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MODERN GASTRONOMY
The science of flavor and tasting

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Introduction
The role of food in tourism and the economy at large can hardly be underestimated. The OECD (2012) states that there is a growing number of tourists that are looking for authentic and novel food experiences that are linked to places they visit. Tourists eat at least twice a day, and food expenditure is reported to comprise at least 30 per cent of tourist expenditure. Evidently, this money is spent in local businesses, which is positive for the employment of people and may help to ease poverty in relevant places. The above-mentioned report gives examples of such policies. Increasingly, (local) governments are acknowledging the importance of gastronomic or culinary tourism and developing programs to attract tourists. This development may well be inspired by the success of Catalonia in Spain and/or the development of the Nordic cuisine in the Scandinavian countries (Byrkjeflot, Strandgaard Pedersen, and Svejenova 2013). The dominant positions of restaurants from these regions in the list of best restaurants is likely to be correlated to the interest in gastronomy of their governments.

Consumers have become more and more knowledgeable and demanding. According to Pine and Gilmore (1999), the economy has shifted from service to experience. They argue that the contemporary consumer is willing to pay more for complete and meaningful experiences that enhance a basic service, like eating and drinking, and bring it to a higher level. Boswijk, Thijssen, and Peelen (2005), elaborated on this concept and outlined the following characteristics of such experiences:

- There is a heightened concentration and focus, involving all one’s senses.
- One’s sense of time is altered.
- One is touched emotionally.

Hospitality professionals deliver the gastronomic experience. If you take the above seriously, delivering a meaningful gastronomic experience must be regarded as quite a challenge. Many aspects could be involved, like authenticity (local ingredients, preparations, customs, etc.), quality and consistency, food safety and security, local sourcing and building networks, and marketing strategies and promotion, just to mention a few. We will ultimately focus on a subject that is crucial above all: the role of education of food professionals in
the development of gastronomic tourism. The scientific approach to gastronomy offers a fundamentally new way to assess eating and drinking and therefore liking or customer satisfaction. In this chapter, we will discuss some aspects of this new view on gastronomy, how it links to hospitality and hospitality management, and how this knowledge could benefit hospitality education in relation to gastronomic tourism. We first take a closer look at how we define gastronomy.

**About gastronomy**

Traditionally, gastronomy was primarily associated with culinary enjoyment, or ‘the practice or art of choosing, cooking and eating good food’ as the Oxford dictionary states. Today we define gastronomy as the science of flavor and tasting (Klosse 2013). This new definition brings gastronomy to a completely different playing field; it places it in the realm of science, and this offers great opportunities, especially for training of food professionals both in the service and in the kitchen.

The two central concepts in the science of gastronomy are flavor and tasting. Both are intricately related and yet very different. Flavor can be defined in many ways. In our view of gastronomy, flavor can best be considered as a product quality, a result of nature and human intervention. Thus defined, flavor is basically a particular collection of molecules and physical structures. Consequently, flavor is placed in the world of the natural sciences and has quite an objective dimension. Tasting, on the other hand, is the human capacity to register flavor, and people use all of their senses to do that. Tasting is a sublimation of our senses. Therefore, it is by definition subjective and the domain of the human related sciences, including bodily knowledge like neurology.

The mission of gastronomy is to get a better understanding of why foods and beverages are liked. Liking adds value to the tasting experience. This is a function of the brain: information gathered during tasting is synthesized and interpreted. This is flavor perception and can be defined as the brain image we get from tasting. This whole process has always been considered as a black box and led to the general supposition that there is no arguing about taste.

The key for opening this box is making the distinction between flavor and tasting. When a wine is poured from one bottle, people have the same product, yet they can perceive the same wine differently. Flavor is the constant, people are the variable. If both flavor and tasting are considered to be personal, or rather subjective, scientific research is severely hindered, if not impossible. It may well be one of the reasons why we still know little about tasting compared to other senses.

**Flavor classification**

Flavor can be assessed objectively and this opens the door for classification. The flavor styles model was developed which can be used for all kinds of purposes. It is a tool to identify flavors and communicate about them. Furthermore, this model is used for menu composition, improvement of dishes, and for matching foods and beverages. The model is based on powerful parameters that can be measured, at least to a certain extent: *mouthfeel* and *flavor intensity*. These are the universal flavor factors that help to describe the flavor not only of wines, but also of chocolate and chips, French fries and mayonnaise, soft drinks and milk, beer and wine, coffee and tea, meat and fish, fruits and vegetables. In other words, in everything we could possibly taste, these same flavor factors can be distinguished, in all kinds of ways, combinations and intensities, or in whatever culture or local cuisine.
Mouthfeel is the core concept of the classification. Mouthfeel is about the feeling a product gives in the mouth, whether it is a food or a beverage. Within mouthfeel, three classes are distinguished:

- Contracting
- Coating
- Dry

Within each class of mouthfeel, there are differences in intensity. Take acidity: we can measure the acidity by looking at the pH and the concentration. The lower the pH and the higher the concentration, the greater the intensity and the force of contraction will be. Likewise, there are many mustards on the market that may be very different in contracting. In many cases, mixing ingredients within the same class will also lead to a rise in intensity. Think of how the flavor intensity increases when you add salt or red peppers to a regular vinegar. Or how the force of coating increases by mixing sugar and fat. This particular mix is suggested to be the secret behind many popular industry foods.

We see the three classes of mouthfeel as forces, vectors if you want. For something to be tasted, it needs to be above the so-called ‘sensory threshold’. That is where the intensity starts. In essence, flavor intensity is about the force of flavor. Not all intensities are equal and they mutually react. There are elements that enhance flavor and there is suppression or masking. It is a real power play.

The vectors of mouthfeel flavor combined with intensity form the basis of a three-dimensional model: the flavor styles cube with eight distinct flavor styles. This theory is scientifically validated in my thesis The Concept of Flavor Styles to Classify Flavors (Klosse 2004).

Deliciousness and liking

Food quality can be considered both the most well-defined and ill-defined concept in the food industry today. Food scientists or professional chefs are likely to define food quality from a product point of view. Their definition does not necessarily correspond with consumer opinion. For commercial food products and dishes in restaurants, it is essential that a product has a high quality from a consumer point of view. For commercial food companies, restaurants included, it is essential to know the ‘drivers’ of product acceptance (Cardello 1995).

Similar to distinguishing flavor and tasting, it is useful to separate deliciousness from liking. Deliciousness relates to flavor and liking relates to tasting. The first is product-related, the second human-related. The logical consequence would be that deliciousness could also be approached objectively, just as flavor. Liking is a personal judgement and, by definition, subjective. Deliciousness is in the hands of the producer, chef, winemaker, even of nature itself, while liking is the desired consumer response.

An interesting perspective opens up. Is ‘yummy’ a coincidence? Is there a right way of doing things? To say the least, there is a lot of objective knowledge involved. Harold McGee’s On Food and Cooking (2004) unlocked many culinary secrets. In 2011, Nathan Myhrvold and his associates added ‘Modernist Cuisine’ to the ‘must have list’ of chefs Myhrvold, Young and Bilet (2011). It is important for chefs to learn about the science behind their recipes. People will like foods that have been well prepared over the ones that have been ruined by a bad cook.

We can also approach the question from the other side: if yummy was a coincidence, it would be reasonable to suppose that the group of people that like a certain product or combination would always be find a similar number of people that dislike it. We know that this is not the case.
Although there are – to my knowledge – no foods that are universally liked, it is clear that there are foods that are liked more than others and even more importantly, it is safe to assume that the ones that are well-prepared are better liked than the ones that are less well-made.

Liking is a subjective personal judgement. People are not the same, which implies that the same food may be liked by the one and disliked by the other. Tasting capacity differs from person to person and there are many other influences. Tasting is learning. Some preferences are ‘acquired tastes’. A liking for beer, Brussels sprouts, coffee, and dark chocolate takes time to develop. Wine tasting is can also serve as an example. People can learn to recognize flavors and build up experience. In the process, it is likely that preferences and liking are going to shift. Elements that experts consider as positive, may be negative drivers of liking for ‘normal consumers’, and the other way around: amateurs may like flavors that experts consider to be defects (Hughson and Boakes 2002; Delgado and Guinard 2011).

**Culinary success factors**

Up to now, the fundamentals of flavor composition have not been formulated. Without a solid backbone, cooking and food-product development can easily get the character of ‘cook and look’. In art, music and architecture, laws of composition have been developed. Deliciousness in taste is comparable to ‘beauty’ in art. The ancient Greek had the same word, techne, for both ‘art’ and ‘technique’. Art was defined as ‘the right way of making things’. In all art, technique is essential. There may be technique without art, but there is no art without technique. Formulating CSFs can be seen as a first step in getting a better understanding of flavor and the components that drive liking.

The CSF’s were developed by analyzing successful dishes of 18 of the best chefs in the Netherlands. Six product characteristics or Culinary Success Factors (CSFs) were found and these were tested several times at different locations. This was done by having chefs develop three series of similar dishes. Every series consisted of one dish based on the CSFs and two variants, in which one of the CSFs was systematically left out, under the condition that the dish was still restaurant worthy. In a tasting, these nine dishes were served to focus groups. In the tasting, the ‘perfect’ dishes were preferred over the variants.

The following CSFs have been identified (Klosse 2004):

1. Name and presentation fit the expectation
2. Appetizing smell that fits the food
3. Good balance in flavor components in relation to the food
4. Presence of umami
5. Combination of hard and soft textures
6. Flavor richness is high

Another international study confirmed these outcomes (Klosse, poster presentation at the Pangborn conference Aug. 2017). The results show that the deliciousness of dishes is not a coincidence. It is the predictable outcome when the CSFs of food are present. The formulated CSFs will help chefs in the development of new dishes and improvement of existing ones. An interesting prospect for future research is to verify these factors in other cultures.

**Quality perception**

Consumers are not neutral observers and therefore flavor perception merits our attention. In hotels and restaurants, gastronomy is directly linked to hospitality. Above, we mentioned
hospitality as an extrinsic factor. Therefore, it is logical that hospitality studies incorporate knowledge about gastronomy (see Santich in Lashley, Lynch and Morrison 2007). Liking is personal. Every human being has a personal framework in which he or she tastes. There are differences between men and women, children and the elderly, and genetic variations of human beings in general. Culture and experience play a role and also the climate and the price of products, just to mention a few of many influences. And it doesn’t stop there: products that are tasted simultaneously tend to react on each other. There are flavors that enhance others, while some others degrade. Even the greatest of wines can turn into ‘plonk’ with the ‘wrong’ meal, and adding an unfitting herb or spice may spoil the flavor of a dish. Surely, those types of interactions can better be avoided.

Flavor must also fit time and place. Consequently, the relationship between product quality as such and consumer appreciation is indirect and can be very complex. It is conceivable that although product quality may be high based on product characteristics, the consumer does not like it. In other words: a product is not good, but it is found to be good. This concept is known in marketing as the difference between the product and the consumer approach, and this applies to many other product categories as well.

In general, expectancies play an important role in liking. The package, label, and advertisements of products are mostly designed to raise consumer’s expectation of a product. Care should be taken that the product meets these expectancies. If it does, it is reported to be able to modify people’s actual perceptual experiences, similar to placebo effects in medicine. The magnitude of this effect is related to the availability and reliability of sensory information. If there is ample reliable information, the role of expectancy is smaller than when sensory information is less available and less reliable (Dougherty and Shanteau 1999).

Broad and fundamental approach

Mouthfeel and flavor intensity describe the intrinsic side of flavor; what it factually is. But before we take a bite or a sip, we are likely to have seen or heard things about what we’re going to taste, and we also have our recollections and prior experiences. These are the so-called extrinsic elements. These may be more important than often thought. Studies show that ‘what you see, is what you get’ finds a new dimension in flavor perception. Connoisseurs describe a white wine differently after it has been colored red with neutral coloring (Morrot, Brochet, and Dubourdieu 2004). Presentation is important in general. Indeed, the plates can have an influence on the flavor of the dish. Food served on a star-shaped plate was reported to be perceived as more bitter than when served on a round plate. Yoghurt was judged to be more dense and expensive when it was eaten from a heavier bowl. These heavier bowls even made people feel more full (deLange 2012). Other experiments show the influence of atmosphere. Music in restaurants, for instance, may well prove to influence the flavor experience. People enjoyed eating oysters much more when hearing breaking waves than farmyard sounds. Conversely, a dish of bacon and eggs tasted more ‘bacony’ when listening to the sound of sizzling bacon than to a farmyard of clucking chickens. Heston Blumenthal’s dish ‘the sound of the sea’ is a good example of how this knowledge can be set to use (Spence and Shankar 2010; Spence and Piqueras-Fiszman 2014).

If such extrinsic factors of flavor are taken into account, tasting gets even more multisensorial as sight and hearing are involved as well. All the more reason to use the word flavor, whenever an edible product is involved. It is the flavor, and not the taste, of a certain dish or a wine that is being tasted. Flavor is the product property part of taste that is influenced by peo-
people like chefs, brewers, and winemakers. At the same time, flavor may have an emotional side, which leads to preferences and appreciation. To mention just one example: in some cultures, insects are a delicacy; in others, people wouldn’t dream of eating them.

Both on the product and on the people side, tasting is influenced by a host of external influences. On the product side, such influences include the name on the menu, presentation, advertising, price, etc. Tasting is also influenced by various aspects that affect people, such as hospitality, atmosphere, culture, education, knowledge and experience, religion, sensory capacity, etc. If we truly want to understand why people enjoy some foods more than others, all of these aspects need to be taken into account.

Much of the above influences expectancy. In tourism, people in general have different objectives and expectations. Unfamiliar foods are a barrier to some and an attraction to others. Mitchell and Hall (2003) distinguish four types of food tourists, the gastronomes, indigenous foodies, tourist foodies, and familiar foodies. Of these, the last group is considered to be neophobic; only the ‘gastronomes’ seem interested in discovering new foods and may choose to eat foods that are unfamiliar to them.

**Gastronomic tourism and education**

Gastronomy is closely linked to the culture and heritage of a certain region. What local people eat, when, where, and the way they eat are all visible manifestations of culture. In fact, food can be considered as the most intimate contact with the local culture as it is ingested. Furthermore, landscapes have often been forged by the food that is grown and the way this is done.

We have seen that there is an interest in attracting tourists through food. We have also shown a new approach in gastronomy which opens new windows in educating people about flavor and tasting. On the flavor side culinary education could be less recipe-based. Chefs could profit from knowing more about food science and how product characteristics and culinary techniques relate to the composition of flavor, e.g. the culinary success factors and deliciousness. On the tasting side, hospitality education could be less service-oriented. Again, education should change, and putting more focus on learning about understanding the customer and how all the extrinsic influences could enhance the food experience would be a great step forward.

For strategies to attract gastronomic tourism to be successful, it is essential to include programs to educate the food professionals that must do the job of satisfying the customers, in all levels of restaurants. Food professionals should be able to ascertain that their guests enjoy what is being served. After all, these guests do the tasting and must pay for the service. Clearly, it is vital for a successful operation that they like what they have consumed. However important, without specific knowledge and experience, ‘deliciousness’ and ‘liking’ are elusive concepts. The academic approach to gastronomy could enable students to make it less mysterious.

In the development of the curriculum of gastronomy, we need to take into account that the senses of gustation, olfaction, and touch have been considered during history as inferior to seeing and hearing. Onfray (1991) gives a review of the history of this neglect. Consequently, modern day people need to be trained at schools or universities. Therefore, practical tastings and workshops are needed to develop experience and create a basis for understanding gastronomic concepts. Senses that have long been neglected need to be involved in the construction of the (gastronomic) reality of the students. This form of constructivist education deserves the attention of educational researchers.
References


