Sensory science, the food industry, and the objectification of taste

Les sciences sensorielles, l'industrie alimentaire et l'objectification du goût

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Introduction

Sensory science, artisan foods, and everyday perception

This paper stems from my academic and professional experience as a sensory scientist seeking to address questions about the sensory properties of a loose grouping of foods that tend to be called things like “non-industrial,” “local,” or “traditional” – that, for convenience, I will refer throughout much of this paper as “artisan” foods – created within what David Pye has called a “workmanship of risk” (as cited and expanded by Paxson 2013, p. 132). Briefly, a workmanship of risk implies that such foods are not made exactly the same, every time, and that a degree of variation is accepted and even valorized by producers and consumers alike; the production of such foods is a skillful negotiation of risk, rather than an abnegation of it. This is opposed to foods that, in this paper, I will call “industrial,” that are produced in a “workmanship of certainty,” in which technical and technological innovations deskill the production process, leading to the elimination of both risk and variation. Sensory science has historically had very little to say about the sensory properties of and consumer response to artisan foods, and my attempt to reconcile the perceived requirements of rigorous sensory-science...
research with the empirical reality of artisan foods has led me to the line of reasoning I present in this paper.

In my own research into the consumer sensory perception of Vermont artisan cheese (Lahne & Trubek 2014; Lahne, Trubek, & Pelchat 2014), I began to realize that the difficulties involved in applying sensory science to these artisan foods. Heather Paxson calls artisan cheeses “unfinished commodities” (Paxson 2013, p. 13); that is, there is not an apparently objective equivalence between market value and the intrinsic value of these cheeses. In this paper I extend that concept to the sensory value of artisan foods; I propose that the tastes of such foods are “unfinished”: they are not intrinsic, but are apparently established from both intrinsic and extrinsic food properties through the sensory practices of consumers in everyday life (Chabrol & Muchnik 2011; Hennion 2005, 2007; Teil & Hennion 2004). I find myself in an unstable position: I am trained as a sensory scientist and interested in the quantitative evaluation of the sensory properties of foods, but, as a social scientist I find myself asking whether the theoretical bases of the discipline and some of its assumptions could be strengthened. These critiques are not aimed at undermining the discipline as a whole, but to provoke reflection and reconsideration of some fundamental assumptions. In fact, while the discipline in recent years has begun to focus on issues of ecological validity and consumer experience, I argue that these moves are hindered by its history and unexamined assumptions. I argue that a disciplinary focus on industrially produced foods and experimental methodologies has been fostered by the close relationship between sensory science and the food industry, and, in this paper I examine the origins and consequences of this relationship.

Development

Sensory dichotomies

Although it appears that sensory science is concerned with systematically examining subjectivity in the form of the inner experiences of individuals confronted with foods (Shapin 2012), it would be more accurate to say that sensory science is concerned with sieving a type of objectivity from those inner experiences. A basic and explicit assumption of sensory science is that certain sensory stimuli are inherent to food and are thus valid or true, while others are only correlated or associated in context with food, and are therefore biasing or false (e.g., Lawless & Heymann 2010). A parallel or corollary of this central assumption allows sensory scientists to define objective sensory experience: sensory perceptions that arise from true stimuli are true perceptions of a food that reflect a lasting, objective reality, while those that arise from bias or from contextual associations are cognitive blips that reflect a transitory, subjective experience. In some ways this is a sensible position: we have been aware for more than a century now of the fundamental chemical nature of foodstuffs, and research into taste and flavor perception has demonstrated that some of these chemicals stimulate our taste and olfactory receptors in order to create the perception of food flavor.

But this syllogism only displaces the difficult work of understanding subjective sensory experience; sensory science is left with the problem of distinguishing between true and biasing food properties in the first place. Sensory science marks itself out as a discipline
and, in particular, from marketing or consumer science by insisting that its ambit is these true stimuli and the true sensory experience (Lawless & Heymann 2010, pp. 13-14); sensory science begins with the exclusion or isolation of biasing stimuli, usually through practices of experimental control within laboratory settings. Thus, while the goal of sensory science practice is explicitly to “evoke, measure, analyze, and interpret [sensory] responses to products as perceived through senses of sight, smell, touch, taste, and hearing” (Lawless & Heymann 2010, p. 2), to guarantee that the sensory experiences being captured are objective it must also have standardized practices and methodologies for identifying which sensory properties are inherent – and thus legitimate for study – and which must be controlled, eliminated, or, if all else fails, ignored (ibid).

Sensory science does not have an elaborated or consistent methodology for categorizing these potential sensory qualities. There is no well-publicized list of properties with headings like “valid” and “biasing” that can be drawn upon when conducting sensory research. There aren’t even competing camps, advocating fiercely for the inclusion or exclusion of this or that property as real or fictional, as might occur in other disciplines. In practice, sensory science tends to rely on a hodgepodge of assumptions and empirical results to make claims for validity or bias. For example, physical or chemical properties are by default held to be sensorially valid, perhaps because many sensory professionals come from “hard science” backgrounds (Köster 2009). Properties like sugar content, which appear objective and measurable, are often treated as valid by default, even though they might not bear as strong a relationship to sensory perception as might be hoped (Martens & Martens 2008).

Further, sensory scientists generally consider sensory properties and the associated perceptions true if and only if they produce statistically significant results in controlled laboratory studies (cf. Köster 2003, 2009; Pangborn 1964; Schutz 1998). This immediately leads to the problematic result, however, that a food property can only be a legitimate sensory property and source of sensory perception if it is amenable to examination within a controlled, experimental context. The exigencies of the laboratory can come to dictate what is a valid source of sensation in everyday sensory experience, despite the huge dissimilarities between the two contexts (Köster 2009; Lave 1988; see also Muniesa & Trébuchet-Breitwiller 2010). In other words, food properties that conform more readily to experimental or laboratory practice are a priori more likely to become valid sensory properties; in the same way, human subjects’ sensory responses to foods are legitimized based on how easily they are experimentally accessed.

Curiously, this simultaneous need and incapacity to dichotomize the internal sensory experience as valid or biasing in sensory science has not been examined carefully within sensory science (or without, either). I suspect that this has more to do with the particular goals and priorities of sensory science than any lack of insight on the part of practitioners. Put bluntly, it is not productive for sensory science to question its epistemological foundations, and sensory science is, above all else, a productive discipline (Martens 1999; Peryam 1990); sensory science is a product of its origins.
A brief history of sensory science

The origins of sensory science are in the late 1930s, when the increasing industrialization of agriculture and food production within and outside of the United States (Shapiro, 2005) brought increasing competition between formerly regional or local producers and food manufacturers. As the scale of food businesses increased dramatically, they distributed to larger populations and found themselves more frequently struggling to capture market share from competitors. In an environment of increased competition, the ability to produce food that consistently appealed to the largest possible groups of consumers became a paramount advantage, and this led to an increased interest in product quality and consumer acceptance (Peryam 1990; Schutz 1998). Capturing the zeitgeist of the era, W. Platt quotes an executive of a baking company in 1931 piously observing that “we must never forget that all our millions of dollars worth of business depends on that little sensation which our products make upon the tongues of our customers” (quoted in Pangborn 1964, p. 64).

Although humans have been interested in the nature and quality of sensory phenomena for millennia, prior to the middle of the twentieth century the technology for evaluating the sensory quality of food was not systematized or standardized: “sensory evaluation of food [in commercial settings] was largely confined to recording opinions of one or two experts with many years of experience in evaluating the quality of a specific commodity” (ibid p. 63). Standardized sensory evaluation techniques, which would become the basis of sensory science, first began to be developed, gathered, shared, and critiqued in the late 1930s, marked by the first panel on “Flavor in Foods” presented at the American Chemical Society in 1937 (ibid). The development of sensory science as a systematic way of understanding the human sensory perception of foods has its roots in the industrialization of the food system in the middle of the twentieth century and the imperatives this imposed on the new food conglomerates. As I describe below, the need to provide adequate nutrition to troops during and after World War II drove the Army to sponsor research into how soldiers perceived what they were being fed (Amerine, Pangborn, & Roessler 1965; Pangborn 1964; Peryam 1990). From these initial sparks, sensory evaluation of food evolved into a discipline within food science (Schutz 1998) based on methodologies from experimental “physiology, psychology, and psychophysics” (Stone, Bleibaum, & Thomas 2012: 17).

Thus, these sensory-science theories and methodologies, which stem from a particular historical moment, have been assumed as “best practice” for accessing and studying all human experiences with food. In fact, these methodologies do a comparatively poor job with artisan foods, like Vermont artisan cheese. There are several reasons for this that I will explore: first, the psychophysical theories of human behavior that underpin sensory science are more problematic than usually acknowledged (cf. Köster 2003, 2009; Lawless 1999); second, sensory science has worked to serve the needs of the food industry from its inception (Peryam 1990; Schutz 1998), and does not need to address other forms of food production.

A psychophysics of eating

Psychophysics is one of the oldest and most fundamental branches of experimental psychology; it is concerned with determining the “quantitative relation between
environmental stimulation (the physical dimension) and sensory-perceptual experience (the psychological dimension)” (Schiffman 2003 : 441). The psychophysical approach to understanding sensory experience is to bring the entire situation within the paradigm of experimental control: that is, to control all aspects of the environment, the sensory stimulus, and the ways in which the sensing subject can interact with the stimulus, in order to produce results that are unambiguously attributable to experimental intervention. Relevant histories for the psychophysics of taste (Bartoshuk 1978), smell (Cain 1978), and psychophysics in general (e.g. Baird 1997; Lawless & Heymann 2010; Schiffman 2003) are readily available. I am mostly concerned with the adoption of and continuing reliance on psychophysical methods and theories by sensory science. This is a critical issue for four reasons.

12 First, there is good reason to wonder whether psychophysical approaches to basic stimuli-response relationships transfer well to situations of complex stimulation, like eating in everyday life. As a note, by “psychophysical approach,” I mean the assumption that there is a functional, contextually portable, and ideally quantitative relationship between stimulus and internal response. This kind of approach, even with the multivariate methods suggested by Martens & Martens (2008), requires assuming that human behavior can be reduced to its constituent elements for study and then reassembled. Social theorists have derided this reductive approach (Howes 2005; Lave 1988), as have a few sensory scientists (Köster 2003, 2009; Lawless 1999; Lawless & Heymann 2010); even psychophysicists have found evidence that sensory perception is an emergent phenomenon (e.g., Laing & Francis 1989; Laing, Link, Jinks & Hutchinson 2002). Thus, the assumption that the psychophysical approach can be transferred without distortion to the complex world of food is fraught with potential pitfalls.

13 Second, in attempting to become an “objective” science, sensory science “modelled [sic] itself mainly on the basis of sciences like food chemistry and nutrition psychology” (Köster 2009 : 71). Magni Martens writes that sensory science has never concerned itself with theory: “we might say that sensory science has developed along a pragmatic direction introducing methods and validity criteria ‘that work’ without even being aware” of theories and philosophy about sensory perception (Martens 1999 : 237). Rather than developing its own theories of how human beings behave in general and in particular with regards to sensing, sensory science has tended to adopt theory from its antecedents: “physiology, psychology, and psychophysics” (Stone et al. 2012 : 17): that human behavior and experience is the result of individual choices and actions in response to an external, objective world. Sensory science, therefore, both implicitly and explicitly excludes the influences of society and culture on individual sensory perception.

14 The critical observer might ask whether these psychophysical approaches are appropriate for capturing the human sensory experience of food in everyday life, where such isolation is the rare exception instead of the norm. A quick, introspective consideration of taste and smell reveal both senses to be qualitatively different from vision, hearing, or touch; in fact they have often been neglected as objects of scientific and philosophical inquiry (Howes 2005; Martens 1999). Foods in everyday life rarely (if ever) present a single stimulus, and the interactions between stimuli both within and across modalities is incredibly complex (Auvray & Spence 2008).

15 Third, the psychophysical approach assumes that, in sensory perception, the subject is a passive receiver of both the stimulus and the psychological image that comprises
perception. This theory of perception is critical in the sensory-science concept of the human as a sensory measuring instrument (Köster 2009; Lawless 1999; Lawless & Heymann 2010). However, it doesn't reflect very well the empirical reality of human sensory perception. Writing about food, sociologist Antoine Hennion theorizes that “‘amateurs’ [that is, connoisseurs] do not believe things have taste. On the contrary, they make themselves detect [tastes], through a continuous elaboration of procedures that put taste to the test” (Hennion 2007: 97). In my own gloss, taste is neither a property of foods, as sensory science would have it, nor a property of consumers, as critical sociology would have it (Bourdieu 1984), but an active and reflexive practice (Lahne & Trubek 2014). We learn how things taste by experiencing them ourselves, but also by observing others’ reactions and comparing them to our own, and by observing how others make the same comparisons (Shapin 2012).

16 The theory of taste as a social practice is confirmed in studies of wine connoisseurs. Novices are unaware of the range of possible sensory experiences wine might provoke, and so report fewer descriptive adjectives than experts of various types (Hughson 2006). Novices can neither accurately describe wine to each other, nor benefit from expert descriptions of wines (Solomon 1990, 1991); experts, however, can effectively communicate sensory experiences to each other (Ballester, Patris, Symoneaux & Valentin 2008; Solomon 1990, 1991). It is important to note that this is not unconscious behavior; in my own study of Vermont artisan cheese consumers, subjects were able to explain the ways in which they actively learned to taste properties in the cheeses (Lahne & Trubek 2014). They were aware of the apparent subjectivity of their actions, but did not feel that this invalidated their experiences (ibid).

17 Fourth, the adoption of the psychophysical approach is historically contingent rather than necessary: “sensory psychologists, originally trained in the “higher” senses (vision and audition), applied the same methods on the “lower” senses (smell, taste, and touch) without taking the essential differences between these sensory systems into account” (Köster 2003: 359). Further, the needs of the food industry drove methodology as much as it drove the subject of the research: “although these [psychophysical] methods contributed much to the improvement of the translation of perceived sensory properties into physical product properties and to product development, they did not contribute to the understanding of eating and drinking behavior or food choice” (Köster 2009: 71). Sensory science has been very effective at “fulfilling the need for information... but the concomitant emphasis on practicality has diverted talent from the consideration of underlying issues” (Peryam 1990: 86). The discipline has developed methodology in order to obtain results that “will be useful to a company in meeting consumer expectations and insuring a greater chance of marketplace success” (Lawless & Heymann 2010: 17), but there has never been a drive to prove that those methodologies measure phenomena that are meaningful outside of the context of the production and marketing of the industrial food system – that they tell us something fundamentally true about the food we eat.

18 Thus, the theories and assumptions that sensory science has implicitly borrowed from psychophysics do not necessarily serve the goal of a systematic, rigorous investigation of the human sensory experience of foods (Howes 2005; Köster 2003, 2009; Martens 1999). When research into the human sensory perception of food contradicts these assumptions, as happens fairly frequently, the fault is shifted from the assumptions to the subjects (Korzen & Lassen 2010); violations of these theories become biases to be
guarded against and controlled for. While both the methods and theories of psychophysics have helped sensory science succeed as a partner to the food industry, they constrain a sensory science that seeks to truly address human consumption behavior and experience in everyday life.

**Sensory science and the food industry**

While all research disciplines, “scientific” or not, are historically and materially contingent and are never as objective or “pure” as they would perhaps strive to be (Shapin 2012), sensory science in particular has been shaped directly by the needs of industrial agriculture and food manufacturing. Sensory science is a discipline historically oriented to solving industrial problems (Peryam 1990); in fact, “sensory evaluation is the child of industry” (Elaine Skinner, quoted in Lawless & Heymann 2010: 1). The key “origin story” of the discipline is the use of acceptance-testing research to solve the problem of enlisted men in the US Army “refus[ing] to eat many nutritious rations that had been carefully formulated” (Pangborn, 1964, p. 64); these rations are perhaps the epitome of industrialization in the food industry (see also Lawless & Heymann, 2010; Meilgaard, Civille & Carr, 2007; Peryam, 1990; Schutz, 1990; Stone et al. 2012). In a reverse of the expected order, sensory science is a hodgepodge of theories and methodologies mobilized for industrial purposes: “normally, technology arises from scientific discovery, but with sensory evaluation we see a science growing from a robust technology” (Peryam 1990: 86).

Other early successes in the discipline are all related to the resolution of specific industrial problems. The first method of descriptive analysis, developed by the Arthur D. Little Company, was a privately owned, industrial tool meant for product development and quality assurance purposes (Peryam 1990; Schutz 1998) and was licensed to private companies for $15,000 (over $100,000 in today’s dollars: Pangborn 1964). Rigorous research programs were initiated at private companies like Kroger and Seagram’s (Peryam 1990; Schutz 1998), but their results and methodologies were unknown for a long time or remain unknown because they were and are considered industrial secrets (Peryam 1990). “[T]o this day sensory evaluation as a scientific discipline has suffered from the fact that much good research goes unpublished” (Schutz 1998: 44). A significant share of sensory science research and theory has been developed in this particularly contingent fashion, in which the needs of the industry dictate the research to be done, the research to be made public, and subsequently the theory that is formulated from that research.

The result of sensory science’s close historical relationship with the food industry is that sensory methodologies are what I call “overfitted” to industrial food production. The concept of overfitting comes from statistics, especially non-linear modeling: a model becomes overfitted when it is made to conform too well to the sample data on which it is based, and it no longer has predictive power for data outside of the sample (for a quick, non-technical summary, see Silver 2012). As I will discuss below, industrial food production has certain features that make the system and the food produced within the system distinct. Sensory science methodologies implicitly or explicitly rely on these distinct features, and so apply only poorly, if at all, to food produced outside of the system. Since sensory-science results can inform food producers’ livelihoods, public policy decisions, and our everyday lives (e.g., Shapin 2012), these methods...
ideally should apply equally well to all foods. Thus, the concept of overfitting becomes a gloss for the poor portability of sensory science methodologies outside of the context in which they originate (Latour 1990).

**Skill, certainty, and variation**

Industrial food production, like industrial practice in general, is characterized by what Heather Paxson calls a “workmanship of certainty” that “by deskilling production and standardizing materials... ensure[s] a known, standardized outcome” (David Pye, quoted in Paxson, 2013 : 132). This is in contrast to pre-industrial and current, artisanal food production practices that Paxson terms “workmanship[s] of risk,” in which “the quality of the result is not predetermined, but depends on the judgment, dexterity, and care which the maker exercises as he works” (ibid). Industrial food production is predicated on absolute control of inputs and methods, and the result is a vast quantity of near-identical product. In contrast, non-industrial methods of food production, whether historical or practiced by artisans today, at some level abdicate absolute control over some aspects of materials and process, and instead rely on the crafter’s skill and adaptability to wrest a positive outcome from the specifics at hand, turning irregularities and variations into positive, even desirable outcomes, instead of liabilities (ibid. : 133).

In this arrangement, industrial and non-industrial food producers are opposed in their treatment of variation in their products, both in degree and valorization. Industrial producers seek to effectively eliminate unplanned variation, and when it occurs it is a matter for concern; non-industrial producers accept a degree of variation in their products (although they seek to “professionalize” themselves by avoiding variation for its own sake, cf. Paxson 2013 : 155) and attempt to embrace and capitalize on it when it occurs (ibid). The elimination of unexpected variation is one of the features of industrial production on which sensory science methodologies rely, and when this assumption of homogeneity is not met, as in non-industrial production, sensory science methodologies are difficult, if not impossible, to apply.

This is because a workmanship of certainty allows the industrial producer to firmly control the ingredients, properties, and qualities of a food product. The sensory properties of each instance of that product, and the consumer’s sensory perception of it, should be predictable and consistent. There is no need for difference tests (Lawless & Heymann 2010) on batches of Coca-Cola (we could as easily use for an example Charles Shaw Cabernet Sauvignon or President Brie – the workmanship of certainty applies across product categories) produced by different factory operators or on different days, except as a method of quality control – any sensory variation is unexpected and unwelcome. Every bottle tastes the same because there is no variation in the process or ingredients, and thus the product should have “objective” sensory properties; the necessary conditions for repeatable sensory experience are carefully maintained. A definitive and stable sensory profile of Coca-Cola produced using descriptive analysis techniques (Lawless & Heymann 2010) makes sense: every bottle of Coca-Cola should have this amount of “citrus” quality and that amount of “caramel” quality, and so on. Experimental changes in formulation and production process can then be causally linked to changes in its sensory profile. The implementation of a paradigm of control allows the industrial production of food to be treated as an experimental situation, in which specific hypotheses can be rigorously tested, including those concerning sensory
perception. Sensory science can confidently relate sensory differences in products to changes of process or formulation precisely because the assumption of homogeneity holds for industrial production.

25 In non-industrial practice, however, variation is an integral part of the product due to the characteristic “workmanship of risk” (Paxson 2013). The fact that two instances of the same cheese from the same producer could taste somewhat different is often a cause for celebration, both by the consumer (Lahne & Trubek 2014) and the producer (Paxson 2010, 2013). But sensory science, which was developed with the assumption of control in industrial production, does not have a paradigm for capturing an uncertain relationship between process and outcome. What is the sensory profile of this type of cheese? Should the two cheeses, nominally produced in the same way, be considered different products because they taste different? The very nature of a workmanship of risk means that variation can be introduced at every step of the process, and the final product represents the producer’s negotiation with the variation, rather than its complete exclusion (Paxson 2013). An epistemology that relies on total control, common to industrial production and sensory science, is tricky to apply to artisan production. In fact, the only way to answer these questions that is epistemologically valid for sensory science is to control the sources of variation in non-industrial practice, rendering the workmanship one of certainty instead of risk, and thereby changing the very object of study. I call this the assumption of homogeneity; once it is made explicit it problematizes the ability of sensory science to address foods produced outside the industrial paradigm.

Context and commodity

26 Sensory science also depends on the idea that food ingredients and products are acontextual: that they have intrinsic qualities that are distinguishable and detachable from the context in which they are consumed. In the industrial workmanship of certainty, in which process is obfuscated and unimportant, only outcomes are important (Paxson 2013); the products of this workmanship seem to be portable across contexts precisely because they are explicitly detached from any specific production context. The assumption that foods are portable – that they can be detached from any particular context– is key for sensory science practice.

27 Building on the laboratory practices of experimental psychology (Pangborn 1964; Peryam 1990), sensory-science methodologies require the execution of apparently everyday behaviors (tasting, smelling, reflexive consideration of liking) in decidedly unusual circumstances: those of experimental control (Lawless & Heymann 2010; Muniesa & Trébuchet-Breitwiller 2010). Thus, both foods and sensing subjects are removed from their normal contexts, an act which has profound consequences for perceptual and cognitive processes (Lave 1988); the assumed acontextuality of most industrial products helps mediate this displacement. Consider, for example, the sensory evaluation of cheese in which researchers, concerned about the effect of color on flavor perception, required subjects to wear sunglasses inside the sensory evaluation laboratory (e.g., Carpino, Horne, Melilli, Licitra, Barbano & Van Soest 2004). Divorcing the tasting experience from its everyday context is a known problem within the discipline, to which I am in no way the first to draw attention (e.g., Köster 2003, 2009; Lawless & Heymann 2010; Lync, 1990).
Sensory science's treatment of the laboratory context as mostly unproblematic is a direct result of the *ex nihilo* nature of industrial food production. If food products are naturally without context then they become portable across contexts. There is nothing peculiar, then, in having subjects taste them in ways that seem odd when compared with everyday life, because they have, as a rule, never been part of everyday life. In this way, the assumption of contextual portability renders foods as acultural, asocial packets of organic matter – as close, in other words, as they can be made to maps, equations, or chemical compounds: of constant form and function wherever they are found (Latour 1990).

However, non-industrial food production is often not of products that are easily portable across contexts. Returning to research on artisan cheese production and consumption, we see that producers (Paxson 2013), consumers, and the products themselves (Lahne & Trubek 2014) are embedded in social and cultural contexts that are intensely relevant to sensory perception. Producers, for example, see the sensory profile of their products as a reflection of not only their materials and production practices, but also their ethical choices and relationship to the land on which they rely (Paxson 2013). Similarly, consumers see their preferences and perceptions shaped by not only the materiality of the product, but their relationship with the producers and their ideological approach to food (Lahne & Trubek 2014). In addition, the complex interactions between connoisseurship and repeated experience are at play in the production of sensory experience (e.g., Chabrol & Muchnik 2011; Hennion 2007; Muniesa & Trébuchet-Breitwiller 2010; Sutton 2001). Therefore, the assumption that a non-industrial food product is easily portable between contexts is demonstrably untrue (to be fair, it is probably untrue for industrial products as well, to which consumers can and do form all the same attachments, practices, and expectations). When a non-industrial product is brought into the laboratory or testing context, it deforms much more than an industrial product: it is not a context-free product, an acultural organic mass, but a food to which subjects have relationships shaped by individual, social, and cultural contexts.

The assumption of contextual portability is therefore another implicit way in which sensory science methodologies are better-adapted to industrial than to non-industrial food production. Even critics that highlight problems with context in sensory science in general (e.g., Köster 2009) have not recognized the ways in which some categories of food products (i.e., acontextual or *ex nihilo*) are less affected by this problem than others (i.e., traditional or artisanal). As a result, the fact that this dichotomy stems from a particular aspect of industrial production has been so far unaddressed.

**Overfitted to industry**

Thus, sensory science practice relies on two fundamental features of industrial production: a virtual elimination of variation and the acontextuality of the products. I call these, respectively, assumptions of homogeneity and contextual portability, because, as discussed above, they are not explicitly guaranteed or created by sensory scientists in practice. Instead, they are assumed to be fundamental features of food production. As also noted above, however, they are only fundamental features of industrial food production, and in fact are mostly atypical of non-industrial food production practice. The fact that sensory science either does not acknowledge or is unaware of how these assumptions are contingent on industrial production practice...
illustrates my claim that sensory science methodologies are overfitted to the food industry, and that their application to other foods distorts either the results or the foods themselves (due to the elimination of the “workmanship of risk” in the name of experimental control). Thus, while sensory science’s “pragmatic” approach (Martens 1999) to epistemology is unproblematic within an industrial context, overfitting means that the results of sensory science methodologies are potentially misleading when applied to non-industrial foods. However, because sensory science is deeply invested in concepts of objectivity and epistemological rigor, when sensory evaluation of artisan foods contradicts the experience of ordinary consumers, it is the consumers who are assumed to be irrational or self-deceiving (e.g. Korzen & Lassen 2010). This common conclusion itself should be evidence enough that there is some misfit between the methodologies and the phenomena of interest.

**Sensory experience is social experience**

32 How does the contention that artisan foods need new sensory approaches play itself out in practice? Here I present a necessarily brief summary of empirical research that I have conducted to understand the success of artisan cheesemaking in Vermont. This research integrates sensory-science methodology – focus-group work and novel consumer-product profiling and acceptance – with social theories of human (sensory) behavior (Hennion 2005, 2007; Lave 1988; Shapin 2012), instead of the strictly psychophysical. The results are telling: in artisan products, consumers taste both intrinsic and extrinsic qualities, calling into question some of the fundamental disciplinary assumptions of sensory science. Sensory scientists have increasingly become interested in the effects of extrinsic properties (e.g. Iaccarino, Monaco, Mincione, Cavella & Masi 2006; Menichelli, Olsen, Meyer & Næs 2012; Siegrist & Cousin 2010), and this research should provide further motivation to seriously consider whether this dichotomy is sensible for artisan foods.

33 Vermont is at the forefront of a national, grassroots movement in the United States towards a more diversified food system characterized by artisan producers of moderate size (Vermont Sustainable Jobs Fund, 2010). Artisan cheesemaking, which is increasingly important to Vermont’s dairy sector (Parsons 2010), is “part of a broader movement that focuses on sustainable agricultural practices, farm-to-table distribution, informed food choices for consumers, and connecting local producers with consumers” (American Cheese Society 2010): thus, many of the important aspects of artisan cheese are what sensory science would discount as extrinsic or biasing qualities (Korzen & Lassen 2010; Lawless & Heymann 2010). To make matters more complicated, American cheesemaking in general lacks the cultural patrimony that tends to promote coherent traditional practice in European cheesemaking (Paxson 2010); there are not protected-name categories for products as in Europe (Barham 2003; Guy 2007). Instead, American cheesemakers tend to invent their own style of cheese, often inspired by but intentionally different from any other cheese being made (Paxson 2010, 2013; West et al. 2012): in Vermont alone there are over 40 cheesemakers, making over 130 different cheeses, in a state of just over 625,000 people (Parsons 2010). Vermont produces goat, sheep, and cow cheeses (the only water-buffalo operation in the state closed several years ago), in styles ranging from long-aged, large, alpine...
cheeses to fresh, unripened chèvres, from intensely piquant blues to creamy, mild, bloomy-rind triple-crèmes.

All this is to say that there is no single sensory profile of cheeses produced in Vermont. Nevertheless, both consumers (Lahne & Trubek 2014) and producers (Paxson 2010, 2013) speak of sensory attributes stemming from common connections between sustainability and the landscape, production practices, and the materiality of the cheeses to explain why this huge diversity of cheeses “taste good”. In other words, both Bayley Hazen Blue and Cabot Clothbound Cheddar “taste good” because they are produced in small batches, in Vermont, with particular care for animals, humans, and the landscape (Lahne & Trubek 2014). Perhaps these consumers are biased – they have become convinced that of some external claim about how these cheeses should taste, and are reporting their sensory perceptions in ways that confirm this position and avoid cognitive dissonance – or perhaps they are in some way tasting these extrinsic properties. I was curious whether there was evidence for the latter explanation, and designed sensory-science research that would give some insight into this question. Given the increasing evidence that indicates, due to the complex, integrative nature of sensory perception, it is entirely possible to consider a taste of and for non-material, extrinsic properties (e.g., Korzen & Lassen 2010; Lotz et al. 2013; Mol 2009), this seems like a reasonable position to explore further.

I designed a study with two components: a qualitative, focus-group based inquiry into the everyday sensory experience of consumers (Lahne & Trubek 2014), and a quantitative, consumer-product profile that operationalized the conclusions from the focus group (Lahne et al. 2014). In the focus groups, participants were asked to describe their experiences with and the sensory properties of Vermont artisan cheese. Consumers described their sensory experiences as active and reflexive, and they were aware of their own subjectivity, but did not feel that it invalidated the reality of their experiences (Lahne & Trubek 2014). I was able to synthesize a set of generalizable properties that consumers used to construct these experiences, and these properties were both intrinsic (e.g., the saltiness of a cheese) and extrinsic (e.g., the craftsmanship of the producer and her passion for cheesemaking), and generally interrelated and not easily reduced into component parts. Their validity was reinforced by triangulation with previous work with artisan cheese producers, in which the producers used similar terms in similar ways to describe their own sensory experiences (Paxson 2010, 2013).

Using a novel methodology that quantifies open-ended, unrestricted descriptive comments from consumer-participants (based on Ares, Gimenéz, Barreiro & Gámbaro 2010; Symoneaux, Galmarini & Mehinagic 2012; Ten Kleij & Musters 2003) I designed a consumer acceptance and descriptive study of Vermont artisan cheeses (Lahne et al. 2013). Consumers were provided with Vermont cheeses and accurate descriptions that either described the generic type of cheese (e.g. “Cheddar”) or the particular cheese (e.g. “Cabot Clothbound Cheddar”); in this way, they received contextual information with the samples. Thus, while this study resembles textbook sensory research, it differs in both theory – the explicit inclusion of extrinsic information – and methodology – the quantification of consumers’ naïve, emic descriptions. Not only did consumers’ reported liking differ with the different types of information – a result that has been reported extensively (e.g. Iaccarino et al. 2006; Siegrist & Cousin 2010) – their sensory descriptions varied significantly. Thus, context and other extrinsic properties affect the
actual consumption experience of these products: the taste of Vermont artisan cheeses is not fixed, but emerges in the practices of consumption.

This research shows Vermont artisan cheeses to be unfinished, sensory commodities (Paxson 2013), whose taste is not fixed or inherent, but is negotiated by the consumer during tasting based on both intrinsic and extrinsic properties. The instability of the sensory profiles of these products and consumers’ awareness and interest in that instability presents a challenge to the current theories and methodologies for assessing and stabilizing sensory profiles.

Conclusions

Leaving the laboratory

Sensory science has historically kept its distance from artisan foods. This lacuna is not an oversight: it is simply that artisan foods have historically not been important to the food industry, and so they have not been important to sensory science. Recently, however, there has been growing public, academic, and industrial interest in understanding foods from outside the industrial paradigm, and it has become evident that, due to the particular historical contingency of sensory science, these present an unexpected difficulty to the usual disciplinary methodologies.

Artisan foods challenge the assumptions of homogeneity and contextual portability that are fundamental features of sensory-science theory and that originate from a paradigm of industrial deskilling in food production (Paxson 2013). Sensory science methods assume that the true sensory properties of a food product remain, within limits of random variation, constant across instantiations of that product and contexts that a consumer might encounter it; in contrast, artisan food products are inherently variable and are dependent on the many contexts of everyday life. Furthermore, examinations of artisan foods and everyday sensory experiences present challenges to an even more fundamental assumption of sensory science: that there is a single set of true or valid sensory properties for each food product, and that these properties can be conclusively distinguished from so-called biasing or false properties. In fact, the empirical evidence points in the opposite direction: food sensory properties are dependent on the subject, the context, and on a myriad of factors that are obscured by paradigms of experimental control.

This misfit between the objects of study and sensory-science methodologies is historically contingent; it is not a fundamental feature of the study of human sensory experience. A concern with objectivity, which stems from an organized disciplinary attempt in sensory science to develop a “real” science from a set of industrial techniques (Köster 2003, 2009; Peryam 1990), confounds a discipline which is dedicated to studying subjective experience. Consumers’ experiences of artisan food products, like Vermont artisan cheese, are fundamentally subjective and embedded in social relations, and so are read as irrational and biased by sensory science (Korzen & Lassen 2010).

My own research demonstrates that not only consumer acceptance but consumer sensory perception depends on both intrinsic and extrinsic food properties (Lahne et al. 2013, Lahne & Trubek 2014): the taste of artisan foods is unfinished, and contingent on the food, the context, and the taster. To understand these foods, and to understand
sensory experience in everyday life, sensory science must step back from historically contingent theories and practices. What is required is first a questioning and then a relaxation of disciplinary assumptions about homogeneity, contextual invariance, and the objectivity of sensory properties.

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In this paper I propose to examine why sensory science – a discipline within food science that “comprises a set of techniques for the accurate measurement of human responses to foods” – has historically struggled with assessing the sensory properties of “artisan foods.” As a sensory scientist, I am concerned that this limits the discipline and underserves whole categories of foods and consumer experiences. I will demonstrate that the historical relationship between sensory science and the food industry has led to certain assumptions within the discipline that do not apply outside of industrial food production, and so undermine the assessment of artisan foods. I outline this historical relationship, explain the disciplinary assumptions I believe are problematic, and briefly demonstrate – using some of my own research – the need for sensory methodologies that are broadly applicable to foods produced in different paradigms.

Dans cet article je propose d'examiner pourquoi l'analyse sensorielle – discipline appartenant au champ des sciences de l'alimentation et qui “consiste en un ensemble de techniques permettant de mesurer précisément les réactions humaines vis à vis des aliments” – rencontre des difficultés à évaluer les propriétés sensorielles des aliments issus d’une production “artisanale”. En tant que spécialiste de l'analyse sensorielle, je me préoccupe de cette limite de la discipline qui empêche de prendre en compte des catégories entières d'aliments et d'expériences de consommateurs. J'entends démontrer que les relations historiques entre l'analyse sensorielle et l'industrie alimentaire ont conduit à asseoir certaines hypothèses qui ne peuvent s'appliquer en-dehors d'une production industrielle, et qui par conséquent nuisent à l'évaluation d'aliments issus d'une production artisanale. Je commence par tracer les grandes lignes de ces liens historiques, puis j'expose les hypothèses qui, à mon sens, posent problème, pour finir par démontrer – en me basant sur mes propres recherches - la nécessité de développer des méthodologies sensorielles qui puissent être appliquées largement aux aliments, quel que soit leur mode de production.

Keywords: sensory science, artisan food, food industry, consumers, everyday life, context, objectivity, subjectivity

Mots-clés: analyse sensorielle, produit alimentaire artisanal, industrie alimentaire, consommateur, quotidien, contexte, objectivité, subjectivité
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