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Sensory Science Research on Taste. An Ethnography of two Laboratory Experiments in Western Europe

Abstract:

Recent ethnographies from the anthropology of food and the senses have shown how moments in which people taste foods are shaped by scientific knowledge, methods and rationales. Building on approaches developed in science and technology studies, this paper offers an ethnography of the field to which this shaping power has been assigned: the scientific study of taste. Detailed tracing and analysis of two laboratory experiments on taste performed in laboratories in Western Europe brings out how both turn moments in which people taste into a bodily response. At the same time, since their technical set-ups address different societal problems and varying interest groups, they stage diverging versions: a perception versus a reaction to an exposure. The paper, thus, sheds light on how cultural and social norms, ideals, and practices shape the knowledge production about taste and its resulting effects.

Introduction

During the past three decades, moments in which people taste foods have increasingly become the focus of ethnographic research. Anthropologists of food and the senses have observed, mostly over long stretches of fieldwork, how such moments are crafted in celebrations and festive events in temples in North-Central China (Chau 2008) and in the Massim river region in Papua New Guinea (Howes 2003); in everyday-life cooking and eating practices among Samburu cattle herders in Northern Kenya (Holtzman 2009) and people living on the Greek island Kalymnos (Sutton 2001); and in production and consumption processes of food, such as coffee in Rwanda (Goldstein 2011) and olive oil in Palestine (Meneley 2014).[1] Anthropologists have analyzed how such moments are tied up with memories of the past (Sutton 2001; Seremetakis 1996) and create a sense of place (Trubek 2008; Meneley 2014), brought out how these moments engender specific socialities (Chau 2008; Janeja 2010) and organise gender and age divisions within a group of people (Holtzman 2009), and have shed light on the vocabulary that people have at their disposal, or are taught to use, to express sensations related to the foods they engage with (Senft 2011; Goldstein 2011). Illuminating how moments in which people taste foods occur in a variety of situations and sites, ethnographies of the anthropology of food and the senses have covered a broad range of analytical topics and themes.

Recently, a new theme has begun to emerge. Anthropologists of food and the senses (Roosth 2013; Jakobsen 2013) observed that moments in which people taste food are shaped by scientific research, methods, and rationales. Roosth (2013) witnessed molecular cuisine chefs in France drawing on techniques and elements from chemistry, employing laboratory methods such as vacuum distillation and centrifugation, and using chemical compounds like transglutaminase, methylcellulose, and xathan gum to improve the taste of classical dishes, to develop new ones and, more generally, to further culinary arts (5). By doing so, the chefs replace their practical knowledge, a type of knowledge traditionally relayed from grandmothers to mothers to daughters (8-9). Roosth's ethnography shows how the reinvention of French cuisine as rational and positivist perpetuates gender inequalities.[2]

If anthropologists of food and the senses have recognized that moments in which people taste foods are formed by scientific research, methods and rationales, the question of how such moments are themselves turned into the object of scientific inquire remains. That this has been left unexplored is surprising, considering that, in medical anthropology and science and technology studies (STS), there is a longstanding tradition of ethnographically investigating how scientific knowledge about bodies and their physicalities are produced (see for instance Latour and Woolgar 1986; Martin 1991; Mol 2002; Epstein 2008). In one of the first studies of this kind, Bruno Latour and Steve Woolgar conducted participant observation of scientists doing research in a US endocrinology laboratory (Latour and Woolgar 1986), studying the process through which a part of the human body, the hormone TRF(H) was discovered. They observed that scientists not only logically deduced facts and counter-facts, but that the technical equipment, the material arrangement and other researchers present in the laboratory also influenced the kind of facts and counter-facts that were presented and

discussed (105-150). On the basis of these observations, Latour and Woolgar argue that scientific facts are *socially* constructed. This has recently been taken a step further in *The Body Multiple* (2002) by Annemarie Mol. Mol conducted participant observation in a hospital in the Netherlands, investigating how a bodily abnormality, a disease called arteriosclerosis, is diagnosed and treated. She observed that the two techniques doctors used to diagnose the site and severity of a patient's disease (angiography and duplex doppler) presented them with more than just different data: while angiography made arteriosclerosis visible as lumen loss, duplex doppler made the same disease tangible and audible as change in blood velocity (53-85). Drawing on this, Mol argues that rather than providing different perspectives on one and the same phenomenon, medical practices enact a single disease in different versions (84). Thus, *The Body Multiple* (2002) proposes that knowing about a bodily physicality can imply enacting it in *different* ways.

If the human body, rather than being given, is an object about which knowledge is produced in specific sites, such as natural science laboratories, where facts are materially and socially constructed, and if knowing physicalities of bodies can imply enacting these differently, what does this imply for taste? How do natural science research practices enact taste? And how can we, as social scientists, engage with realities of tasting that are situated at the intersection of scientific, industrial, political and everyday-life processes and politics, and the many, potentially anything but unproblematic, dynamics that unfold in them? To answer these questions, this paper presents an ethnography of contemporary research on taste in Western Europe.

Sensory science in Western Europe

"Taste in humans," as it is called in textbooks (Lawless and Heymann 2010; Taylor and Roberts 2004) is the object of research in a field called sensory science. Sensory science, as the homepage of a master's studies program puts it, investigates “how people use their senses when interacting with food".[3] The field is situated at the intersection of psychology, medical sciences, food science, human nutrition and consumer research. Although the question of what happens as people taste foods arose during World War II when soldiers would not eat rations, because they did not like how they looked and tasted, the field only gathered momentum in the United States mid-century when the US Army provided funds and impetus to existing scientific and industrial interests to generate knowledge (Shapin 2011b: 179).[4]

Nowadays in Western Europe, sensory science research takes place in a variety of sites, including university departments, extra-muros research facilities, hospitals, and marketing departments of food-producing companies. It does not happen without funding, some in form of contract research, some in basic research. Contract research refers to research that is paid by and conducted for a client. Clients in Western Europe include individual companies, collectives of food producers, national governments, and the European Union (EU). In this area, research, especially if it focuses on consumers, often morphs into a wide range of tests that assess (consumer's) "hedonic liking," "expectations," "acceptance," and, most recently, "emotions" roused by specific food products.

Basic research, for the past few years, has also required application for funding. Heads of department and senior scientists submit research proposals to receive grants from schemes that have been set up by national governments, the EU, or alliances that, in the Netherlands for instance, have been formed by universities together with the national government and food industry. Heads of departments and senior sensory scientists sometimes also convince food producers to support (financially or through the provision of raw materials) individual PhD projects, even though these projects pursue research questions that are not immediately relevant for the food producer. Examples of such, I found out during a literature research (see below), include "implicit associations between taste and pitch revealed through food names" (Crisinel and Spence 2009), "change of the human taste bud volume over time" (Srur et al. 2010), and "effects of texture and flavor on expected satiation of dairy products" (Hogenkamp et al. 2011).

Investigating sensory science research practices

To gain insight into sensory science research practices, I started in 2009 by carrying out a literature research of publications from the field of sensory science. Based on the publications, I identified research facilities in Western Europe where one key object of study was "taste in humans" or "taste." I contacted five of them that diverged in terms of methods that they used. Between 2009 and 2011, I carried out semi-structures interviews with heads of the institutes, research managers, senior and junior scientists, research assistants and research subjects. STS scholars (for instance, Latour and Woolgar 1986: 15-41) have pointed out that scientists, in their descriptions of scientific practices, are influenced by conventions about how to represent them. They downplay the craft character of doing science. STS scholars have thus developed the strategy of observing scientific/medical practice in situ, in natural science laboratories and hospitals. Following this strategy, I too engaged in participant observations in the research facilities. Being co-present in actual research spaces or, if that was not possible, in the adjacent waiting rooms and offices, allowed me to see the construction of entities (for instance, a liquid chocolate model system and a population of healthy young adults) and the ongoing adjustments made between them. Out of numerous applied and seven basic science research projects that I observed during fieldwork, I will present two,[5] chosen for their similar size, shared status as basic research, and focus on what the respective scientists called "taste.[6]"

Taste in lab F: Flavor perception

Lab F is part of a Department of *Food Science* that is based in the United Kingdom. The Department consists of several research groups. Some of the groups investigate food objects, such as edible oils and fats. Others study food production processes, such as the generation of flavors during the process of malting. The department collaborates with food producing companies by, for instance, providing training for employees working in their R&D departments. While the other research groups in the department do research on foodstuffs, lab

F investigates how food objects are *perceived sensorially*. When I introduced myself as being interested in "taste," the head of the department asked what exactly I meant by this and quickly went on to answer her own question by explaining, "What we study here is the sensation that you get when you eat food and what the ordinary man on the street means when he says, 'This food tastes nice.' This includes not only the receptor interaction with one of the five basic tastes of sweet, salt, bitter, sour, and umami but also other receptor interactions, the five basic tastes and odor or texture, and their integration in the brain." In the 1990s, she explained, researchers from the lab performed an experiment on the sensory perception of mint-flavored sweets. In the experiment, the research subjects' perception, while sucking the mint, of the menthol odor, which in the traditional model of the five senses is categorized as smell, had not matched the release of aroma compounds. Instead it had correlated with the amount of sugar contained in the mint, which in the traditional model of the five senses is classified as taste. "We have thus come to call the sensation you get when you eat food 'flavor perception'," she summarized.

Investigating flavor perception implied in 2010 that several research projects were running simultaneously. One investigated the flavor perception of beer, another the flavor perception and emotions related to black currant syrup. A third was a PhD project run by a researcher called Wendy. Her project investigated the flavor perception of chocolate liquids. It began with the following research question:

If in a chocolate liquid one varies the level of ingredients, the content of sugar, fat, and cocoa powder, and if one replaces one type of fat, namely cocoa butter, by other types of fat, rapeseed oil, or other equivalents, how does this change the perception of the chocolate liquid's sensory properties?

Wendy explained to me that, "For this type of research, you can't use the chocolate liquids you get in the supermarket. They vary far too much." She therefore constructed a chocolate liquid model system which was not at all simple. The first challenge was procuring the ingredients – cocoa butter equivalents and rapeseed oil in particular. Wendy needed rapeseed oil without its odor, the "deodorized" version. First, it took Wendy quite some time to find a company specialized in making this type of food product. Then, once she had found one, as it happened, the company went bankrupt and the deliveries were delayed. Another problem was the different types of fat. The samples needed to be liquid, she explained, but cocoa butter and some cocoa butter equivalents were solid at room temperature, which made it difficult to mix ingredients. A third problem was the cocoa powder and the way different amounts changed the color in the samples. Wendy recounts:

> And then, obviously, because I was using cocoa powder to flavor the samples, if you add more cocoa powder to the sample, it changes the color. So I didn't want the color of the samples to impact the perception of the flavor. Because obviously, if you see something that looks more brown, you're gonna think: 'That's more chocolatey!' So, initially, I was adding coloring, to kind of mask the differences. But in the end, it turned out that this wasn't feasible for one of the fat types. So then, we had to go and

> explore other avenues. But eventually, I don't know why we didn't think of it from the beginning, we used little brown bottles. [She laughs.]

In the end, it took Wendy the entire first year of her doctoral studies to figure out how to construct samples of chocolate liquids with different levels of cocoa powder and sugar, and different types of fat that would be perceived as equally brown and equally liquid. After these twelve months, she had a chocolate liquid model system in which it was possible to individually vary the level of ingredients and the type of fats while maintaining all the other sensory properties (texture and color notably) stable.

Once the model system was constructed, Wendy moved on to use a mass spectrometer to measure how the samples release aroma. In lab F, this is called the flavor analysis. Then, in the third and final step, she measured the flavor perception of the chocolate liquid model system. For this, she recruited 12 panelists from a pool that the laboratory has built up over the years. The panelists are people from the region, mostly elderly housewives, who are paid by the laboratory to work for them. All of the panelists have been pre-selected by the researchers as having a sensitive palate and being able to put into words the sensations they had in their mouths. Many of the panelists working for the laboratory have been doing so for a long time, some of them for over ten years already, and have developed close bonds with the researchers. The researchers, in turn, value the panelists' work and they organize an annual Christmas party and excursion for the panelists and themselves. "The panelists work *very* hard," the research manager explained, "They are our instruments. They are as accurate as a nice shiny piece of kit," she said, half jokingly, half seriously, alluding and comparing them to the instruments standing around in the lab.

From the pool of panelists, Wendy chose a sensory panel of 12 who, in previous research projects, had proven to be particularly acute and sensitive in the perception of sweet food model systems. After she had handed out samples of the liquid chocolate model system, she asked the panelists for words that exhaustively described its sensory properties. In lab F this process is called descriptor generation. For the sensory property of, "taste/flavor," as Wendy put it, the panelists suggested more than twenty words, among others, "sickly", "slightly milky", "smoky cacao", and "chalky". After a discussion, they "democratically" agreed on two terms: "sweet" and "bitter," Wendy told me. Other sensory properties for this particular model system were (and here again I use Wendy's terms):

- aroma;
- texture/mouthfeel;
- aftertaste;
- texture/mouthfeel after swallowing;

Next, Wendy trained the panelists. She gave them samples in which the levels of ingredients and types of fat varied, telling them each time how each sample differed from the previous one. Using this information, the panelists reflexively sharpened their perception and learned to distinguish differences that were increasingly subtle. Wendy then asked the panelists to rank samples according to one of the descriptors, for instance bitterness. "You have to make sure," she explained, "that everybody is talking about *exactly* the same thing,

because obviously there are many types of bitterness. There is bitterness related to caffeine, the bitterness of cocoa, initial bitterness, and aftertaste bitterness, what have you…"[7]

After the training came the final experiment. On the first day the twelve panelists came to lab F, some of them in the morning, some in the afternoon. They sat down, each in one of lab F's so-called taste booths. The taste booths in lab F are cubicles designed to accommodate one research subject. The lighting in the taste booths is standardized according to the ISO norm 8589:1988, the walls are light grey, and each booth is furnished with an office chair and a table. On the table, there is a computer screen displaying instructions and questions, and a mouse. On the research subject's right is a bottle of plain water and a glass. A button allows the research subject to communicate with the researcher standing behind the wall, in which there is a hatch for the subject to be handed samples by the researcher. As she showed me the cubicles, the research manager, who is well acquainted with molecular cuisine and other food trends, stated, "This is a very different situation than the one you have in a restaurant or a hospital of course. But what we want to find out about is the underlying mechanism, flavor perception, how intense certain stimuli are."

Through the hatch Wendy served the 12 panelists the first sample of the chocolate liquid model system in the small brown bottles. The research subjects put them in their mouths, swallowed, and rated their perception by clicking on scales with the attributes generated earlier at each end. Next, they neutralized their palate with a slice of green apple, a so-called palate cleanser, and moved on to the second sample. After ten minutes there was a break. Several one-hour sessions took place on that day and on those following, during which the research subjects rated samples that – without them being told – differed in sugar and/or cocoa powder content, and/or type of fat. In the end, Wendy had ratings from each of the panelists of their perception of taste/flavor, aroma, texture/mouthfeel, aftertaste, and texture/mouthfeel after swallowing of each sample of the chocolate liquid model system.

Afterwards, Wendy started analyzing the data. She explained that she hoped to find interactions, for instance that not only an increase in sugar level but also the type of fat affected the ranking of sweetness of the model systems. In her thesis, she would relate such findings to those from experiments on flavor perception in other food model systems, especially those of solid chocolate model systems and liquids with banana flavor. When completed, the thesis was to be sent to the supervisors of the PhD project, the members on the PhD committee, and the company that had partly funded the project. The company required that the results not be made available to the public. It is possible that, once the confidentiality agreement, which required the results to be kept under disclosure for several years, ends, the results will be used by Wendy or her supervisors to write an article to be sent to one of the journals in which much of the research from lab F is already published: *Chemosensory Perception, Food Quality and Preference,* and the *Journal of Food Science*.

Taste in lab N: Sensory specific satiation

Lab N is part of a *Division for Human Nutrition* located in the Netherlands. The division consists of several research groups that study health and human eating behavior. Some

projects focus on specific populations, for example, children and elderly people. In 2010, most of the research in lab N addressed one topic in particular, however: obesity. Some of the scientists working on obesity were in dialogue with policy makers working in the public health sector, who were informing themselves about most recent scientific findings in order to design targeted, effective and not-too-expensive intervention programs for the prevention and treatment of obesity. When I first met the head of the department, he told me that he wanted to understand "the meaning of taste for humans" and that he was interested in all aspects of human eating behavior, including the "cultural" or "social" dimensions. He was familiar with Marvin Harris' materialist approach to food and knew the French food sociologists Claude Fischler personally. With a laugh, he said that Bourdieu's long and complicated sentences in *Distinction* were quite a challenge for a nutrition scientist like him to read.[8]

The broader question that was explored under the heading of obesity in 2010 was how in an environment of food abundance people eat (and over-eat). In this vein, researchers were studying food choices people make, or food selection as it is called in the lab; and stages in eating behavior such as the point in time at which people start or stop eating, which researchers term the initiation and termination of food intake. And finally, the researchers were interested in satiation and satiety.[9] One project was investigating how hormones released in the stomach affect satiety, known to the researchers as gastric contribution to satiety; another explored how satiety is affected by food's sensory qualities, what they called oral contribution to satiety. This last project, on "sensory specific satiety", consisted of two PhD sub-projects, one investigating how satiety and satiation are affected by the texture of food, the other focusing on "taste," according to the project's website. When I first met the researcher running the project, Sandra, she explained:

> As you will know, if you really want to study taste and make conclusions about taste and foods and satiation and all the other things, you have to compare sweet and savory. Very distinct. It's the most important category for humans.

To begin with, Sandra was interested in finding out how "taste" (her word) affects food intake in what she called normal humans. She formulated the following research question:

In a population of normal weight young adults, does satiation differ depending on whether a meal is sweet or savory?

In order to answer this, Sandra used a statistics program to calculate the amount of data that was needed to produce statistically significant results, i.e. the size of *the population.* The program calculated that she needed 64 participants. Sandra then wrote an advertisement that she pinned on the blackboards of the department and circulated through a mailing list the department has established over the years. The list consists of people who are willing to participate as research subjects in the experiments of lab N for a bit of extra money. These are mainly students. Sandra got numerous replies, from which she made a selection. "You want to get a bit of a homogenous group," she commented. She excluded all those applicants of not

“normal weight,” which in this case meant everybody with a Body Mass Index below 17 or above 25. She also excluded all those who were not “healthy”, all those who had problems with swallowing, suffered from a stomach or bowel disease, or had a thyroid or other endocrine disorder. She did not include vegetarians, pregnant women or anybody above 35 either. Most importantly, she included only those who ate “normally” – who do not watch their diet. In lab N this is called “unrestrained” eating. She assessed who is "restrained" and who is “unrestrained” using the “Normal Eating Behavior Questionnaire” that she asked the applicants to fill out. This includes the following question: "When you pass a bakery and you smell the aroma of freshly baked bread, do you enter?" If you answered yes, you were, according to the questionnaire, unrestrained. When I talked to her, Sandra brought up that the experiment she was about to perform would interfere with the participants' eating habits. She would, thus, not recruit them again for any of the future experiments she was planning to do in the course of her PhD, she pointed out, but select instead new and “fresh” research subjects.

Once the 64 normal weight young adults were recruited, Sandra invited them to come to the laboratory and had a talk with each of them. “We had an experiment once,” she explained to me, “for which we asked the participants to go online one day before the experiment was scheduled and to fill out a questionnaire. We thought that this would be enough for compliance. But on the day of the experiment they did not show up. ‘Oh sorry, I forgot about it!’, ‘Oh sorry, I have eaten already!’ Now we always have talks. Then they at least call you if they have a flat tire and arrive late.” In the conversations, Sandra instructed each participant to avoid extensive physical exercise before the experiment, to have a normal breakfast in the morning, and to stop eating two hours beforehand. “You want to get them a bit in a standardized state,” she explained. At the end of the meeting, she told them once more the dates on which the study would be conducted and the time slot for which they had signed up. To remind them, she sent out emails three days before the experiment and one day before.

On the morning of the experiment Sandra cooked two dishes. The main ingredients in both were risotto rice and milk. The dishes were standardized — a dietician had helped Sandra with this — in terms of energy density, macronutrient composition, texture, and pleasantness, which is called palatability in lab N. One dish was seasoned with vanilla sugar, cinnamon, artificial sweetener, and butter, the other with garlic, bouillon, salt and crème fraîche. One was sweet, the other savory. At around noon, the first six of the 64 research subjects came in and sat down in six taste booths. The taste booths in lab N are cubicles designed to accommodate a single research subject. The lighting in the taste booths is standardized according to the ISO norm 8589:1988, the walls are light grey, and each booth is furnished with a swivel stool and a table. A tap and a sink are built into the table to the left of the research subject. To the right, there is a mouse on a mouse pad. A button allows the research subject to communicate with the researcher standing behind the wall, in which there is a hatch for the research subject to be handed food objects by the researcher. Above the hatch there is a computer screen displaying instructions and questions.

Sandra served the six research subjects very, very large portions, 800 grams, of one of the two risotto dishes on simple white porcelain plates. Via the computer screen she told them

that they could eat as much as they wanted, and that if they were still hungry after finishing they could even ask for more. This research design is called the ad libitum food intake study. "Ad libitum" is Latin and translates into "at one's pleasure" or "at liberty". The six research subjects started eating, continued, and stopped eating at some point. When they had left, Sandra weighed their leftovers, entered the numbers into a spreadsheet file in which she had also recorded the height, weight, and sex of each research subject, and calculated how much food each one of them had taken in. The experiment was repeated several times that day and on the following days so that, in the end, Sandra had data on each participant eating the sweet version of the dish on one day and the savory version on another.

Next, Sandra analyzed the data, calculating the mean intake of each meal, and the standard variation. She wrote a paper discussing “satiation due to equally palatable sweet and savory meals”. This paper embeds the research findings within the literature on satiation and satiety, publications on satiation and food intake in the case of snacks of different sizes (nibble- and bar-size), food with varying texture (solid, semi-solid and liquid) and more or less volume (due to inserted air). The paper was published in one of the journals lab N's results usually appear in: *Journal of Nutrition*, *Appetite*, and *International Journal of Obesity*.

One object of quantitative science, two versions of a bodily response, an alternative form of critique

In the previous sections, I have described two experiments that the scientists identified as studies on "taste." Let me contrast the two experiments in order to bring out two points.

The experiments are similar in that they share a methodological style. Bruno Latour (1999: 58) has called this style a “regulated series of transformations, transmutations, and translations.” The style of these studies is characterized by *quantifying* and *standardizing*. Quantification was achieved in both labs through counting and measuring entities that had been developed earlier in the research process as specific variables — for instance, attributes such as “sweet” and “bitter” —, and putting them into a (statistical) relation with each other.[10] Standardization contributed crucially to quantification.[11] While some variables, namely those that were the focus of the research project, were measured, many others, that were not the focus — ranging from color in lab F to palatability in lab N — were kept constant.

The methodological style is geared towards *comparability*, *generalizability*, and *universality* (as well as the writing of a specific kind of text). Comparability and generalizability were achieved through the use of a model system of chocolate liquids in lab F and a population of healthy young adults in lab N.[12] The careful production of these research entities rendered the results independent of any variation between two specific chocolate liquids or two individual students. In this process, the taste booth played a crucial role. It separated what happened to one person and her or his body in one taste booth from the wallpaper that was yellow in lab F and the sun that had cast shadows onto the floors in lab N. At the same time, it rendered what happened in one moment to one person and her or his body in one of the booths comparable to other moments in adjacent booths that were also part

of the experiment; to moments that had occurred in the course of numerous previous studies; to many more that would take place there in the future; and, in theory, rendered all of these moments comparable to each other. It established that the event that happened then and there would, ideally, be the same wherever and whenever the same conditions are set up and study protocol followed. The event thus became, in this sense, universal.[13] In contrast to chefs and food producers, who encourage their clients to notice how qualities of a dish or food product are the effect of the place in which it has been produced and grown, and who, by doing so create a "taste of place" (Trubek 2008; Meneley 2014), sensory scientists, by making research subjects take in foods in a taste booth, disentangle the moment in which a person takes in foods from the place in which this happens. Sensory science research practices *undo the locality* of tasting.

By quantifying, standardizing, crafting comparability, generalizability and universality, both experiments disentangled also people and their bodies who were putting stuff into the mouth, clicking on computer mice, and stopping to eat, in other words research subjects;[14] from other people and their bodies who were standing behind a taste booth wall and were entering numbers into spreadsheets, in other words researchers. A particular sociality emerged. Unlike servants and their employers in middle-class households in Dhaka, who negotiate the spiciness of a dish and by doing so create an "everyday normal" (Janeja 2010) or participants in temple festivals in Northern China who jointly produce a "red hot" sociality (Chau 2008), sensory scientists and research subjects carefully and collectively render the very moment in which foods are taken in into a solitary practice. They craft *asociality*. Making each research subject take in a food object in a taste booth separately from the next one staged the sensual encounter between people and stuff instead as an event that happened to *a* person and *a* body. All in all, the two experiments configure tasting as a neatly packaged entity, discerned and discernible, as taste which is a *bodily* response *in* humans and an *object* of quantitative science.

One might now argue that each step in this regulated series of transformations, transmutations, and translations is anything but neutral; that forming a sensory panel out of highly sensitive and articulate housewives or including in a study on "normal" humans only students who state that they enter a bakery when they smell odors of freshly baked bread coming out of it are ways of skewing results; that both experiments are biased. Such a critique assumes, however, that there could ever be research that is *not* biased, research that is completely independent of cultural and social norms, ideals, and practices and their change over time. In response, an alternative form of critique has been developed by STS scholars such as Steven Shapin and Simon Schaffer (1985), Bruno Latour and Steve Woolgar (1986), Donna Haraway (1988), and Emilia Sanabria (2016) in studies on scientific research practices. Rather than denouncing *that* scientific facts and research practices are biased by cultural and social norms, ideals, and practices, they have begun investigating *how* outcomes of research and the process of doing research are shaped by cultural and social norms, ideals, and practices and what kind of effects this yields.

Following this, one recognizes how, in the case of the two sensory science experiments on taste, different *societal problems* and *bigger issues* become built into the technical set-up

of experiments. Whereas the study on flavor perception of chocolate liquids addressed the question of how to organize food production processes efficiently, the research on sensory specific satiation in normal young adults spoke to the societal problem of obesity.[15] In this process, different interest groups and their *practical concerns* were taken into account. The study in lab F provided results that were potentially useful in the daily work of food producers, who are dealing with the effect of replacing one ingredient with another, potentially cheaper, one. In contrast, the research in lab N provided insights that might help health policy makers in designing more efficient and targeted health care interventions to prevent obesity. The effects were anything but benign. Within the technical set-up in lab F an encounter was organized for just a handful of extensively trained and highly sensitized people, panelists, who discriminated and detected very subtle changes in, for instance, degrees of sweetness. Taste, in that experiment, was staged as a *perception*, constituting a human who becomes a knowledgeable subject about the world that is out there. How different from lab N, where a large group of people whose eating behavior had been categorized as natural had lunch twice in the lab. Their lunch consisted of a dish presented in two versions, sweet and savory, which they began to eat and stopped eating. That study configured taste as a *reaction to an exposure* to qualities of an edible during eating, a transformation of food into body that keeps alive an organism that happens to be a human. In the end, while the experiments do share a methodological style, they do not stage the same object, the same bodily response, rather each stages a specific version of taste, together with a highly specific version of the human.

Why mundane moments of tasting matter

This paper has provided an ethnography of the production of scientific knowledge about taste in the field of sensory science. Tracing, in detail, two laboratory experiments that took place in Western Europe, it has brought out how both experiments proceeded through a "regulated series of transformations, transmutations, and translations" that included highly normative choices and steps. Rather than suggesting that the two experiments produced biased results, the analysis has shown how specific societal problems and bigger issues, and the practical concerns of interest groups became built into taste; and how, as an effect, the two experiments staged diverging version of the bodily response: a perception in the first case, and a reaction to an exposure in the second. It has shed light on the difference made by whether a laboratory engages in collaborations with food producers or with health policy makers, and whether the laboratory links its research to questions surrounding the efficiency of food production or the prevention of obesity. It has, thus, provided a critique that acknowledges that scientific knowledge production and laboratory studies on taste do not happen without financial support, that sensory science research is called upon and produces facts about taste that have a "societal relevance", and that sensory scientists engage in collaborations not only amongst themselves, but also with actors and interest groups outside of science. By acknowledging the interactions between sensory science research on taste and industrial, political and everyday life concerns and dynamics, this critique also provides a

starting point for a collective, critical and careful discussion about how these interactions might best be dealt with, organized and lived with, by sensory scientists as they develop and further investigate taste, and by us, as we may enroll as research subjects, pay taxes that fund research, buy food products, take in meals, and sensorially appreciate food and eating.

What the detailed ethnography of two experiments has not covered, and what might be a crucial addition for such a collective critical reflection and discussion about the interactions between knowledge production processes about taste and the industrial, political and everyday life processes they are part of, is the question of how the facts that the two experiments constructed were subsequently used. This could be answered by interviewing the researchers involved in the experiments about the effects the studies had in shaping the research agenda of their laboratories in the following years, and tracing whether and how the resulting publications became read and cited in other studies. Even more important might be investigating of how the results on the flavor perception of a chocolate liquid model system provided insights for the food producers who funded the study, and whether the findings on the intake of a meal in its sweet and savory form by normal humans were fruitful for policy makers who were designing new health policies. Not at least would it be vital to study which of these two, and numerous other experiments that were, and are, running constantly in sensory science laboratories in Western Europe and elsewhere, become particularly important in the design of food production processes, health policies and new food legislation laws. Interviewing employees of large food producing companies and analyzing which scientific research is referred to in policy papers published by the Food and Drug Administration in the US and the European Commission in Europe could provide answers in this regard. In other words, I suggest further investigation into the travelling of scientific facts about taste within sensory science, and from sensory science to food industry and politics.

Ethnographies from the anthropology of food and the senses haven shown that mundane moments in which people taste foods are anything but benign: they are negotiated and discussed about in cooking and food production process (Janeja 2011; Goldstein 2011), used in meals in everyday life to reproduce gender and age distinctions within a group of people (Holtzman 2009), mobilized to create a sense of place in the production and consumption of foods (Trubek 2008; Meneley 2014), and cherished as they are tied up with memories from the past (Seremetakis 1996; Sutton 2001). This ethnography adds that the moments in which people taste foods are also important because they are considered interesting and worth producing knowledge about and are turned into an object of scientific inquiry by sensory scientists who are working in laboratories in Western Europe and elsewhere. In the process of constructing facts about them, these moments become link with societal concerns and bigger issues. Ultimately, this ethnography shows that mundane moments in which people taste food and drinks matter immensely, because "we" build "our" concerns into tasting – where neither the "we" nor the set of concerns is singular – and tasting allows us to address and readdress them.

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Endnotes

[1] The anthropology of food and the senses has become a huge and burgeoning field. For a systematic reviews, see Sutton (2010). Engaging in fieldwork in, traditionally, far-away places and observing how moments in which people taste foods and drinks arrive is only one approach to studying taste. Moments in which people sensually engage with food and drinks have also been studied and theorized as instantiations of people's "taste", in the sense of preference pattern, and analyzed in regard to how they differ according to class, age and gender lines, most famously by Pierre Bourdieu in *Distinction* (2010). For a more detailed discussion of the arguments proposed in *Distinction*, see Mann (2015). They have been conceptualized also as articulations of the relations between foodstuffs, preferences, and food infrastructures (Keneally 2015). And finally there is literature, partially overlapping with these other approaches, on people's sensual engagements with food and drinks in those settings that advertise themselves as "tastings," for instance of wine (Sternsdorff Cisterna 2014), coffee (Goldstein 2011) and olive oil (Meneley 2014).

[2] That moments in which people taste foods are shaped by scientific research and technological innovations is a well recognized phenomenon and topic in food history and history of science. See for instance the edited volume *Food* (Flandrin and Montanari 2013) and Shapin (2011a).

[3] http://www.masterstudies.com/Masters-Degree/Biotechnology/Sensory-Science/, last accessed 12th May 2017.

[4] That "taste in humans" is thinkable as an object of scientific inquire is the effect of epistemic shifts that have happened during the Enlightment period (Leschziner 2006). In this period the body became an entity with a universal physiology, which was depicted two-dimensionally from anatomical dissections of three-dimensional corpses. Before each body had been constituted as a unique entity by its particular combination of humours — blood, phlegm, choler, and melancholy which formed its physical state.

[5] The names of the scientists and research facilities have been anonymised. Rather than attributing bias to individual researchers, the intention of this paper is to shed light on the logic of scientific research practices.

[6] The relation between the word *taste* and moments in which people taste foods and drinks is not straightforward. What sensory (and social) scientists define as *taste* may differ from the ways in which lay people understand and use the word. While the systematic sampling of wine and cheese is explicitly framed as *tasting*, a sensual engagement and appreciation of food and drink may also occur in other ways. Additionally, *taste* (and *tasting*) are English words and other languages suggest other practical relevances tied up with taste and tasting. They also allow for alternative ways of theorizing physicalities of bodies (see Mann and Mol forthcoming). Rather than providing a definition of *taste*, I have left visible the gaps between *taste* as an emic term used by sensory scientists and an etic term used in the analysis.

[7] The training provided to these panellists largely resembles that provided to wine lovers (Sternsdorff Cisterna) and olive oil producers (Meneley). Participants acquire the skill or further develop it to notice more and more subtle differences between and within one property of a substance. What is particular about the trainings in lab F is that descriptors are generated by panelists (rather than being given to them) and the object is a model system (not a food product available on the market or one soon to be launched).

[8] Insights generated by sociologists and anthropologists through personal acquaintances and reading across disciplinary boundaries seem to become drawn into sensory science research as well as molecular cuisine experiments (Roosth 2013). The effects of this dynamic deserve further investigation.

[9] In lab N., satiation is used to describe processes that bring a so-called eating episode to an end. Satiety refers to what happens after a meal has been eaten, involving the suppression of hunger and inhibition of further eating.

[10] Quantifying in the form of measuring creates a particular moral economy, according to Theodor Porter (1992). It changes the relation between disciplines and renders statistics crucial, which could be observed also in lab F and N and deserves further investigation.

[11] Standardization, a of process "constructing uniformities" (Timmermans and Epstein 2010: 71), occurs in laboratories as well as outside of them. For a detailed analysis of standardization in a food production process, see Paxson (2013).

[12] The use of models and populations can itself become highly contested as Gail Davies' (2010) ethnography of laboratory mice in genetic research and Steven Epstein's (2004) study of in- and exclusion processes of populations in the development of HIV drugs exemplify.

[13] It is in emic, in the sensory scientist's terms, that the taste booth becomes a means to create universality. Like other scientific ideals (for 'objectivity' see Daston and Gallison 2010), this universality is highly specific. For an extended discussion of how the geographical location matters to tasting, see Mann.

[14] As Fabien Muniesa and Anne-Sophie Trébuchet-Breitwiller (2010) have pointed out in their ethnography of consumer tests in the perfume industry, becoming a research subject requires a lot of discipline and a particular set of (in)attention skills.

[15] This is not only the case nowadays, it seems it has also happened in knowledge production processes in the past, when the major concern was to govern 'the Other' in various forms. For example, as part of the endeavour to govern Nature, in 1787, on the first successful expedition to the highest mountain top in Europe, the Mont Blanc, the leader of the expedition, Horace-Bénédict de Saussure, regularly measured his companions' ability to taste (de Saussure 2007 [1787]); and as part of the British Empire's endeavour to govern Other People, in 1898, on the first expedition to the islands Torres Straits, the Cambridge anthropologist Charles S. Myers similarly measured the islander's ability to taste (Myers 1904).