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Just a matter of taste[1]

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Abstract

According to an ordinary view, we distinguish, classify, and appreciate food and beverages according to their taste. However, scientists seem to disagree with this naive view. They maintain that we don't really perceive the lemony taste of a cake or the delicate smoky taste of a single-malt whiskey, because what we ascribe to taste is in reality mostly perceived by smell.

As opposed to this scientific consensus regarding taste, I will defend a naive view of taste and deny that olfaction is involved in what we naively call taste. Like the uninformed layman, I will maintain that when I eat a strawberry, what I really perceive is its taste, not its smell or flavor.

Keyword: perception, taste, sense, flavor, olfaction, multimodal, Grice

> I'm firmly of the opinion that real progress in philosophy can only come from taking common sense seriously. A departure from common sense is usually an indication that a mistake has been made.
>
> Kit Fine[2]

[1] Many thanks to Olivier Massin, Kevin Mulligan and to the anonymous referee of this journal for their comments and suggestions.

[2] "Metaphysical Kit", interview by Richard Marshall in 3ammagazine.com, 23.03.2012. Retrieved from http://www.3ammagazine.com/3am/metaphysical-kit/

1. Introduction

Recently published papers and monographs[3] reveal a renewed interest among philosophers in the way the senses are distinguished and classified. This renewal is due in part to recent findings in neuroscience and psychology that have pressed philosophers to rethink their views on perception.

By showing, for example, that perceptual systems integrate information from different senses into common multimodal perceptual objects or events,[4] recent scientific studies on perception challenge some traditional philosophical views about the senses and their interaction. Philosophers don't agree about the revisions needed in order to accommodate these new discoveries, but they generally concur that these new data provide an invaluable opportunity to refine their views.

In this productive debate, a special emphasis has been placed on the senses of taste and smell, which, more than other sensory modalities,[5] challenge the commonsense approach to individuating the senses. Many philosophers[6] now maintain that commonsense views supported by a long philosophical tradition are directly threatened by the science of taste and olfaction and that a new philosophical approach to the senses is therefore needed.

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[3] See, for example, Keeley (2002), Nudds (2003), Macpherson (2011b), Biggs, Matthen, and Stokes (2014).

[4] A classic example is the McGurk effect. In this effect, an auditory sound /ba/ paired with a visual lip movement associated with /ga/ often produces the percept /da/ (McGurk & MacDonald, 1976).

[5] I will use the expressions "sensory modality" and " sense" interchangeably to refer to the perceptual faculties including at least the following: sight, touch, hearing, smell, and taste.

[6] Fulkerson (2014), Macpherson (2011c)

The view defended in this paper is more conservative. It will argue that despite the incontestable progress made by science in our understanding of the senses in general and of the sense of taste in particular, there is no reason to replace or abandon our ordinary distinction among the senses.[7]

Common sense distinguishes five senses: sight, touch, hearing, smell, and taste. And most people do not hesitate to distinguish their sensory experiences according to this classification. They know when they hear a strident sound or when they taste a sweet peach. Despite this obvious and banal fact, some philosophers argue that the naive distinction among the senses is erroneous or confused. Among the different arguments used to demonstrate the inadequacy of our naive understanding of the senses, taste is often invoked to show that our ordinary classification of the senses lacks sound scientific bases.

In what follows, I will consider this argument in detail. In the second section, I compare the scientific conception of taste to our ordinary conception and examine the notion of flavor. This comparison shows that science distinguishes taste from the other senses on the basis of physiology and anatomy. To evaluate the physiological criterion used in science to individuate the sense of taste, I explore, in section 3, the different philosophical approaches to the nature of the sensory modalities. Following Grice's proposal, I review and assess four different criteria for classifying the senses. After considering the sensory organ, stimulus, and qualia criteria, I argue that the proper

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[7] Although I defend a classical view of the way senses are distinguished, I don't endorse the classical Aristotelian taxonomy of the senses that commits to the existence of only five senses. I believe that the proper object criterion that will be defended in section 4 allows for the existence of many other possible senses (such as thermoception and trigeminal perception).

object criterion adequately individuates the senses. In the final three sections, I explore the consequences of applying the proper object criterion to the sense of taste.

2. The commonsense vs. the scientific view of taste

Whether you are obsessed with the culinary arts or eat only for sustenance, as soon as food enters your mouth you experience something special, that is, something inaccessible to your other senses. The special information you extract by chewing food or letting it melt in your mouth is commonly attributed to a unique sense: taste. According to the ordinary view, we distinguish, classify, and appreciate food and beverages according to their taste. However, scientists offer accounts of taste that seem to undermine this naive view. They maintain that we don't really taste the lemony note of a cake or the delicate, smoky accent of a single-malt whiskey, because what we ascribe to taste is in reality mostly perceived by smell. This is the view defended, for example, by Hollingworth and Poffenberger (1917) almost a century ago:

> [A] very great number of our so-called tastes are not tastes at all, but really odors. The sense organ of smell is so situated that it may be stimulated not only in the ordinary way, through particles borne into the nostrils by currents of air from the outside, but also by particles and vapors which pass up, from the mouth cavity, behind the soft palate, by way of passages called the " posterior nares." In this way it happens that tasteless substances, with definite odor, are mistakenly supposed to have taste. (pp. 11–12)

Sciences of the chemical senses have achieved some important and crucial developments over the last century. And, as the following remarks attest, the idea that what we sense when eating or drinking is partially olfactory in nature remains dominant:

> There is little doubt that what we refer to as mouth-based taste, or (more properly) flavor, receives its principal distinctive properties from olfaction. (Rozin, 1982, p. 397)

> We are accustomed to experiencing flavor as a singular sensation in the mouth. As a result, we use the words "taste" and "flavor" interchangeably in casual conversation. This makes it easy to forget that flavor is actually a fusion of taste and smell, and that the apparent simplicity of flavor is just an illusion. (Gilbert, 2008, pp. 91–92)

> We have noted that the sensation of flavor seems to be coming from the mouth, even though much of the flavor is due to retronasal smell. This is called mouth capture. In addition to the sensory signals, mouth capture is believed to be due also to the high level of activity in the tongue and lips areas of the motor cortex. It all adds to the illusion we live under when we enjoy the flavor of our food and give the mouth all the credit. (Shepherd, 2012, pp. 150–151)

> There is a distinction between taste and flavor: the latter is sensed by the nose and mouth as a whole, and so includes odor, texture, and temperature. Taste is more limited, and is sensed solely by receptor cells in taste buds on the tongue, the roof of the mouth, and throat. (“Taste”, in the vernacular, usually means flavor.) (Byrne & Hilbert, 2008, p. 386)

> One everyday example that highlights a widespread confusion between the senses of taste and smell is the fact that people commonly report losing their sense of taste when their nose is blocked. (Auvray & Spence, 2008, p. 1016)

As these quotes demonstrate, most scientists consider the ordinary way of speaking and thinking about taste to be at best ambiguous and at worst plainly wrong, because it fails to distinguish between "tastes" and "flavors." According to their view, tastes and flavors are fundamentally different, because unlike tastes, flavors are not detected solely by the tongue but result from the discoveries made "by the tongue and the nose together, not by either of these organs alone" (Smith, 2012, p. S6).

The lemony quality of a cake or the smoky accent of whiskey are in effect detected only when some of the cake's or whiskey's molecules, warmed by body heat in the mouth, become volatile and travel up through the retronasal canal until reaching the olfactory receptors. The fact that retronasal olfaction contributes to the perception of

flavors explains why most food and beverages seem bland when we have a blocked nose.

According to scientists, taste is therefore limited to the perception of four or five tastes.[8] And although umami has recently been added to salt, sweet, sour, and bitter, Erickson is right to stress that "the idea of 'four primary' tastes is certainly the most central one in taste today" (Erickson, 1984, p. 105).

Despite widespread agreement about the existence of a very limited number of basic tastes, most taste researchers acknowledge the difficulty of isolating tastes from the other components of taste perceptions. Consider, for example, Titchener's comment about the apparent simplicity and unicity of flavors:

> For the most part, sensations of taste come to us blended with sensations of smell, touch and temperature. These blends have a curiously unitary character: it is only by directing the attention, in the light of past experience, first to one and then to another aspect of the given whole, that we can distinguish the separate components. Thus the flavour of a peach, or of black coffee, seems to be simple and unique; but we may happen to notice the aroma before we begin to taste, and in this way take an involuntary first step towards analysis. At times, the difference between smell and taste comes to us with a sort of shock; the bitter taste of unsweetened chocolate, for instance, is in sharp contrast to the aromatic odour. Again, we may remark that our food today is more savoury than it was yesterday, when our nose was stopped up with a cold, or we may discover that the repulsive flavour of certain medicines, such as castor oil, is avoided by the simple expedient of holding the nose. In all these cases, and in many others like them, everyday experience plays into the hands of psychological analysis. Smell and taste are, after all, separate senses with separate sense-organs; and while a blending of their sensations is the rule, occasions are bound to arise when we taste without smelling or smell without tasting. (Titchener, 1909, p. 129)

As stressed by Titchener, most people consider peaches and coffee to have a characteristic taste. It seems that when we taste a peach or drink coffee, we perceive a complex arrangement of qualities irreducible to the peach’s sweetness or the coffee’s bitterness. Considering that it is difficult to phenomenologically distinguish the so-

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[8] See Erickson (2008) for a criticism of the notion of basic taste.

called basic tastes from these other components, we must ask why scientists reduce taste to the perceptions of certain basic tastes. Titchener provides a partial answer: scientists distinguish basic tastes from other gustatory qualities primarily in response to the idea that tastes must be perceived by taste receptors located in the mouth. Because most of the qualities perceived when eating a peach or drinking coffee are in reality detected by olfactory receptors, scientists conclude that those qualities are not genuine tastes. Consider, for example, Smith's explication of the notion of "flavor":

> Although we're all familiar with taste, it is surprisingly complex and puzzling. What we call taste encompasses the combined sensory inputs of taste, touch and smell, as influenced by sight and sound. The tongue and associated receptors in the mouth detect only salty, sweet, sour, bitter, savoury and possibly metallic, yet we can "taste" such flavours as mango, onion, strawberry, mint, cinnamon and vanilla. Flavours such as these are discovered by the tongue and the nose together, not by either of these organs alone. (Smith, 2012, S6)

According to Smith, because gustatory experiences seem incredibly rich, complex, and diverse, what surprises the layman is that his tongue detects only a few tastes. As exemplified by the following quote, scientists distinguish their technical concept of taste from everyday talk about taste by introducing two other notions—aroma (or odor) and flavor:

> When food is consumed, the interaction of taste, odor and textural feeling provides an overall sensation which is best defined by the English word “flavor”. German and some other languages do not have an adequate expression for such a broad and comprehensive term. Flavor results from compounds that are divided into two broad classes: Those *responsible for taste* and those *responsible for odors*, the latter often designated as aroma substances. However, there are compounds which provide both sensations. Compounds *responsible for taste* are generally nonvolatile at room temperature. Therefore, they interact only with taste receptors located in the taste buds of the tongue. The four important basic taste perceptions are provided by: sour, sweet, bitter and salty compounds. (Belitz, Grosch, & Schieberle, 2009, p. 340)

Although the notion of basic taste is still intensively debated in the scientific community, there is no scientific publication that does not endorse the distinction

among taste, flavor (or odor), and aroma. According to the prevalent terminology, the term "taste" is restricted to the qualities detected by the taste buds, the term "aroma" or "odor" refers to the qualities detected by retronasal olfaction, and the term "flavor" usually refers to the collection of all the sensory qualities perceived while eating food or drinking beverages.

It is worth noting that the scientific terminology involves a shift of meaning: what is referred to by our everyday use of the term "taste" corresponds to the scientific use of the term "flavor." When I say, for example, "I don't like the *taste* of broccoli," what I mean, according to the scientific terminology, is "I don't like the *flavor* of broccoli." Moreover, the scientific use of the term "taste" has no equivalent in ordinary speech. Cross-cultural studies of taste show, in effect, that in most languages the word "taste" is used to mean "flavor," whereas no lexical distinction in the languages studied seems to correspond to the scientific distinction between "taste" and "smell":

> The linguistic tendency to use the word taste to mean flavor is not an idiosyncrasy of the English language. University of Pennsylvania professor Paul Rozin asked bilingual speakers of nine languages to provide synonyms for the words taste and flavor. They were given a dictionary to see if they could find better words. And then they were educated on the difference between the Basic Tastes and aroma. In seven of the nine languages (Spanish, German, Czech, Hebrew, Hindi, Tamil, Mandarin Chinese), it appears that this same idiosyncrasy exists, so that if it goes in the mouth, it’s tasted. Only Hungarian and French seemed to have words that hinted at a distinction between the concept of taste versus that of taste plus aroma: what you know now is flavor. (Stuckey, 2012, p. 34)

Despite the broad scientific consensus about the distinction between taste and flavor, I will show that there is no valid argument in favor of the revisionist terminology introduced by scientists. I will argue in particular that the fact that some qualities we

naively attribute to tastes are detected by the olfactory receptors is not sufficient to establish that they are smelled and not tasted.[9]

3. The notion of flavor and the interaction of the senses

In distinguishing flavors and tastes, the scientific view of taste conflicts with the commonsense view, because scientists consider taste to be limited to the perception of only five different qualities: sweet, sour, salt, bitter, and umami.[10] Whereas the commonsense view attributes to taste an apparently endless variety of qualities, like coffee, peach, Coke, olive, etc., this revisionary conception of taste results directly from the implicit criterion used by scientists to distinguish the senses. According to most specialists, tastes must be restricted to the properties detected by the tongue only, whereas odors or smells are necessarily discovered by the nose.

To illustrate how this criterion operates, consider how Smith shifts from the word "taste" to the word "odours" as soon as the role of the nose in what we commonly call taste is revealed:

> Although we're all familiar with taste, it is surprisingly complex and puzzling. What we call taste encompasses the combined sensory inputs of taste, touch and smell, as influenced by sight and sound. The tongue and associated receptors in the mouth detect only salty, sweet, sour, bitter, savoury and possibly metallic, yet we can "taste" such flavours as mango, onion, strawberry, mint, cinnamon and vanilla. Flavours such as these are discovered by the tongue and the nose together, not by either of these organs alone.
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> We seldom recognize experiences of pure taste. Holding the nose closed reduces our ability to tell the difference between pieces of raw apple and raw potato

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[9] For related arguments against the revisionist view put forward by scientists regarding the everyday conception of taste, see Richardson (2013).

[10] For a critical approach to the notion of basic taste, see Erickson (2008), which attacks the concept of basic taste by arguing that it relies on a poorly defined hypothesis that cannot be tested scientifically.

> because it prevents *odours* in the mouth from reaching the olfactory epithelium at the bridge of the nose. (Smith, 2012, S6, my italics)

Attributing part of the gustatory perception to smell is therefore directly motivated by the physiology of taste and odor.

The conservative view defended in this paper rejects the revisionary definition of taste, because it maintains that taste, as the ordinary use of the term suggests, can correctly qualify the sensible qualities perceived when eating a peach or drinking coffee. To claim that we actually perceive the taste of a peach and not only its flavor is not to reject the notion of flavor altogether. There is no reason to doubt that food, like other entities, can be perceived by several sense modalities. Most of our perceptions are multimodal in the sense that a single object exhibits several qualities that can be perceived simultaneously by several senses. For example, we can perceive the color, the shape, the texture, and the sound of a unique object. It is therefore unsurprising that food or beverages are accessible to different sense modalities. If this is the case, the notion of flavor can be understood as the combination of the sensible qualities exhibited by food and beverages. Under this definition, flavor demarcates the subset of sensible qualities we experience when ingesting food or beverages.

As stressed by many recent studies (e.g., Verhagen, 2007; Verhagen & Engelen, 2006), the perception of flavor is highly multisensory, because it involves experiences of taste, smell, texture, temperature, trigeminal irritations, and even hearing. But the crucial question from a philosophical perspective is whether these different components of flavor can be explained by the interaction of individual senses or whether a revision of the commonsense distinction among the senses is needed in order to account for the notion of flavor.

Because the topic of multisensory perception is so broad and because philosophical studies of taste are almost nonexistent, it is difficult to give a satisfactory answer to this question. It is, however, possible to make the following remarks regarding the notion of flavor and its relation with the commonsense approach to the senses defended in this paper (see section 4).

(1) The conception of the senses defended in this paper does not involve any claim about how the senses work. For example, it does not assume that the senses are informationnally encapsulated or functionally isolated. The criterion of the senses defended in this paper should be conceived, on the contrary, as providing the elementary components necessary to articulate any theory about the senses' interaction. The commonsense conception of taste does not prevent therefore taste to interact with other sense modalities. The fact that a cake can be perceived as lemony, moist, and soft clearly indicates that different senses work together to offer a unified perception of the cake.

(2) The multisensory perception of flavors is always described by using sensory categories like taste, smell, touch, etc. It appears therefore that traditional divisions between the senses are always at work at some level in the analysis of the notion of flavor. For that reason, the philosophical question of the individuation of the senses is at the core of the notion of flavor. In what follows, I propose to explore different philosophical accounts for the division of the senses into different modalities. I believe that finding a satisfactory criterion for distinguishing the senses will directly contribute to a better understanding of the notion of flavor.

(3) From a phenomenological perspective, the notion of flavor brings together very dissimilar perceptual experiences. Chemesthesis, for instance, which defines the sensation we experience when eating hot chili peppers, mustard, or mint, is

characteristic of certain foods, but unlike most other flavor components, like temperature, texture, or taste, irritations produced by chemestetic substances are not experienced in the food itself but in the mouth or the nose. Like pain or tickles, chemesthesis belongs therefore to the family of interoceptive senses, which track properties of our own body, rather than to the family of exteroceptive senses, which track properties of external objects or substances. Understanding how the notion of sense modalities can be extended to interoception will therefore directly affect how to interpret the notion of flavor.[11]

(4) According to the commonsense view of taste defended in this paper, the notion of flavor is objectionable only when it implicitly carries revisionary conceptions of taste and smell. This is the case, for example, when the word "flavor" is used to express the fact that gustatory and olfactory features of food are indistinguishable. In that case, "flavor" is explicitly used to replace what we ordinary call "taste." As denounced by Spence, Auvray, and Smith (2014), the different meanings associated with the term "flavor" often result in theoretical confusions. I believe these confusions would disappear if specialists did not restrict the meaning of the word "taste" to those properties that result from the direct stimulation of the gustatory receptors localized on the tongue or elsewhere in the oral cavity, but instead used "taste" in its ordinary sense

4. Demarcating the sense of taste

As pointed out above, science distinguishes taste from the other senses on the basis of physiology and anatomy. But, as stressed by many philosophers,[12] the demarcation of

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[11] For a recent discussion of interoception see Ritchie and Carruthers (2013)

[12] A large collection of classical and more recent papers discussing the problem of the demarcation of the senses can be found in Macpherson, F. (Ed.) (2011b) and Biggs, Matthen, and Stokes (Eds.) (2014).

the senses is problematic, and several different ways to distinguish them have been proposed. Grice's paper "Some Remarks about the Senses" can be considered the locus classicus for addressing this question. In this paper, Grice considers four criteria according to which the senses can be distinguished from each other: the *sensory organ* criterion, the *proximal stimulus* criterion, the *phenomenal* criterion, and the *proper sensible* criterion. Although Grice does not explicitly consider taste, his four criteria provide a useful framework for the discussion of how taste should be individuated. I therefore examine each of the criteria in turn and evaluate their relative benefits or weaknesses in relation to the challenge raised by the individuation of taste.

4.1 The sensory organ criterion

As stressed above, the scientific individuation of taste appears to rely essentially on sense organs: to be considered an experience of taste, an experience must exclusively involve the use of the organ dedicated to the perception of tastes, namely the taste buds (*gustatory calyculi*) found on the tongue and adjacent parts.[13] According to the sensory organ criterion, tasting can then be defined as the act of perceiving through the use of taste buds. But because taste buds are able to differentiate only five different sensible qualities,[14] taste "has the status of a minor sense, as the channel of only a limited number of sensations: sweetness, sourness, bitterness, saltiness, and umami" (Auvray &

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[13] In fact, taste receptors similar to those found on the tongue have also been found in the human intestines. This discovery introduces new difficulties for the sense organ criterion, because experiences of taste are not located in the guts although they apparently harbor taste organs similar to those located in the mouth. According to these new findings, sense organs aren't sufficient to individuate the senses. As I will argue, they are not necessary either.

[14] For a critical discussion of the notion of basic taste, see Delwich (1996) and Erickson (2008).

Spence, 2008, p. 1022). Therefore, the scientific conception of taste departs from the commonsense view on the basis of the individuation criterion used to demarcate the sense of taste. But is this criterion adequate and effective? In other words, does the organ criterion capture our conception of taste, and does it effectively distinguish taste from the other senses?

As I point out in section 1, the scientific conception of taste derived from the organ criterion imposes a deep revision of the commonsense notion of taste by excluding from the category of taste most of the experiences commonly associated with taste. In this sense, it seems that the sensory organ criterion is inadequate because it fails to pick out experiences that are considered experiences of taste. One possible response to this objection would be, of course, to argue that the commonsense view of taste is confused and confusing and that we should let science show us how to define and demarcate the sense modalities. As Nudds (2004) argues, the problem with this response is that by revising the commonsense notion of taste, scientists may merely be changing the subject:

> There have been authors who attempt to give a "scientific" account of the senses; but they do nothing to show that they haven't simply changed the subject. Whatever they are giving an account of, it's not the senses as we commonly understand them. (p. 35)

Of course, there is no reason to deny that science helps us understand the world we live in and the way we can access it, but science should also be able to explain the world given to us in pretheoretical experiences. Otherwise, as Nudds maintains, science does not explain *our* world but considers only problems and entities fundamentally disjunct from our everyday experiences. For science to help us understand how *our* senses work, it must therefore start with a notion of senses and sense modalities compatible with the

commonsense view. Otherwise, we have no reason to believe that scientific characterizations of the senses are about the senses rather than anything else.

The priority of the commonsense view over any scientific approach to the sense modalities is in fact apparent when we consider how the sense organs are individuated by science. In fact, it is because tastes are localized in the mouth in perceptual experiences that scientists look for taste receptors in the mouth. Similarly, because we know sniffing is necessary for smelling, smell receptors are searched for in the nose.[15] It therefore seems that any scientific characterization of the senses relies at their very outset on the phenomenology of sense experiences. In fact, without a preliminary notion of the sense modalities, scientists would not know what they should look for and where, and no scientific investigation of the sense modalities could be initiated.

The sensory organ criterion for individuating the senses therefore appears to be ineffective and subordinate, because it depends on a prior individuation of the senses grounded in the phenomenology of perception.[16]

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[15] Unlike Richardson (2013), who suggests that the exteroceptivity of smell is ensured by the act of sniffing, I do not believe that the exteroceptivity of smell is guaranteed by the act of sniffing or that sniffing is constitutive of the olfactory experience itself (for more details, see Mizrahi, 2014). We certainly know that there is a causal dependency between the act of sniffing and olfactory experiences, but there is no reason to think that the act of sniffing is part of our olfactory experiences. In this regard, olfaction is similar to the other sense modalities. Visual experiences result, for example, from the opening of the eyes, but there is no reason to believe that a visual experience of a red tomato includes information about the eyes of the observer. The knowledge that a specific sense organ is causally related to a perceptual experience seems therefore not to be determined by some phenomenal features of the perceptual experience itself but rather by some generalization about the existing correlation between a kind of experience (such as visual or olfactory) and the availability of particular sense organs (for an opposite position, see O'Dea, 2011).

[16] Although I do not consider the most general questions regarding the reliability of perception as a source of knowledge and the realism of the senses, I argue that *if the notion of sense is scientifically meaningful*, it must explicated by reference to the phenomenology of perceptual experiences.

4.2 The proximal stimulus criterion

Rather than calling upon the phenomenology of perceptual experiences to distinguish the sense modalities and the sense organs, scientists have proposed to individuate the senses according to the proximal physical stimuli that directly affect the sense organs. Unlike the sensory organ criterion, which is restricted to the physiological mechanisms involved in perception, the proximal stimulus criterion extends the definition of the sense modalities to the direct external physical causes of the physiological processes responsible for our sense experiences. For example, rather than identifying vision with the perception obtained with the use of the eyes, the stimulus criterion proposes to identify vision with the sense directly activated by light. The problem with the proximal stimulus criterion is, however, similar to the one encountered by the sensory organ criterion: it fails to provide an independent criterion for individuating the senses. If, as suggested, a sense is individuated solely by the fact that it is caused by a characteristic kind of physical stimulus, there should be a way to distinguish the kind of physical processes relevant for individuating the senses from the other kinds of physical interactions an organism has with its environment. But this is precisely what the proximal stimulus criterion cannot do. To distinguish the proximal stimuli relevant for individuating the senses, we must already be able to know what counts as a sense organ or what counts as a perceptual experience. Consider vision. If electromagnetic waves between 380 and 750 nanometers are singled out as the proximal stimuli of vision, it is not by virtue of any intrinsic characteristic of this particular range of wavelengths but only because they enter into a functional explanation of the visual system. In short,

electromagnetic waves in this range are considered the proximal stimuli of vision because they directly stimulate what is identified with the organ of sight: the eyes.

In other words, the proximal stimuli criterion fails to individuate the senses according to an independent criterion because there is no way to demarcate the relevant proximal stimuli without referring to the sense organs or the proper objects of the sense.

4.3 The phenomenal or qualia criterion

The sense organ and proximal stimuli criteria fail to distinguish sense modalities because they leave aside the phenomenology of perception. For a physiological or physical state to enter into a functional explanation of perception, it must cause the right kinds of psychological states. But perceptual experiences are essentially characterizable in phenomenological terms. Perceptual experiences are experiences that represent or present things as being a certain way. They have a certain qualitative phenomenological character such that there is “something it is like” for the subject of experience to have it. To demarcate sense modalities, we must therefore rely on their specific phenomenology. Fundamentally, it is because our experiences of touching and hearing are phenomenologically different that we distinguish touch and audition. And it is this "naive" demarcation of the senses that guides scientific approaches to sense modalities, not the other way around.

How the phenomenology of perception should be analyzed is hotly debated in philosophy, and the controversies that underpin this discussion surface in the way the sense modalities are demarcated. There are basically two approaches to the phenomenology of perception, and their fundamental differences lie in their accounts of the nature of experiential or phenomenological properties of experience. Although most philosophers recognize that our apprehension of reality through perception has a

distinctive subjective character, they do not agree about the nature of these qualities. The phenomenal qualities of experiences can be identified with either intentional properties and objects or nonintentional features of experiences; in the latter case, they are commonly referred to as "qualia." Both options offer a variety of theories. Nonintentional approaches to phenomenal properties include, for example, adverbialist theories, which contend that the phenomenal properties we ascribe to perceptual experiences are ways of perceiving. Thus, rather than explaining visual states in terms of intentional objects, as in "I perceive a red object," the adverbialist characterizes perceptual experiences in terms of manners of affecting the perceiver, like "I'm sensing redly." In contrast, the intentionalist thinks the qualitative qualities of perceptual experiences should be accounted for in terms of qualities of intentional objects. Following Aristotle, the intentionalist demarcates the senses on the basis of the qualities they represent: vision represents colors, audition represents sounds, olfaction represents smells, etc.

My sympathies lie with the second approach. But before assessing its consequences for the sense of taste, I will return to the theory of qualia and present my reasons for contesting its relevance for the individuation of the sense of taste.

The qualia criterion proposes to demarcate the senses by specifying the sort of phenomenal character shared by all the experiences of a given sense modality. But as Grice rightly stresses, this approach faces two major obstacles. The first is linked to the transparent or diaphanous nature of perceptual experiences. It seems that when we consider the phenomenal character of our own perceptual experiences, all we can find are the qualitative properties of the intentional objects of those experiences. When I try, for instance, to specify the phenomenal character of my experience of looking at a red

tomato, all I need to do is list all the visual features the tomato appears to have. As Grice states,

> If we were asked to pay close attention, on a given occasion, to our seeing or feeling as distinct from what was being seen or felt, we should not know how to proceed; and the attempt to describe the differences between seeing and feeling seems to dissolve into a description of what we see and what we feel. (Grice, 1962, p. 45)

The transparency of perception seems to call into question the general purpose of qualia, because the phenomenology of a perceptual experience appears to deliver only intentional objects and properties. It is therefore unpromising to try to demarcate the senses by appealing to a phenomenology of perceptual experiences conceived as involving qualia.

According to Grice, there is another reason for not using qualia to demarcate the different senses. The qualia criterion, by defining perceptual experiences in terms of intrinsic characteristics, splits perceptual experiences in a problematic way. By specifying sensory modalities on the basis of qualia rather than intentional objects, the qualia criterion obliterates the essential relation between a given sensory modality and its proper object.[17] In effect, according to the qualia criterion, the fact that we perceive colors and hear sounds is only contingent, because each given sense can be independently characterized by its qualia conceived as intrinsic features of perceptual experiences. This approach to the senses has the unfortunate consequence of leaving open the possibility of each sense having different proper objects. Thus, according to the qualia criterion, colors could be seen as well as heard, and sounds could be heard as well as seen.

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[17] The notion of "proper object" or "proper sensible" is used in Aristotle's *De Anima* to distinguish the five external senses. Each sense, according to Aristotle, has sole access to its own proper sensible, and there is a unique proper sensible for each sense.

If we want to preserve the essential link between the senses and their proper objects, the best option appears to be a characterization of their phenomenology in terms of intentional objects rather than qualia. This is the proposal I will now defend.

4.4 The proper object or proper sensible criterion

In *De Anima*, Aristotle distinguishes between the proper and common objects of the senses. The proper objects of a sensory modality are those objects that are perceivable by that sense and that sense alone (418a12–13). Colors, for example, are the proper objects of sight, whereas sounds are the proper objects of hearing. Common objects, in contrast, can be perceived by more than one sense. Motion, rest, number, shape, and size (418a18–20) can be detected by more than one sense (e.g., motion and shape can be both seen and touched), so Aristotle categorizes them as common objects.

Because proper objects are perceived by a unique sense, they can be used to distinguish and identify the senses without having to sort them according to either their intrinsic features or the qualia with which they are associated.

The appeal of Aristotle's account lies in its simplicity and strength: proper objects characterize the phenomenology of the senses and at the same time distinguish the sensory modalities from each other. For instance, perceiving colors characterizes what it is to see, but it also explains why seeing is different from smelling or hearing.

Despite its attractiveness, the proper object criterion (POC) has been challenged for various reasons. It has been argued, for example, that the notion of proper object is circular because it presupposes the notion of sense it is supposed to explain. This is the criticism expressed, for example, in Keeley (2002):

> That is to say, relying on the proper objects of sense does not tell us by virtue of what these properties are the proper objects of *vision*, whereas those properties are the proper objects of *touch*. Of course, the obvious thing that classes these

> properties together is that we *see* the visual ones, and *tactually feel* the tactile ones. But to invoke this feature is to revert to the sensation criterion. (p. 22)

If, as Keeley claims, proper objects could be specified only by the way they appear in perception, there would be a genuine risk of circularity. Fortunately, however, there is a way to characterize the nature of proper objects that does not presuppose their dependence on perception. Although we have assumed that perception is the privileged access to proper objects, there is no reason to assume that proper objects are *essentially* perceptual or mental. In an intentionalist and realist view of perception, proper objects can be conceived as mind-independent entities. In this view, although each sensory modality has privileged access to one type of intentional object, these objects can exist without being perceived.[18] The mind-independent or realist view of proper objects avoids the criticism of circularity often directed against the POC by establishing the priority of the proper objects over the senses.[19] Although colors are seen and odors are smelled, there is no compelling reason to claim that colors and odors are *necessarily* perceived. By contrast, if the realist view of proper objects defended here is correct, there is no episode of seeing that does not involve colors and no episode of smelling that does not involve odors, because each sense modality is nothing other than the perception of one type of proper object.

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[18] The realist view of proper objects fits nicely into naive realist theories of perception, which hold that perceptual experiences are necessarily constituted by relations of conscious sensory awareness to mind-independent objects, properties, and events. For a clear presentation of the diversity of naive realist theories, see Crane and French (2005, section 3.4).

[19] There are basically two different ways to defend a realist view of proper objects: reductionism, which reduces proper objects to physical properties (see, for example, Hilbert, 1987; Byrne and Hilbert, 2003; Tye, 2000), and primitivism, which holds that proper objects are sui generis entities that cannot be identified with entities specified in other terms (see, for example, Campbell, 1993; Yablo, 1995).

A second objection to the POC concerns the perception of common objects. Grice observes that although size is a common rather than a proper object, there is a difference between feeling and seeing the size of a coin. But if, as supposed by the POC, the senses are distinguished only according to their proper objects, it seems that we have no way to explain the difference between our tactual and visual access to common objects of perception like size or shape. Grice explains,

> But there is nothing in this statement of the facts to tell us whether the coins *look* different in size but *feel* the same size, or alternatively *feel* different in size but *look* the same size.
>
> At this point two somewhat heroic courses suggest themselves. The first is to proclaim an ambiguity in the expression "size," distinguishing between visual size and tactual size, thus denying that spatial properties are really accessible to more than one sense. This more or less Berkeleian position is perhaps unattractive independently of the current argument; in any case the introduction of the qualifications "visual" and "tactual," in the course of an attempt to distinguish the senses from one another without invoking the special character of the various modes of perceiving, is open to the gravest suspicion. The second course is to amend the accounts of looking and feeling in such a way that, for example, "A looks larger than B" is re-expressible more or less as follows: "A directly seems larger than B in the kind of way which entails that A and B directly seem to have certain color-properties." (Grice, 1962/2002, p. 39)

As Grice rightly points out, if perceptual experiences are not characterized by any intrinsic features, it seems impossible to distinguish between two experiences directed to the same common object. But our tactual and visual experiences of size are completely different even though they have the same intentional object.

To respond to this objection, it would be possible, following Grice, to deny that we perceive common sensibles and assume that our perception of size or shape is directed to sui generis proper sensibles like "visual size" and "tactual size." But I think this line of response should be avoided, because it would deny perceptual access to objects as phenomenological wholes and cut off the sense modalities from each other. If common sensibles were not perceived, we should in effect deny that birds could be

heard and seen or that peaches could be felt and tasted, because the diverse sensory qualities would not be united by the spatial properties that combine these qualities into a unitary framework.

Grice himself suggests a better alternative for distinguishing the sensory modalities without having to dispense with the unity provided by the common sensibles. As explained by Massin, visual and tactual perceptions of spatial properties are experienced in different ways, because the spatial properties are perceptually accessed by dependent properties. One does not only see the size of the coin. One sees the size of the coin by seeing its color. Similarly, one does not simply feel the size of the coin, but instead feels its size by feeling its hardness. Massin demonstrates the point incisively:

> Ironically, the good answer to this objection is advanced by Grice himself: in substance, the relation between shape and colour, or between shape and the proper object of touch is not one of mere conjunction but one of dependence: one can't see a shape without seeing a colour; and one can't feel a shape without feeling a tangible quality, whatever it is. So whether a given shape is seen or felt is determined by the proper sensible on which it depends: it is seen if it depends on a colour; and it is felt if it depends on a tangible quality. To put it another way: if the shape is coloured, it is seen; and if it is, say, pressing, it is felt. If it is both coloured and pressing, it is seen and felt. (Massin, 2008, pp. 2–3)[20]

The POC acknowledges an essential relation between a given sensory modality and its proper object, but it also explains how the senses collectively can give a unified picture of the reality by recognizing the special role played by common objects in perception. In the remainder of this paper, I will demonstrate the advantages of the POC over the other criteria in demarcating the sense of taste. I will show in particular that, contrary to

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[20] Massin elaborates his answer to the POC in Massin (2014). Contrary to his earlier view, cited above, Massin analyzes the relationship between proper sensibles and common sensibles in terms of "filling" rather than dependence. In the view defended in Massin (2014), proper sensibles are not properties or events, but dependent stuffs that fill common sensibles. Massin argues that unlike dependence relations, filling relations can be perceived and therefore elucidate the phenomenal difference between feeling and seeing a shape.

the sense organ criterion used in most scientific and philosophical studies of taste, the POC does not restrict taste to the perception of four or five qualities. Contrary to this minimalist account of taste, I will argue that the world of taste is varied and virtually infinite.

5. What if we could taste coffee after all?

Applied to the individuation of taste, the POC has significant consequences. I will examine them in the following order:

1. Taste is not restricted to the perception of the so-called basic tastes.
2. Taste and smell are not confused.
3. Olfaction is not a "dual modality."
4. The sense of smell in not involved in the direct perception of tastes.
5. There is no olfactory illusion in taste perception.
6. There is no special fusion or binding between olfaction and taste.
7. There is no need to postulate flavor perception in addition to taste and smell.

5.1 Taste is not restricted to the perception of the so-called basic tastes

According to the POC, and contrary to the scientific view of taste, there is no reason to restrict taste to the perception of four or five qualities. The POC is therefore in full accordance with the commonsense view of taste, which considers the array of tastes to be both rich and varied. Unlike what is suggested by the scientific literature on taste, there is no valid reason to deny that we can taste vanilla, lemon, coffee, artichoke, or

squid. If the sense of taste is determined by the way gustatory qualities appear in experience, then it represents an extraordinary diversity of properties.

Moreover, there seems to be no reason to believe that the naive view of taste validated by the POC conflicts with the scientific discoveries regarding the nose's involvement in taste detection. In effect, there is no reason to conclude that a diversity of sensory receptors is correlated to a diversity of sensory modalities. It seems, in fact, that most unitary sensory modalities involve some kind of functional and physiological complexity. For example, vision involves the interaction of two eyes, two kinds of photoreceptors, and functionally distinct subsystems, but this complexity does not provide grounds for a multisensory view of vision.

5.2 Taste and smell are not confused

As stressed by Stuckey, we don't confuse our senses:

> Imagine someone saying, "When I heard that Renoir, I was really moved." or "I like to watch the radio." It just doesn't happen. (Stuckey, 2013, p. 36)

We know by perceiving some colors that we see rather than hear something, and it seems impossible to imagine what it would be like to hear a color or see a sound.[21] But according to the scientific view, taste is an exception to this general principle, because we wrongly attribute taste qualities that in fact belong to olfaction. This view is reflected in Edward Titchener's characterization of taste in his best-selling textbook:

> Next after sight and hearing, in a list of the senses, stand taste and smell. These, too, seem to go together as a matter of course. Psychologically, indeed, they

[21] Although synesthesia has been described as the mixing of the senses, I think it should be described as the triggering of one sensory modality by the stimulation of a different modality. Synesthesia characterized in this way would not constitute a case of confusion of the senses; it would, on the contrary, rely on a prior distinction of the sensory modalities.

> have good right to go together. Both alike are chemical senses, and the two groups of sensations are intimately connected in experience: so intimately, that in everyday life we are constantly attributing to taste what really belongs to smell. (Titchener, 1909, p. 115)

But there are no good reasons to claim that we confuse taste and smell. According to the POC, the distinction among the senses is nothing other than a distinction between their proper objects, and there is no evidence that we systematically misperceive gustatory or olfactory qualities and objects.

As pointed out above, scientists' tendency to ascribe to olfaction some of the qualities perceived by taste relies on the organ criterion they implicitly use to individuate the sensory modalities. As I will argue in the next section, olfaction, like any other sense modality, is individuated not by its organ but by its proper object: smells.

5.3 Olfaction is not a "dual modality"

According to Auvray and Spence (2008), olfaction is

> the only dual sensory modality, in that it senses both objects in the external world and objects in the body (mouth). (p. 1022)

Similar claims can be found in Rozin (1982) and numerous psychological studies of olfaction and taste.

The belief that olfaction corresponds to the perception of "objects in the body (mouth)" seems to be in total disagreement with the phenomenology of olfaction. Unlike distant objects or events accessible to sight or hearing, smells appear "in the vicinity of the nose" (Richardson, 2013, p. 417) or are indeterminately located around the perceiver (see Matthen, 2005; Batty, 2010; Mizrahi, 2014), but they do not appear to be located in the mouth of the perceiver, as stated by Auvray and Spence (2008).

The curious claim that olfaction is directed to objects in the mouth results from applying the organ criterion to the sense of smell. But as argued in 4.1, there seems to be no way to ascribe an organ to a sense modality that does not rest on the phenomenology of perception. It is certainly remarkable that the nose is involved in olfaction and taste, but this involvement does not show that olfaction is a dual-sensory modality. What it suggests, in my view, is that smell and taste are similar sensory modalities directed to distinct but ontologically similar objects.

5.4 The sense of smell in not involved in the direct perception of tastes

According to the POC, to say that the sense of smell is not involved in the perception of tastes is to say that the sense of smell and the sense of taste are directed to distinct proper objects: smells and tastes. Rather than focusing on the biology of their respective organs, a better understanding of the sense of smell and the sense of taste would therefore require a better understanding of the nature of their proper objects. Unfortunately, very little has been done in this regard. For a long time, psychologists and scientists have focused on vision and left the other sensory modalities relatively unexplored.

However, an emergent and rapidly growing interest in the study of other sense modalities has recently challenged this "visuocentrism."[22] With the study of nonvisual experiences, new philosophical puzzles have emerged and new ontological entities have entered discussions of the world of perceptual experiences. It has been argued, for example, that the content of auditory perception is events rather than objects (Casati & Dokic, 2005) and that only an account of force can adequately explain the nature of our sense of touch (Massin, 2008). Although philosophical inquiries into perception can

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[22] See O'Callaghan (2007), chap. 1.

benefit from the research conducted in psychology and cognitive science, I believe that philosophical accounts of the sense of taste will capture the specificity of taste only if they return to its phenomenology.

5.5 There is no olfactory illusion in taste perception

Although illusions can occur from time to time in all sensory modalities, it has been argued that the occurrence of illusions in olfaction is atypical because such illusions are supposed to occur every time we taste something. Prescott explains, for example, that the interchangeability of the terms "taste" and "flavor" in everyday language can be explained by an olfactory illusion:

> The most obvious indication that this is the case is the well known illusion of olfactory qualities of foods appearing to originate in the mouth. This illusion is both strong and pervasive, despite the fact that we are frequently presented with evidence of the importance of the olfactory component in flavours, e.g. through a blocked nose during a head cold or through the well-known technique of making the medicine go down easier by holding the nose. (Prescott, 1999, p. 349)

The idea that there is an olfactory location illusion that explains why retronasal perception of odors is interpreted as originating in the mouth rather than the nose is odd for at least two reasons.

First, if we assume that the peachy quality we detect when eating a peach is an odor rather than a taste, where should this peachy quality appear if not in the mouth? It is suggested by Prescott and others[23] that we mislocate retronasal odors because they

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[23] See, for instance, how Shepherd (2012, p. 18) describes as a "mirage" what happens when we taste certain foods: "And astonishingly, the sense of flavor produced is a mirage; it appears to come from the mouth, where the food is located, but the smell part,

are not located in the nasal cavity, where the odorant molecules are detected by the olfactory receptors. But no odor, whether perceived through retronasal or orthonasal olfaction, is ever located *in* the nose. When we smell a good wine, its odors are located in the glass containing the wine or vaguely around it but certainly not in our nose.[24] So why is nonillusory retronasal olfaction supposed to locate odors in the nose rather than in the mouth, where they actually appear?

Second, if we consider perception in general, the objects of perception are rarely located where the sense organs are supposed to be. With the possible exception of touch and bodily senses, it is a fundamental property of our senses that they give us access to distal objects and properties. If we consider qualities located in the mouth rather than the nose to be illusory, it seems that we have as much reason to say that most of our perceptual experiences are illusory, because they all present qualities located at a distance from their respective sense organs.

Therefore, the idea that flavors are partially constituted by odors wrongly located in the mouth arises from two confusions. It is assumed that sensory modalities are individuated by the sensory organs and that sensory qualities are perceived where the sense organ is located. I have argued that both assumptions are wrong. If what we naively consider to be tastes are tastes and not flavors or odors, there is no reason to conclude that they are mislocated. Tastes are located in the mouth—exactly where they are perceived.

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of course, arises from the smell pathway. No wonder it has taken so long to begin to realize what an amazing sense retronasal smell is."

[24] Philosophical views regarding the spatial content of olfactory experiences are quite diverse. Lycan suggests that smell is aspatial (2000, p. 278), Smith holds that we experience smells in our nose (2002, p. 139), Richardson maintains that odors are in the vicinity of the nose (2013, p. 417), and Matthen (2005, p. 284) and Batty (2010b, p. 112) claim that odors are indeterminately located around the perceiver.

5.6 There is no special fusion or binding between olfaction and taste

Although most of our perceptual experiences are multimodal in the sense that the same reality can be perceived simultaneously by several senses, it has been argued that the nature of the relation between taste and smell is unique because they are so closely related that they actually fuse together to create a new "percept":

> It has been proposed that when flavor components are congruent, the qualities of taste and smell fuse into a unified, harmonious percept. (Lim & Johnson, 2012, p. 520)

Because the relation between the sense of smell and the sense of taste appears to be so intimate, it has also been suggested that this relation can be associated with a kind of synesthesia:

> These descriptions appear to have many of the qualities of *synesthesia*, in which a stimulus in one sensory modality reliably elicits a consistent corresponding stimulus in another modality. Whereas in other modalities, synesthesia is a relatively uncommon event, the possession of taste properties by odors is almost universal, particularly in the case of commonly consumed foods. (Prescott, 2011, p. 704)

Rather than explaining the relation between taste and smell by a special kind of perceptual integration between these two sensory modalities, I suggest that the sense of smell and the sense of taste have distinct proper objects, even though they probably share some common objects.[25] Although they often interact, there seems to be no reason to conclude that taste and smell (with the meaning defended in this paper) are inherently

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[25] I have argued Mizrahi (2014) that smell is directed to stuffs rather than individual objects. I believe that a detailed study of the nature of taste will reveal that taste is another case of stuff perception. It is remarkable, in effect, that food perception does not involve the perception of any particular object, but that the multimodal perception that characterizes food perception is rather linked with the destruction of the individuals entering the mouth. By chewing aliments, we not only extract information about tastes, smells, temperatures, textures, etc., but also gain information about the stuffs that exhibit those properties.

interrelated, as suggested by many studies.

5.7 There is no need to postulate flavor perception in addition to taste and smell

Spence, Smith, and Auvray (2014) claim that, contrary to both the scientific consensus and the commonsense view, sweetness is not a taste. They argue that because sweetness is not experienced in isolation, it should be considered not a pure taste but rather a flavor attribute. As they put it,

> Our aim in this article is to argue that it does not make sense to treat taste attributes, such as, for example, sweetness, as belonging to a distinct category from flavour attributes, such as, for example, fruitiness or meatiness, which we recognise in our experience of eating and drinking. (p. 251)

The view defended here, on the contrary, is that sweetness is a taste attribute along with fruitiness or meatiness. It could appear at first that there is only a terminological difference between these two approaches and that what Spence, Smith, and Auvray call "flavor" is what I call "taste." But this is not the case. The view defended in the present paper recognizes that taste is a sensory modality individuated by its proper object. Although it also acknowledges that taste can interact with other sensory modalities like touch or thermal perception to provide more exhaustive access to food, it does not endorse a multisensory approach to taste. I believe that Spence, Smith, and Auvray (2014) rightly denounce the confusions that arise when one tries to dissociate "basic tastes" from what people really experience when they perceive food. But there is no need to suppose, as they do, that the only way to account for the richness of food perception is to appeal to the notion of "flavor." All that is needed, as I have demonstrated here, is to return to the naive notion of taste.

6. Conclusion

According to the POC defended in this paper, demarcating the senses presupposes an understanding of the phenomenology of each sense modality. It is therefore crucial, as emphasized in many new philosophical studies, to acknowledge the diversity of the senses and to fill the existing deficit regarding philosophical studies of the nonvisual senses. Regarding the sense of taste, much needs to be done, because it is only by giving a comprehensive phenomenological description of gustatory experience and identifying its objects that we can expect to gain a solid understanding of its nature.

Another important outcome of the approach defended in this paper concerns the way cross-modal or multimodal interactions are conceived. The distinction between taste and flavor has been used to claim that, contrary to the commonsense view of the senses, which suggests that the senses are discrete and relatively independent, perceptual experiences cannot be exhausted by the phenomenal features associated with each modality. It has been argued in particular that flavors are inherently multisensory and cannot therefore be reduced to phenomenal features associated with taste, smell, or any other particular modalities (see, e.g., Smith, 2013; Macpherson, 2011a; O'Callaghan, 2014). If, as argued in this paper, the notion of taste is not restricted to the basic tastes but can be extended to the phenomenal features referred to with the term "flavor" in the scientific literature, there is no reason to maintain that flavors threaten traditional philosophical views about the senses and their interaction. If strawberry, coffee, and mint are tastes and not flavors, the notion that flavor is intrinsically multisensory must be reconsidered, as well as the support it lends to the claim that perceptual experiences are not the sum of the phenomenal features associated with each single modality.

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