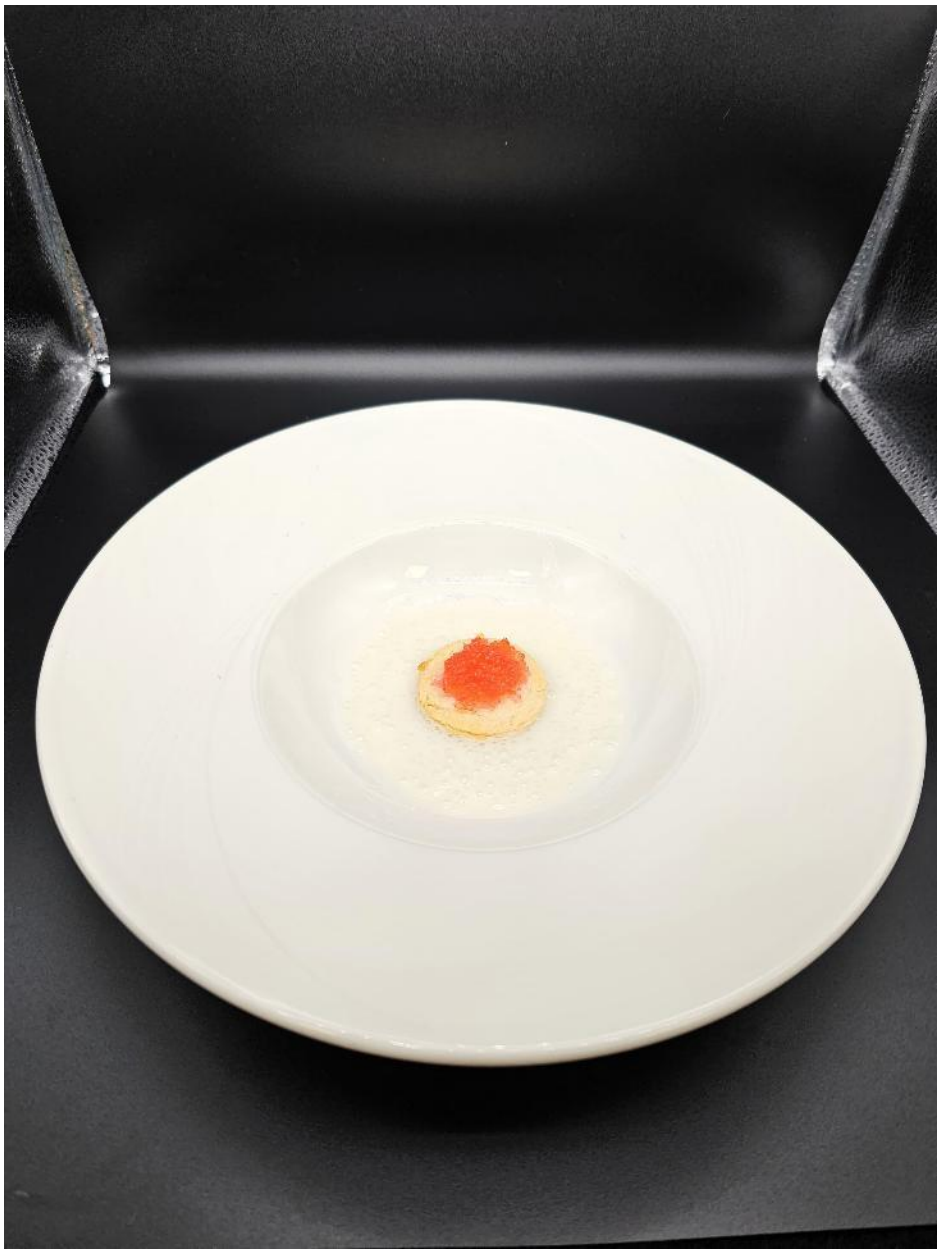
Module Advanced Molecular Gastronomy



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Introduction

Note by Note cooking, also known as synthetic cooking is a cooking technique developed by scientist Hervé This with the premise of using entirely, either pure compounds or mixtures in recipes (This, 2013), which rules down the use of whole foods such as vegetables, fruits, meats, or spices, but instead directs us to use key compounds (structural or flavour-responsible for example) from them in recipes. The aim of the report is to outline the development of a dish for the module "Advanced Molecular Gastronomy" at TU Dublin in Spring 2025, with the theme of this year's Note by Note competition "Food for the future" in mind.

According to the 2024 edition of the State of Food Security and Nutrition in the World report, between 713 and 757 million people faced hunger in 2023 (FAO et al., 2024). In addition, 13.2 per cent of the world's food was lost after harvest along the supply chain from farm to consumer (United Nations 2020). As a potential solution to these global challenges, local food systems and short food supply chains could offer a sustainable approach for the future of food. The advantages of these types of systems include fairer prices for farmers, access to fresh and seasonal produce for consumers, a reduced environmental impact and greater social cohesion at local level (Augère-Granier, M.-L. 2016). Moreover, the quality of produce is higher in terms of taste and nutrition as items don't need to be shipped long in advance (Jia, F. et al 2024). With the above in mind, a dish using Note by note cooking principles was developed to push for a message highlighting the potential power of local food systems as a solution to tackling these problems.

The aims of the report are to

1. Outline the process of developing the dish and explore the challenges faced during its production
2. Establish the sensory appeal of the dish
3. Document the characteristics of the dish (process, ingredients, etc.) for submission to the Note by Note cooking competition.

For the purposes of the competition, the following dish was developed:

"*Shortcrust pie disc topped with Granny Smith apple flavoured fluid gel, encircled by a hazelnut foam"*

Apple pie is a traditional dessert in Irish food culture, featuring ingredients that are readily available in the local food system of Ireland, such as apples and flour. Hazelnuts, also known as cobnuts or filberts, are also native to Irish woods (Tree Council 2024).

The developed dish supports the message of "food for the future" by highlighting the importance of local foods in building sustainable food systems. By conveying a classic traditional dish such as the humble apple pie in a novel way, we remind the eater of the importance of local produce. Via note by note, ingredients that are native can be presented with an innovative twist, increasing the range of applications for the ingredients and thus supporting their use even further. Moreover, the unusual presentation of the elements of the dish renders the experience memorable and leaves a stronger impression on the eater, who could potentially leave the dining room with a more astute awareness of the global issues affecting the food of the future.

Materials and methods

Pie discs

Ingredients

Ingredient (brand)	mass (g)	w/w
Wheat gluten (Biotiva)	8	0.09
Wheat starch (Foo Lung Chee Kee)	47	0.54
Sunflower oil (Mediterani)	11	0.13
Caster sugar (Sysco)	5	0.06
Water	16	0.18
total	87	1

Equipment

- Bowl (stainless steel)
- Tablespoon (stainless steel)
- Rolling pin
- Cling film
- Baking paper
- Baking tray
- Oven (Skyline Premium)

Method

1. Mix the gluten, wheat starch and salt in a bowl.
2. Add the oil and make a crumbly consistency.
3. Add water slowly while mixing gently.
4. Wrap in cling film and refrigerate for 30 minutes.
5. Roll into thin discs.
6. Bake at 200C for 20 minutes.

Apple gel

Ingredients

Ingredient	Mass (g)	w/w
Gellan gum F (Sosa)	3.5	0.011
Water (gelling)	250	0.765
Granny Smith Apple Flavour (MSK)	2.5	0.008
Salt (Saxa)	0.5	0.002
Caster sugar (Sysco)	25	0.077
Yellow food colouring (Mallard Ferrière)[a]	0.05	0.000
Raspberry red food colouring (Mallard Ferrière)[a]	0.1	0.000
Added water (blending)	45	0.138
total	326.65	1

a: for the food colourings, maximum permitted levels were taken from the package label and were determined to be 0.2g/kg (red) and 0.1g/kg (yellow).

Equipment

- Bowl (stainless steel)
- Tablespoon (stainless steel)
- Thermomix (for blending)
- Saucepan
- Whisk

Method

1. Make the apple jelly by bringing water with sugar, flavour, salt, and colour to 85C and then mixing the gellan gum in with a whisk so it is fully solubilized.
2. Set in a metal bowl and break into pieces.
3. Blend in Thermomix with additional water to get the desired consistency.
4. Pass the gel through a fine sieve.

<u>Hazelnut foam</u>

Ingredients

Ingredient	mass (g)	w/w
Xanthan gum (Redmond Fine Foods)	0.6	0.006
Skim milk powder (MillacValue)	4	0.041
Caster sugar (Sysco)	5	0.051
Water	88.7	0.901
Hazelnut flavour (MSK)	0.2	0.002
Total	98.5	1.000

Equipment

- Jug (stainless steel)
- Immersion blender (Robot Coup Mini MP 160)
- Spoon (stainless steel)

Method

1. Pour water into a jug, add hazelnut flavour.
2. Pour skim milk powder, sugar and xanthan gum slowly to the jug while blending with immersion blender.
3. Blend until desired consistency is reached.

Results and Discussion

Making the pie shards was a relatively easy process. First, a simplified version of regular wheat flour or a "Note by note flour" was made by combining gluten and wheat starch. The method and recipe used for the pie shards were adapted from (Moiraghi et al., 2019) and (Ruhlman, 2009) by estimating the relative contents of starch and gluten in wheat flour from the former and determining the ratio of flour to fat to water from the latter. After weighing, the starch and gluten were mixed in a bowl (figure 1). Next, sugar and salt were added to give flavour to the dough. The next step was to add the oil and break it into the dough with the fingertips in order to form small crumbs (figure 2). Finally, water was added and the dough formed by very lightly massaging the water in in order to avoid overworking the dough (figure 3). Overworking the dough can cause it to become too hard due to excessive gluten development (Institute of Food Science and Technology, 2017). Once made, the dough was rested in the fridge (3.1 degrees Celsius) for 30 minutes, in order for the glutens in the flour to relax which should help to give a more tender pie crust with less shrinkage (Nigella.com., 2011). For a pie dough, the goal was to have as crumbly and soft texture as possible. The final texture was not as crumbly and soft as desired, even if it was satisfactory. In further experiments, the texture could be potentially improved either by trying to minimize the kneading of the dough, resting it longer in the fridge, or searching for saturated fat choices from the Note by note ingredient repertoire, as the drawback of using a liquid oil at room temperature is that it prevents the formation of air pockets in the dough that help in creating a flakier dough (Dorn, 2012)**.** The appearance of small pie disks was designed to be that of small discs of a diameter of 3 centimeters to achieve a nice uniform texture that is appealing. The discs were made using a cookie mold. (figure 4). The discs were then placed in an oven at 200C for 25 minutes to achieve some browning on the top and cook them thoroughly (figure 5). The flavour obtained was pleasant; wheaty, slightly sweet and one of baked pie dough. In short, it is possible to achieve an adequate pie dough with note by note techniques. However, the final texture was a bit hard and not sweet enough. For the texture the aforementioned reasons could be at fault, for the sweetness, simply more sugar could be added.

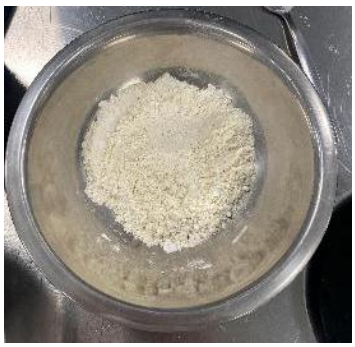

Figure 1: Bowl with gluten, wheat starch and sugar

Figure 2: Dough with gluten, starch, sugar, and oil

Figure 3: Final dough

Figure 4: Cookie mold used to make pie discs

Figure 5: Baked pastry discs

The fluid gel was the most laborious element of the dish, but still relatively effortless to complete. Gellan gum was chosen for the application, as it is a hydrocolloid that is highly applicable for different types of gels (Imeson, 2009). Solutions of gellan gum will gel on cooling at low concentrations. The exact temperature depends on factors such as acylation and pH, but in general they can be expected to set at least when the temperature drops into the 30–50 °C range (Coultate, 2014). The gellan gel used in the recipe is referred to as a fluid gel in the culinary sense of the word; as (Burke et al., 2021) note, "when most chefs prepare fluid gels, they are generally referring to blended gels rather than truly "fluid" gels". The consistency is achieved by shearing the gel with a blender (Thermomix) to make a fluid gel-like puree (Burke et al., 2021). The proportions of ingredients were adapted from (Fallow, 2025). The solvation of gellan to the aqueous solution was easily achieved through continuously whisking the solution while slowly pouring the powder into it, thus avoiding clumping of the powder. Once the solution reached the desired temperature of 85C, it was poured into a metal container and let to cool down until it set (figure 6). After cutting it and blending with some additional aqueous solution, it was passed through a sieve to achieve as smooth of a texture as possible. While the texture was quite smooth and firm, it was not as fluid as wanted, but a bit too set (figure 7). This could be due to the too high gellan amount or a too low amount of added water in the blending stage. Nevertheless, it was smooth and pleasant enough to be added in between the pie layers. The flavour was sweet and the aroma of apple came through, although it was highly artificial – a drawback of Note by Note cooking.

Figure 6: Set and cut gellan gel

Figure 7: Final gellan gel

The hazelnut foam was composed as the last element of the dish about 10-15 minutes before plating to preserve the foam stability. A light, wet, and coarse foam was desired to complement the thick gel and the dense pastry structure with the airiness of the foam. Using 0.4% xanthan gum with a liquid (water in this case with hazelnut flavour) results in a coarse, wet foam that is on the lighter side (Logsdon, 2015). Another ingredient that can be used to make foams is skim milk powder; not only does it provide structure to a foam (Martínez-Padilla et al., 2014), it also gives a white colour and some dairy flavour to the foam, association with custard or cream sauces that are often served with it. With the addition of hazelnut, the dish delivers a local alternative to the more usual almond pairing in apple pies while still staying in the flavour realm of nuts. The foam was simple to make, with hazelnut-flavoured water inserted in a narrow jug and then blitzed on high with the immersion blender (figure 8) while slowly pouring the mixture of skim milk protein and hazelnut in, trying to ensure proper solvation of the macromolecules while also increasing the time for air incorporation. The final result is a very light foam that is quite liquidy but thicker than water, with many small air bubbles (figure 9).

Figure 8: Immersion blender used for the foam

Figure 9: Final hazelnut foam

For plating, inspiration for the discs was drawn from a comment by professor P. Danaher at the course, who suggested to stack circular discs with the gel in between them. Based on feedback from colleagues and personal choices, the final plating that was considered includes one pie disc topped with the apple gel, as in Danaher's suggestion it is not as visible. This rationale was liked and backed also by fellow classmates in the last session and was chosen for the final plating. The foam was set on circle around the disc to continue the them of circularity, as a hint also to circular economy, another sustainable production method in food systems. The final dish can be seen in figure 10.

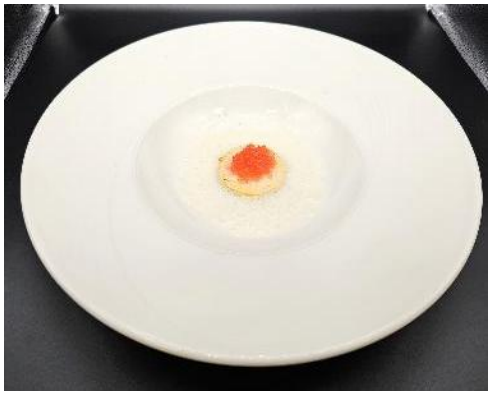

Figure 10: The final dish

Sensory analysis was also performed on the dish by fellow classmates in order to determine the liking of the respondents towards the aspects of appearance and texture in each of the three elements of the dish and overall. The attributes were chosen based on what the judges of the Note by Note competition would look at when judging the dish. The method of analysis chosen was a 9-point hedonic test. The results of the sensory analysis are presented in Table 1. In total, 13 responses were received.

Table 1: Sensory analysis

Attribute	Average hedonic score	Standard deviation (±)
Appearance (overall)	7.4	1.1
Appearance (pastry discs)	7.2	1.7
Appearance (apple fluid gel)	7.3	1.1
Appearance (hazelnut foam)	6.8	1.6
Aroma (overall)	6.4	1.8
Texture (pastry discs)	6.9	1.3
Texture (apple fluid gel)	6.8	1.9
Texture (hazelnut foam)	7.2	1.2

According to table 1, respondents like all attributes related to the product's appearance, texture and overall aroma, more or less in the sense of "liking moderately". With the limitations of the study, namely the small number of respondents, the standard deviation reaches a value between 1.1 and 1.9 units, indicating that true liking can range from liking slightly to liking very much. Nevertheless, even with standard deviation considered, no respondents disliked the product in any of the attributes. When looking at the average hedonic scores, respondents consider the overall appearance as the most liked attribute, and the overall aroma the least liked. One comment noted that the aroma should be made stronger; in subjective experience the lack of aroma was also noted. For future elaboration of the dish, more flavourings should be added for a stronger aroma. Regarding appearance, the hazelnut foam got the lowest score out of the elements. While unclear why, perhaps a stronger or thicker foam could increase the result. Nevertheless, the texture of the foam was the most liked texture out of the three elements. The pastry discs and the apple gel received lower scores for texture; potential ways of improving the score could be the previously mentioned softening of the pastry in the former case and lowering the gellan gum content or increasing the water content in the latter case.

Conclusion

The Note by Note dish “Locavore’s deconstructed apple pie” illustrated that various elements with distinct and appealing textures, complementary flavours, and unexpected forms in terms of the traditional flavours and parts associated with an apple pie were successfully made using Note by Note cooking principles. Shortcrust pastry discs, a gellan-based apple-flavoured sweet semi-fluid gel, and a light hazelnut-flavoured foam were achieved through the use of Note by Note ingredients and cooking methods. While adequate results were achieved in terms of texture and appearance, the pastry discs could have been a bit softer, the gellan gel a bit smoother, and more fluid, and the foam a bit thicker. The dish would also benefit from a stronger aroma and flavour to achieve a great result. Nevertheless, the recipes and methods outlined in the report act as solid bases for future dish development if the need is there. Moreover, the concept of the dish acts as an impactful carrier of the core message presented in the introduction of the report, namely the urge to focus on local ingredients in contrast to ingredients transported thousands of kilometers away as a means to combat excessive climate emissions. While Note by Note cooking is challenging in terms of achieving similar textures and flavours to whole ingredients, it offers a novel way to play with local ingredients (albeit in highly refined and processed form).

References

Augère-Granier, M.-L. (2016). Short food supply chains and local food systems in the EU. *EPRS | European Parliamentary Research Service*. [online] Available at: https://www.europarl.europa.eu/RegData/etudes/BRIE/2016/586650/EPRS_BRI(2016)586650_EN.pdf.

Burke, R.M. et al. (eds) (2021) Handbook of Molecular Gastronomy. CRC Press. doi:10.1201/9780429168703.

Coultate, T.P. (2014). *Food : the chemistry of its components*. Cambridge: Rsc Publishing.

Dorn, M. (2012). *Everything You Need to Know About Pie Dough*. [online] Co+op. Available at: https://www.grocery.coop/food-lifestyle/cooking/everything-you-need-to-know-about-pie-dough.

Fallow. (2025) How Chefs Make Fluid Gels. Available at: https://www.youtube.com/watch?v=6F0bvqwOFh0.

Imeson, A. (ed.) (2009) 'Food Stabilisers, Thickeners and Gelling Agents'. Wiley. doi:10.1002/9781444314724.

Institute of Food Science and Technology (2017). *Protein: gluten formation*. [online] IFST. Available at: https://www.ifst.org/lovefoodlovescience/resources/protein-gluten-formation.

Jia, F. et al. (2024) 'Promoting resilient and sustainable food systems: A systematic literature review on short food supply chains', Journal of Cleaner Production. Elsevier BV. Available at: https://doi.org/10.1016/j.jclepro.2023.140364.

Logsdon, J. (2015). *Foams and Foaming*. [online] Amazing Food Made Easy. Available at: https://www.amazingfoodmadeeasy.com/info/modernist-techniques/more/culinary-foams-technique.

Martínez-Padilla, L.P., García-Mena, V., Casas-Alencáster, N.B. and Sosa-Herrera, M.G. (2014). Foaming properties of skim milk powder fortified with milk proteins. *International Dairy Journal*, 36(1), pp.21–28. doi:https://doi.org/10.1016/j.idairyj.2013.11.011.

Moiraghi, M. et al. (2019) 'Flour and starch characteristics of soft wheat cultivars and their effect on cookie quality', Journal of Food Science and Technology. Springer Science and Business Media LLC. doi:10.1007/s13197-019-03954-9.

Nigella.com. (2011). *Resting Pie Dough/Pastry | Ask Nigella.com | Nigella Lawson*. [online] Available at: https://www.nigella.com/ask/resting-pie-dough-pastry.

Ruhlman, M. (2009). *Ratio*. Simon and Schuster.

Sworn, G., Sanderson, G.R. and Gibson, W. (1995) 'Gellan gum fluid gels', Food Hydrocolloids. Elsevier BV. doi:10.1016/s0268-005x(09)80257-9.

The State of Food Security and Nutrition in the World 2024' (2024). FAO; IFAD; UNICEF; WFP; WHO; Available at: https://doi.org/10.4060/cd1254en.

This, H. (2013) ‘Molecular gastronomy is a scientific discipline, and note by note cuisine is the next culinary trend’, Flavour. Springer Science and Business Media LLC. Available at: https://doi.org/10.1186/2044-7248-2-1.

Tree Council. (2024). *HAZEL*. [online] Available at: https://www.treecouncil.ie/native-irish-tree-item/hazel.

United Nations (2020). *Sustainable Development Goals: 17 Goals to Transform our World*. [online] United Nations. Available at: https://www.un.org/en/exhibits/page/sdgs-17-goals-transform-world.

www.kingarthurbaking.com. (2025). *How to keep pie crust from shrinking, once and for all | King Arthur Baking*. [online] Available at: https://www.kingarthurbaking.com/blog/2023/05/17/how-to-keep-pie-crust-from-shrinking.

Appendix: Logbooks for the sessions

MODULE CODE: TFCS9025

MODULE TITLE: Advanced Molecular Gastronomy

STUDENT NAME: Maximos Tsivourakis

FOOD PRODUCT: Local Eater's Deconstructed Apple Pie

WEEK NO: 1 **DATE: 18/03/2025**

Weekly Aims and Objectives

- Make the first rendition of the dish
    - Make the pie shards
    - Make the apple gel
    - Make the hazelnut foam
    - Combine the elements in an appealing presentation

Materials and Method (Ingredients, Equipment and Method)

Pie shards

Ingredients

Ingredient (brand)	mass (g)	w/w
Wheat gluten (Biotiva)	6	0.059
Wheat starch (Foo Lung Chee Kee)	47	0.461
Sunflower oil (Mediterani)	33	0.324
Water	16	0.157
total	102	1

Equipment

- Bowl (stainless steel)
- Tablespoon (stainless steel)
- Rolling pin
- Cling film
- Baking paper
- Baking tray
- Oven (Skyline Premium)

Method

1. Mix the gluten, wheat starch and salt in a bowl.

2. Add the oil
3. Add water slowly while mixing gently.
4. Wrap in cling film and refrigerate for 30 minutes.
5. Roll into thin disc
6. Bake at 200C for 20 minutes.

Apple gel

Ingredients

Ingredient	Mass (g)	w/w
Gellan gum F (Sosa)	1.1	0.007
Water (gel)	100.0	0.666
Granny Smith Apple Flavour (MSK)	1.0	0.007
Salt (Saxa)	1.0	0.007
Caster sugar (Sysco)	5.0	0.033
Added water	40.0	0.266
Malic acid (Sosa)	1.0	0.007
Raspberry red food colouring (Mallard Ferrière)	1.0	0.007
total	150.1	1

Equipment

- Bowl (stainless steel)
- Tablespoon (stainless steel)
- Thermomix (for blending)
- Saucepan
- Whisk

Method

1. Make the apple jelly by bringing water with sugar, flavour, acid, salt, and colour to 85C and then mixing the gellan gum in with a whisk so it is fully solubilized.
2. Set in a metal bowl and break into pieces.
3. Blend in Thermomix with additional water to get the desired consistency.
4. Pass the gel through a fine sieve.

Hazelnut foam

Ingredients

Ingredient	mass (g)	w/w
Xanthan gum (Redmond Fine Foods)	0.4	0.004
Skim milk powder (MillacValue)	2.5	0.025
Water	94.6	0.946
Hazelnut flavour (MSK)	0.05	0.001
Total	100.0	1.000

Equipment

- Jug (stainless steel)
- Immersion blender (Robot Coup Mini MP 160)
- Spoon (stainless steel)

Method

1. Pour water into a jug, add hazelnut flavour.
2. Pour skim milk powder and xanthan gum slowly to the jug while blending with immersion blender.
3. Blend until desired consistency is reached.

Results and discussion

The session was started by making the apple gel. Initially the Thermomix was used, but it proved too slow in heating the solution to the desired temperature, so instead a burner was used with a saucepan on it. The temperature was measured with a thermometer. The final gel was firm and very slightly brittle. After passing it through a sieve and blending with water, it was quite smooth and fluid, but perhaps a bit too liquidy. The flavour was appalling; too acidic and not sweet at all. The malic acid should be removed for next week. Moreover, the colour was too bright red, a more orangey colour will be attempted next week.

The pastry held its structure, but was way too crumbly, perhaps from the high content of oil in it (KingArthurBaking, 2025). Normally, when pie crust is made with butter, the dough consists of small crumbles of fat and flour “pebbles” before adding the water. Today the dough was already quite fluid and smooth at the stage of adding the fat to the flour, which could indicate that there is too much of it.

The foam was aerated to some extent, but will require either more xanthan gum or skim milk powder to increase the dry matter concentration and thus increase the foaminess, as it was still too liquidy and there were too few air bubbles.

Figure 11: The fluid apple gel after setting and being cut (left) and after blitzing in the Thermomix with additional solution.

Figure 12: The fluid apple gel before passing it from a sieve (left) and after passing it through and adding some colour.

Figure 13: The final pie dough, cooked (left), the hazelnut foam (middle), and the final dish (right)

Conclusions

The elements of the dish are set for a promising start but require more focus in terms of individual attributes; namely for the apple gel the the flavour needs to be less acidic and more sweet. The addition of sugar and removal of malic acid could be useful to mask the unpleasant acidity. Moreover, it should be less fluid, so less water should be added in the blending stage. For the dough, less water should be added to make it less crumbly, and sugar should be added for sweetness. The hazelnut gel will require more skim milk powder or xanthan gum to increase the foaminess.

Recommendations for following week.

- Add more sugar to gellan gel.
- Add more xanthan gum and skim milk powder to foam.
- Decrease fat content in the dough and add sugar.
- Change colour of the gel.
- Remove malic acid.

Ingredients required for the following 2 weeks.

- Keeping the same ingredients bar malic acid, adding yellow food colouring.

MODULE CODE: TFCS9025

MODULE TITLE: Advanced Molecular Gastronomy

STUDENT NAME: Maximos Tsivourakis

FOOD PRODUCT: Local Eater's Deconstructed Apple Pie

WEEK NO: 2 **DATE: 24/03/2025**

Weekly Aims and Objectives

- Adapt recipe based on previous weeks suggestions.

Materials and Method (Ingredients, Equipment and Method)

Pie discs

Ingredients

Ingredient (brand)	mass (g)	w/w
Wheat gluten (Biotiva)	6	0.06
Wheat starch (Foo Lung Chee Kee)	44	0.45
Sunflower oil (Mediterani)	27	0.28
Caster sugar (Sysco)	5	0.05
Water	16	0.16
total	98	1

Equipment

- Bowl (stainless steel)
- Tablespoon (stainless steel)
- Rolling pin
- Cling film
- Baking paper
- Baking tray
- Oven (Skyline Premium)

Method

1. Mix the gluten, wheat starch and salt in a bowl.
2. Add the oil and make a crumbly consistency.
3. Add water slowly while mixing gently.
4. Wrap in cling film and refrigerate for 30 minutes.
5. Roll into thin discs.
6. Bake at 200C for 20 minutes.

Apple gel

Ingredients

Ingredient	Mass (g)	w/w
Gellan gum F (Sosa)	5	0.016
Water (gelling)	250	0.791
Granny Smith Apple Flavour (MSK)	2.5	0.008
Salt (Saxa)	0.5	0.002
Caster sugar (Sysco)	25	0.079
Yellow food colouring (Mallard Ferrière)	2.5	0.008
Raspberry red food colouring (Mallard Ferrière)	0.5	0.002
Added water	30	0.095
total	316	1

Equipment

- Bowl (stainless steel)
- Tablespoon (stainless steel)
- Thermomix (for blending)
- Saucepan
- Whisk

Method

1. Make the apple jelly by bringing water with sugar, flavour, salt, and colour to 85C and then mixing the gellan gum in with a whisk so it is fully solubilized.
2. Set in a metal bowl and break into pieces.
3. Blend in Thermomix with additional water to get the desired consistency.
4. Pass the gel through a fine sieve. Adjust colour if necessary.

Hazelnut foam

Ingredients

Ingredient	mass (g)	w/w
Xanthan gum (Redmond Fine Foods)	0.5	0.005
Skim milk powder (MillacValue)	3	0.031
Caster sugar (Sysco)	5	0.051
Water	89.1	0.912
Hazelnut flavour (MSK)	0.1	0.001
Total	97.7	1.000

Equipment

- Jug (stainless steel)
- Immersion blender (Robot Coup Mini MP 160)
- Spoon (stainless steel)

Method

1. Pour water into a jug, add hazelnut flavour.
2. Pour skim milk powder, sugar and xanthan gum slowly to the jug while blending with immersion blender.
3. Blend until desired consistency is reached.

Results and discussion

Pie shards

Figure 14: Final pie shards, fluid gel and foam

This week, the pie shards had a bit more structure compared to week 1, likely due to the reduced amount of fat added to the dough. However, the texture was still somewhat unstable, and while not ideal, the shards were noticeably sweeter, which improved the overall flavor. The oil content should still be reduced, as the dough was not consisting of “granules” in the pre-water stage. The fluid gel was noticeably sweeter and less acidic, resulting in a more pleasant taste. However, the texture was too firm and gloopy, which negatively impacted its intended fluidity. This was likely due to either poor solvation of the gellan gum or the use of too high a concentration in the formulation. The colour of the gel was also better this week, with a more orange tint representing a more “jammy” or cooked apple colour. Regarding the hazelnut foam, a slightly higher amount of xanthan gum was added to improve foaminess, which led to a minor improvement in structure. However, the foam was still not as airy as desired. Additionally, the hazelnut aroma remained too weak, showing that a higher concentration of hazelnut flavouring is needed for better aroma impact. In addition, the plating should be improved for next week. Professor P. Danaher suggested the use of a circular mold to make discs of the pastry and stack them on top of each other with the apple gel in between. This sounds promising, so it will be tried next week.

Figure 15: Final dish of week 2.

Conclusions

Overall, adaptations this week showed some improvements in sweetness and flavor balance across components, particularly in the pie shards and fluid gel. However, texture issues persisted in all elements, including pie shards that were still too crumbly, an overly firm fluid gel, and an under-aerated hazelnut foam. While minor progress was made, further refinement of formulation and the method, as well as plating, are needed to achieve the desired result.

Recommendations for following week.

- attempt new plating
- add more hazelnut flavour to foam and more xanthan gum and skim milk powder
- focus on method of gel, reduce gellan gum amount
- reduce fat in pie shards
-

Ingredients required for the following week.

- Keeping the same ingredients.

MODULE CODE: TFCS9025

MODULE TITLE: Advanced Molecular Gastronomy

STUDENT NAME: Maximos Tsivourakis

FOOD PRODUCT: Local Eater's Deconstructed Apple Pie

WEEK NO: 3 **DATE: 31/03/2025**

Weekly Aims and Objectives

- Adapt changes to recipe from previous week.

Materials and Method (Ingredients, Equipment and Method)

Pie discs

Ingredients

Ingredient (brand)	mass (g)	w/w
Wheat gluten (Biotiva)	6	0.06
Wheat starch (Foo Lung Chee Kee)	44	0.47
Sunflower oil (Mediterani)	22	0.24
Caster sugar (Sysco)	5	0.054
Water	16	0.17
total	93	1

Equipment

- Bowl (stainless steel)
- Tablespoon (stainless steel)
- Rolling pin
- Cling film
- Baking paper
- Baking tray
- Oven (Skyline Premium)

Method

1. Mix the gluten, wheat starch and salt in a bowl.
2. Add the oil and make a crumbly consistency.
3. Add water slowly while mixing gently.
4. Wrap in cling film and refrigerate for 30 minutes.
5. Roll into thin discs.
6. Bake at 200C for 20 minutes.

Apple gel

Ingredients

Ingredient	Mass (g)	w/w
Gellan gum F (Sosa)	3.5	0.011
Water	250	0.795
Granny Smith Apple Flavour (MSK)	2.5	0.008
Salt (Saxa)	0.5	0.002
Caster sugar (Sysco)	25	0.079
Yellow food colouring (Mallard Ferrière)	2.5	0.008
Raspberry red food colouring (Mallard Ferrière)	0.5	0.002
total	30	0.095

Equipment

- Bowl (stainless steel)
- Tablespoon (stainless steel)
- Thermomix (for blending)
- Saucepan
- Whisk

Method

1. Make the apple jelly by bringing water with sugar, flavour, salt, and colour to 85C and then mixing the gellan gum in with a whisk so it is fully solubilized.
2. Set in a metal bowl and break into pieces.
3. Blend in Thermomix with additional water to get the desired consistency. Add colour if necessary to reach desired colour.
4. Pass the gel through a fine sieve.

<u>Hazelnut foam</u>

Ingredients

Ingredient	mass (g)	w/w
Xanthan gum (Redmond Fine Foods)	0.6	0.006
Skim milk powder (MillacValue)	4	0.041
Caster sugar (Sysco)	5	0.051
Water	88.7	0.901
Hazelnut flavour (MSK)	0.2	0.002
Total	98.5	1.000

Equipment

- Jug (stainless steel)
- Immersion blender (Robot Coup Mini MP 160)
- Spoon (stainless steel)

Method

1. Pour water into a jug, add hazelnut flavour.
2. Pour skim milk powder, sugar and xanthan gum slowly to the jug while blending with immersion blender.
3. Blend until desired consistency is reached.

Results and discussion

This week the pie discs were firmer and held their structure better, showing improvement compared to previous trials. However, they still lacked a proper snap and remained slightly too crumbly, suggesting that the fat content should be reduced a bit more still to achieve a firmer consistency. The new disc shape was more visually appealing and will be kept for next week. The fluid gel had a more appealing colour and a sweeter, better-balanced flavour after the removal of malic acid. However, the texture remained slightly too gloopy, suggesting further adjustments are needed to achieve a smoother, more fluid consistency. While it was ensured that the gellan solvates properly by whisking the water vigorously while adding the powder slowly, perhaps the additional water in the blending stage was not enough. The hazelnut foam had a nicer airiness this time around, suggesting that the higher amount of xanthan gum and skim milk powder helped. The hazelnut flavour was more noticeable as well. The plating was much nicer than the previous two weeks, with more elegance due to circular shape of the discs and the gel between them. However, it could be still improved.

Figure 16: Final foam, fluid gel, and pie discs for week 3

Figure 17: Final dish of week 3

Conclusions

This week showed noticeable progress across all components. The pie discs were firmer and held their shape better, and the new circular shape improved the plating visually, although the texture was still slightly too crumbly, indicating a need to reduce fat content further. The fluid gel showed improvement in flavour and colour after removing malic acid, but its texture remained too gloopy, possibly due to insufficient water during the blending stage. The hazelnut foam had improved airiness and a more pronounced flavour, suggesting that the adjusted xanthan gum and skim milk powder ratios were effective. Overall, the dish came together more cohesively, with a more elegant presentation, though there is still room for refinement in both texture and plating.

Recommendations for following week.

- Adapt new plating option
- Add more water to gellan gum gel in blending stage

Ingredients required for the following week.

- Keeping the same ingredients.

MODULE CODE: TFCS9025

MODULE TITLE: Advanced Molecular Gastronomy

STUDENT NAME: Maximos Tsivourakis

FOOD PRODUCT: Local Eater's Deconstructed Apple Pie

WEEK NO: 4 **DATE: 07/04/2025**

Weekly Aims and Objectives

- Attempt new plating.

Materials and Method (Ingredients, Equipment and Method)

- See main body of the report (final ingredients, equipment, and method).

Results and discussion

- See main body of the report (final results and discussion are based on the final session).

Conclusions

- See main body of the report (final conclusion is based on the final session).