

A waffle generator, by Martin Lersch

Hervé This vo Kientza^{1,2}

1 Université Paris Saclay, INRAE, AgroParisTech, UMR SayFood 0782, 91120 Palaiseau, France

2 Group of Molecular Gastronomy, INRAE-AgroParisTech International Centre for Molecular and Physical Gastronomy, 22 place de l'agronomie, 91120, Palaiseau, France.

*Correspondence: herve.this@inrae.fr

Abstract

Our Norwegian colleague Martin Lersch, a chemist who created the internet site Khymos, introduced a waffle generator.

Keywords

Avogadro, generator, recipe, waffle

Sunday August 9th was the 250th anniversary of the birth of Italian chemist Amedeo Avogadro. In celebration of this, our Norwegian colleague Martin Lersch announced Avogadro, a parametric waffle recipe generator (Lersch, 2026a; 2026b, 2026c). In the internet page of Avogadro, you choose the ingredients and you nudge sliders for properties like sweetness, richness and tanginess; the tool computes a complete batter on the spot, scaled to the number of eggs used, and a waffle heart quality indicator shows whether the batter is workable and how typical the composition is.

Under the hood, Avogadro is built on a mathematical model distilled from nearly 1,000 waffle recipes, mainly from Norway and Scandinavia. The model captures the underlying relationships between ingredients - what actually makes a batter behave like a batter - so that every generated recipe, however unusual its slider settings, stays grounded in how waffles are really made.

For sure, eating (new) waffles is fun, but Martin Lersch announced also that he will publish soon his model... and this is what will interest more all those who are interested in molecular and physical gastronomy.

Some remarks, about the current production first

It is clear, and displayed, that the internet page is Scandinavian, because the proposed waffles have the shape of an heart. This is very particular, and one should know that there are

News

many different waffles specialities : there are beer waffles, Flemish-style (with yeast and beaten egg whites), German-style (with spices), American-style (with baking powder), as well as chocolate, cheese, bacon, and fruit varieties; Bordelaise (orange blossom), Binche (buttermilk and yeast), Brussels (20-pocket), Campine (thin), chasse (thick, with coarse sugar grains), Liège (fermented, with cinnamon, 24-pocket), home-style, hard, and Scandinavian (heart-shaped, very thin) waffles... to name but a few.

Above all, however, one must mention the oublie—recorded as early as the 12th century under the name oublie or oblata, a term still closely linked to its religious meaning of an unconsecrated communion wafer—before the 13th century saw its emergence as a secular pastry. The oublie is flat, like the wafer, and there was an entire profession dedicated to its production: the oublieurs (This, 2019).

Now, about a molecular model

I don't know what Martin's model is, but we can start from the communion wafer: a non-fermented bread, made into a thin disk. This means that there is starch and “gluten”: gluten is a continuous network that forms in the presence of water—when gliadin and glutenin proteins are cross-linked by water molecules (and possibly other chemical bonds) during kneading (Shewry and Belton, 2024). Then, during cooking, the starch granules gelatinize and form a continuous gel, creating a second network that strengthens the wafers, particularly once the water has evaporated (Assifaoui et al., 2006; This, 2021). The thinness and the dryness make the crispiness.

In waffle dough, adding butter and eggs is important both for flavour and for consistency. In particular, egg proteins add another network, and possibly a foamy consistency if the egg white or yolks are whipped. The distribution of fat, as particles, soften the final system (the fat, at room temperature, is partly liquid, partly solid, the reason why I spoke of particles rather than

droplets) (This vo Kientza, 2023).

What about the limits for the proportion of the ingredients? If you play with butter and flour only, distributing the fat in the network of the flour, the mathematical problem called Apollonian gasket was solved in 1982: the Alsatian mathematician François Apery demonstrated that you can have 100 % fat (Apery, 1982). And at the other end, a waffle with 0 % fat would be more an oublie.

The sugar? The honey? The milk? The yeast? The final water content? All these ingredients have an effect that can be guessed using simple physics and chemistry ideas. For example, sugar dissolves in water; milk is adding mainly water, proteins and fat. Etc.

And this is why molecular and physical gastronomy is so useful for cooking.

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News

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