A Tasty Mixture

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Abstract

Predicates of taste are puzzling expressions: on the one hand, they appear to express subjective judgments, but, on the other hand, they can be disputed, as if they expressed objective facts. I propose that when a speaker says that z is tasty, she says that a probabilistic mixture (in essence, a weighted average) of competent perceivers would perceive z to be tasty. This is an objective fact about these perceivers; but the identity of the perceivers, and the level of competence associated with them, is decided subjectively by the speaker. I compare this proposal with competing theories, and demonstrate that it accounts successfully for the properties of predicates of taste, as well as with the special puzzle of overt experiencers.

1 Disagreement on taste

A well known Latin maxim warns us that *de gustibus non est disputandum* (there's no arguing about taste), and yet such arguments are all too common:

(1) John: Roller coasters are fun.

Mary: Roller coasters are not fun (Lasersohn 2005).

Clearly, John and Mary are in disagreement. But it is a strange kind of disagreement: although John and Mary can argue animatedly about the issue, neither can rationally accuse the other of making an error of fact or

judgment; neither of them is, in a sense, at fault. Hence, such cases of disagreement over personal taste have been called *faultless disagreement*.

Lasersohn (2005) explains such disagreements by postulating that sentences are evaluated not only with respect to a time and a world, but also with respect to a judge. What John and Mary say are in contradiction, because no judge would agree to both the proposition that roller coasters are fun and to the proposition that roller coasters are not fun. However, neither John nor Mary are at fault, since John and Mary's utterances are evaluated with respect to different judges.

While Lasersohn manages to capture the faultlessness of the disagreement between John and Mary, he fails to explain why they are arguing in the first place. What is the point of arguing about the judgments of different judges? To quote from no lesser a source than Monty Python, "An argument isn't just contradiction... An argument is a connected series of statements intended to establish a proposition."

Put another way: the point of an argument is, presumably, to attempt to change the other party's opinion. Of course, one could, and often does, fail, but this is what the speaker is generally trying to do. So for an argument to make sense, there has to be a way, at least in principle, for the speaker's argument to convince the hearer.

But it is hard to see how John could, in any conceivable way, convince Mary that roller coasters are fun if she doesn't like them. Lasersohn (p. 652) has the following to say about the chances that John will convince Mary: "If Mary has ridden on the roller coaster and knows that she does not like it, surely John will not be able to convince her that it is fun by showing her the results of a survey!" Lasersohn is right, but only because with or without a survey, John will simply not be able to convince Mary that roller coasters are fun, period. But is this what he really is trying to do?

I do not believe that John is trying to convince Mary that she likes roller coasters, but, rather, that she *ought* to like them. And if this is his goal, a survey *can*, actually, help. Suppose John conducted a survey and found that many people who are generally acknowledged to know a fun thing when they see it, find roller coasters to be fun. This survey will not convince Mary that she likes roller coasters. But it may, at least conceivably, convince her that she *ought* to like them. I therefore propose that the *use* of predicates of taste (henceforth POTs) is normative, though their *meaning* is not—they refer to a survey. How can we formalize the survey idea?

2 Genericity?

Several authors (Bhatt and Izvorski 1998; Keshet 2005; Moltmann 2010; Pearson 2013) suggest that a POT expresses a generic statement. Roughly, it is claimed that "z is fun/tasty" means that, in general, people judge z to be fun/tasty. I will concentrate here on one proposal—Anand (2008), which is representative of both the advantages of and the problems with this view.

Any theory that takes POTs to be generic faces an obvious problem. POTs certainly do not *look* like generics—they have the form of simple predication. Where, then, does the generic quantifier come from?

Anand solves this problem in a very interesting way. He claims that all POTs are individual-level predicates, which he analyzes according to Chierchia's (1995) theory. Chierchia proposes that individual-level predicates are "inherent" generics: they select for the generic quantifier. Thus, for Chierchia, a simple predicative sentence such as *John is intelligent* actually involves generic quantification. This view forces Chierchia into the conclusion that the generic quantifier must be a universal quantifier: since "If one is intelligent, one remains such even when acting silly" (p. 198), *John is intelligent* means that "whenever John is or might be located, he... is intelligent" (p. 199).

In order to account for the well known phenomenon that generics allow exceptions, Chierchia follows many researchers in proposing that the generic quantifier is a universal restricted to normal individuals:[1]

> (i) Italians know Latin.
>
> When we say (i), we do not mean to say that any Italian, wherever he is, knows Latin. We are presumably talking about Italians of normal intelligence, average upbringing, and so on (p. 199n22).

Anand makes use of Chierchia's quantifier, and proposes that the interpretation of POTs is universal quantification over normal individuals. For example, "z is tasty" means that z possesses the property that causes all normal perceivers to perceive tastiness. He proposes the following interpretation (where s is a situation variable, presumably—though Anand does not say so—restricted to contain z, and $c(\mathbf{taste})$ is a contextually restricted domain of perceivers):

[1] Though this proposal is problematic—see Cohen (2012) for discussion.

$$[\![\text{tasty}]\!]^{c,i,g} = \lambda z : \exists!P \\ [\forall x_e[P(x) \rightarrow \mathbf{gen}_{a,s}[\mathbf{normal}(a,s) \wedge a \leq c(\mathbf{taste})][\mathbf{tastiness}(a,s)]]] \\ \wedge \iota P[\ldots](z)$$

Therefore, to say that z is tasty, according to Anand, is to say that there is a unique property s.t. if an individual possesses it, then all normal perceivers of a certain kind will perceive tastiness in all situations, and z has this property.

Note that in Anand's system the *only* possible source of the generic quantifier is the individual-level POT; hence, he *must* use of Chierchia's theory, and inherits whatever advantages or disadvantages it has; but he cannot use a theory of generics that does not trace genericity to individual-level predicates.

Crucially, the generic quantifier **gen** is, following Chierchia, a universal quantifier provided by the inherent genericity of the predicate. And, equally crucially, this quantifier quantifies over normal perceivers. The latter is necessary in this system in order to account for exceptions, i.e. perceivers who do not perceive the predicated property—they are considered abnormal.

This approach, however, suffers from serious problems.

The first problem is that, as is well known, generics do not require the existence of actual supporting instances:

(2) a. Members of this club help each other in emergencies.

b. Mary handles the mail from Antarctica.

However, POTs do seem to require the existence of actual supporting instances, and are bad if such existence is denied:

(3) #Although the cake was tasty, because of the coating of the plastic it was wrapped in, it always tasted terrible.

Anand is aware of this problem; indeed, example (3) is due to him. He proposes that the requirement for the existence of supporting instances is written into the lexical meaning of POTs. However, it is not clear what would motivate such a stipulation.

The second problem depends on Anand's interpretation of generics as quantifiers over normal individuals: the perceivers need not be normal. For example, as Anand himself acknowledges, even if John knows that his taste buds are atypical, he can still say of something that it is tasty. Anand speculates that domain restriction may be able to solve this problem. Presumably,

he means that if the domain is restricted to people whose taste buds are similar to John's, then he would be considered normal with respect to them.

But there is no evidence for this: John can still say truthfully and felicitously of something that it is tasty out of the blue, with no explicit or implicit restriction to any group. Worse, such a move would rob normality of its explanatory role, and would treat it as a mere formal notion, so that anything can trivially be considered normal, by restricting the domain appropriately. But then we would predict that a generic statement such as *Ravens are white* has a reading under which it is true: when the domain is restricted to albino ravens. But the fact is that no such reading is available.

The third problem is that predicates of taste are graded: something can be tasty to a certain degree. However, there is no mention of degrees in Anand's formalization: something either is or isn't tasty, not tasty to a certain degree.

It is therefore not immediately clear how Anand would handle comparatives and superlatives. What, under his system, would it mean to say that z_1 is tastier than z_2?

Perhaps Anand could argue that, in this case, all normal perceivers will judge z_1 to be tastier than z_2. Most theories of comparatives interpret such a statement by using two copies of the adjective, essentially saying that z_1 is tasty to a degree d_1, z_2 is tasty to a degree d_2, and $d_1 > d_2$.[2] In this way, degrees could conceivably be incorporated into Anand's account.

However, such an approach would run into trouble with examples such as (4).

(4) Food was tastier a hundred years ago.

Note that the interpretation of (4) requires the comparative and the tense operators to take scope over Anand's universal quantifier: otherwise, (4) would require that all normal perceivers perceive a higher level of tastiness with the food of a hundred years ago than with today's food, but, of course, no perceivers can perceive both the food of today and that of a hundred years ago!

Anand would therefore have to assign to (4) the following interpretation: a hundred years ago, all normal perceivers perceived a tastiness level of d_1 with their food; today, all normal perceivers perceive a tastiness level of d_2 with their food; and $d_1 > d_2$. But this is still not quite right: it requires

[2]There are, of course, important difference between the theories that make use of this simple idea; see Aloni and Roelofsen (2014) for a recent brief overview.

that, at a given time (today or a hundred years ago) *all* normal perceivers perceive exactly the same level of tastiness—d_1 or d_2. But this requirement is of course unrealistically strong.

Rather, what we want is something like a comparison between the *average* levels of tastiness perceived today and a hundred years ago. But it is hard to see how Anand could account for this interpretation.

It is essential for Chierchia (1995), hence for Anand, that the quantifier be a universal over normal individuals. Indeed, this is how Chierchia handles exceptions to generics: the exceptions are considered abnormal, hence do not falsify the universal quantification. However, this leads to the fourth problem, since POTs do not require that *all* normal perceivers have the indicated perception. Consider, for example, (5), attested on the Web:

(5) Cranberry juice... is rather cheap and tasty (most people enjoy cranberry juice) but it probably is an acquired taste.[3]

Sentence (5) states that cranberry juice is tasty, while acknowledging that not all people like it. Perhaps Anand might want to argue that those who dislike cranbrry juice are somehow abnormal, but this is denied by the sentence itself: to say that something is an acquired taste it to acknowledge that there is nothing abnormal about those who have *not* acquired it. As Micaela Firszt explains in *Acquired Tastes: Well Worth the Wait* (*Odyssey*, Dec 17, 2014):

> When you try a certain food or drink, don't like it, and someone tells you, "It's an acquired taste," it's normal to react in a scoff and wonder why anyone would continue to try something when they know they don't enjoy it.

We can conclude, then, that Anand's account fails. What, then, is the correct interpretation of POTs?

3 Predicates of taste and clarity

We have seen that POTs are not really similar to generics. As we look for an appropriate analysis of their meaning, it would be suggestive to find

[3] `www.drugtestdoctor.com/urine-test-pass.php`

some other construction that they *are* similar to. There is, indeed, such a phenomenon: the predicate *clear*.

Let us first note that both POTs and *clear* are gradable:

(6) $\left\{ \begin{array}{l} \text{very} \\ \text{reasonably} \\ \text{rather} \\ \ldots \end{array} \right\}$ clear/tasty/interesting

Both POTs and *clear* allow comparatives and superlatives:

(7) a. clearer, clearest

b. tastier, tastiest

c. more interesting, most interesting

Of course, these properties are common to many predicates, in addition to POTs. But there are some properties that are much more closely associated with POTs, and which are shared by *clear*.

The third point of similarity is the property that we began this paper with: faultless disagreement. *Clear* also gives rise to faultless disagreement, as can be seen by the following attested example, where one philosopher describes a faultless disagreement with another:

(8) We have here a simple conflict of intuitions, and in the last analysis it may be that you pays your money and you takes your choice. It seems quite clear to me that [I am correct]. The opposite is quite clear to Levi (Kyburg 1976:366).

A fourth point of similarity is the fact that POTs have a subjective "feel" yet carry normative, objective implications; and so does clarity. Barker and Taranto (2003) argue that *It is clear that p* does not, in fact, entail *p*, and take this fact as evidence for basing the interpretation of clarity on belief. In a later paper, Barker (2009) argues that clarity is, in fact, more objective than belief. For example, he notes that one might believe that there is life on Mars, yet agree that it is reasonably clear that Mars is barren of life; or one may believe in the existence of God, yet still deny that it is clear that God exists.

The fifth point of similarity is that both behave like factives, in allowing interrogative complements. For example, the factive verb *know*, unlike

the non-factive *believe*, allows an interrogative complement. Both *clear* and POTs like *interesting* pattern with factives in this regard:

(9) a. Mary knows who the murderer is.

b. *Mary believes who the murderer is.

c. It's clear who the murderer is.

d. It's interesting who the murderer is.[4]

The great similarity between POTs and clarity does not, of course, mean that they constitute the same phenomenon; but it does suggest we ought to see whether an analysis of the latter can shed some light on the former.

Wolf and Cohen (2011) propose that *It is clear that* ϕ means that competent reasoners would conclude, with a high level of confidence, that ϕ. Wolf and Cohen formalize the notion of "competent reasoners" in terms of a *mixture model*. This is a widely studied notion in mathematical probability:

> A mixture of distributions is a weighted average of probability distributions with positive weights that sum to one. The distributions thus mixed are called the components of the mixture. The weights themselves comprise a probability distribution called the mixing distribution. Because of this property of the weights, a mixture is, in particular, again a probability distribution (Blischke 1978:174).

A mixture model is, in a sense, a formalization of the survey idea.

4 Predicates of taste are mixture models

I propose applying the idea of a mixture model to POTs. Specifically, "z is tasty" means that competent perceivers would perceive a high level of tastiness with z. Crucially, in contrast with Anand's approach, these perceivers need not be normal, and they do not all have to agree that z is tasty.

In formalizing this interpretation of POTs, we can use the fact that POTs are vague (Lasersohn 2005). I assume that each perceiver i assigns a degree

[4] An anonymous reviewer of a previous version of this paper questions the acceptability of this sentence, but acknowledges that a simple google search for "it's interesting who" returns tens of thousands of results.

to the proposition **tasty**(z). This degree can be represented as a probability measure (Kamp 1975): P_i(**tasty**(z)).

Recall that the proposed definition refers to *competent* perceivers; these are perceivers whose taste is respected—not all perceivers carry the same weight. Hence, each perceiver i is assigned a weight w_i.

Let us require:

$$\sum_{i=1}^{n} w_i = 1$$

Then, the weighted average of all perceivers is provably also a probability measure—a *mixture model*:

$$P_{\text{mixture}}(\phi) =_{\text{def}} \sum_{i=1}^{n}(w_i \times P_i(\phi))$$

Note that P_{mixture} does not necessarily increase with the number of perceivers.

The truth conditions of POTs can be derived most naturally if we assume that each vague predicate Q is associated with a delineation function (Lewis 1970): $d(Q)$ returns the threshold for a true application of Q. Then, "z is tasty" is true iff the value of the mixture model of perceivers is above d(**tasty**), the threshold for tastiness:

$$(10)\ \sum_{i=1}^{n}(w_i \times P_i(\textbf{tasty}(z)))) > d(\textbf{tasty})$$

In this way, we have succeeded in squaring the circle: POTs have an objective aspect, because the judgments of competent perceivers are objective facts; yet they also have a subjective aspect, because the identities of the perceivers and their weights—the levels of competence associated with them—are decided subjectively by the speaker.

5 Solutions to the problems

Let us see how the proposed semantics for POTs solves the problems raised above. The problem we started from—faultless disagreement—receives a natural solution. When John and Mary disagree, they disagree on what counts as a competent perceiver, i.e. the identities of the perceivers and the weights assigned to them. This is a genuine disagreement, not merely a contradiction. However, it is faultless: John and Mary are both entitled to have different

assessments of the perceivers. But although faultless, the argument is not pointless. It is conceivable that John would be able to convince Mary that she does not take into account some competent perceivers. *This* is the reason why they argue.

We can also solve the problems accompanying Anand's approach. The first problem involves the existence of supporting instances, as demonstrated by (3), repeated below.

(3) #Although the cake was tasty, because of the coating of the plastic it was wrapped in, it always tasted terrible

Sentence (3) is odd since the sentence says that the cake was tasty–by the proposed account, this means that competent perceivers would perceive high levels of tastiness with it. However, the sentence also says that all perceivers who tasted the cake, however competent, actually perceived low tastiness, and this is a contradiction.

The second problem facing Anand's theory involves abnormal perceivers. This is not a problem, however, with the proposed interpretation, because it is not concerned with the normality of perceivers. Only the weights assigned to them by the speaker matter. Someone with atypical taste buds will assign high weights to similar abnormal perceivers, and can therefore pronounce something to be tasty.

The third problem concerns comparatives and superlatives, as exemplified by (4), repeated below.

(4) Food was tastier a hundred years ago.

The comparative receives a standard interpretation—a comparison between degrees. Under the proposed approach, (4) receives the desired interpretation: it compares the degree of tastiness assigned by a mixture model of competent perceivers (essentially, the weighted average level of tastiness perceived) a hundred years ago to the degree of tastiness assigned by a mixture model of (different) competent speakers today, and states that the former is higher. Thus, we compare weighted averages of perceived tastiness, and not degress that have to ber perceived by *all* perceivers, as desired.

The fourth problem comes from Anand's requirement that the quantifier be a universal, but it does not arise under the current proposal: the proposed theory requires that the mixture of perceptions of perceivers be high, not that *all* of them agree.

6 Psych predicates and overt experiencers

POTs can occur with an overt experiencer, e.g., *z is tasty for X*. Intuitively, a similar meaning can be expressed by a psych predicate, e.g., *X likes z*. However, Anand (2008) notes an important difference between the two. He points out that the psych predicates that correspond to POTs do not allow faultless disagreement. Thus, Mary's answers in (11) and (12) are infelicitous.

(11) John: I like this.

Mary: #But you're wrong. It's disgusting.

(12) John: This bores me.

Mary: #But you're wrong. It's not boring.

Anand claims that, in contrast, faultless disagreement *is* possible with overt experiencers:

(13) John: This is tasty for me.

Mary: But you're wrong. It's disgusting.

(14) John: This is boring for me.

Mary: But you're wrong. It's not boring.

Note that Lasersohn's theory predicts the exchanges in (13) and (14) to be bad, since there is no contradiction: a judge *can* accept that something is tasty/boring for John, while judging it disgusting/interesting.

Anand attempts to account for the data in (13) and (14) by proposing that "z is tasty for X" means that X has grounds for believing that z possesses the property that causes all normal perceivers to perceive tastiness. There are, however, two problems with this proposal.

The first problem is that while overt experiencers are better than psych predicates in cases of faultless disagreement, they are still not perfect: (13) and (14) are still somewhat odd, though unquestionably better than (11) and (12).

The second problem comes from the fact that Anand relies on Chierchia's (1995) theory, according to which some predicates (namely individual-level predicates), including POTs, induce the generic quantifier. Crucially for

Anand, POTs express quantification, and the *only* source of this quantifier is the inherent genericity of the predicate. But Chierchia's theory is designed to account for generics; applying it to POTs is problematic.

Consider (15a). Regardless of how we choose to interpret the POT *fun*, this sentence is a generic, expressing a generalization about roller coasters. Chierchia would interpret (15a), essentially, as (15b).

(15) a. Roller coasters are fun for X.

b. For **gen** $z \in$ roller-coasters: z is fun for X.

Crucially, the generic quantifier is introduced by the individual-level predicate *fun*; there is no other source for it in the sentence.

Anand's theory requires that (15b) be interpreted as (15c).

(15) c. For **gen** $z \in$ roller-coasters:
X believes that for **gen** $y \in$ normal-perceivers:
y perceives z to be fun

The second generic quantifier is *also* introduced by the predicate *fun*; again, there is no other source for it in the sentence. But according to both Chierchia and Anand, the predicate *fun* can generate only one instance of **gen**—but (15c) requires two.

Put another way, the generic quantifier ought to have scope above the belief operator to get the generic reading, but also below it, to get Anand's interpretation. Hence, even if *fun* did induce a generic quantifier, it would have to quantify over roller coasters, and would not be able to quantify over perceivers. And since this is the only source of quantification available to Anand, his proposed interpretation cannot be generated.

I propose an alternative solution to the puzzle of overt experiencers. A POT, even when it is modified by "for X", is always interpreted as a mixture model. By default, the weights are assigned to perceivers by the speaker; but they are assigned by X if the sentence is modified by "for X".[5]

Thus, (16a) and (16b) both mean (10), repeated below.

(16) a. It's tasty.

b. It's tasty for X.

[5]This is not to be confused with Lasersohn's judge: neither the one who assigns the weights to the perceivers, nor the perceivers themselves, are parameters of evaluation.

(10) $\sum_{i=1}^{n}(w_i \times P_i(\textbf{tasty}(z)))) > d(\textbf{tasty})$

The difference is in the assignment of weights: in (16a), weights are assigned by the speaker, whereas in (16b), the weights are assigned by X.

It follows that if X is the speaker, as in the sentences in (17), both forms are evaluated with respect to the same assignment of weights, hence have the same truth conditions:

(17) a. It's tasty.

b. It's tasty for me.

The only difference is that (17b) appears to express an implied contrast: both say that the referent of *it* is tasty for the speaker (i.e., judged tasty by perceivers whose taste is respected by the speaker), but (17b) implies that it might not be tasty for someone else. Overt mention of the experiencer has a similar effect to an overt use of a pronoun in a pro-drop language, which is also used to indicate contrast (Enç 1986).

This explains Anand's (2008) observation that faultless disagreement with (17b) is possible, because the hearer can still challenge the assignment of weights. However, as pointed out above, Anand fails to note that such disagreement is still somewhat odd, and not as felicitous as with (17a). The reason is that the speaker already implies that there are other legitimate assignments of weights, hence it would be odd to argue that the speaker's assignment is the only correct one.

7 The origins of mixtures

In this paper I argue that predicates of taste, just like expressions of clarity, are evaluated with respect to mixture models. A question that ought to be asked is *why?* What is it about these expressions that requires mixture models in their interpretation?

I do not have a definitive answer to this question, but, in conclusion, I would like to offer the following speculation: the reason has to do with the vagueness of both expressions. It is well known that vague predicates are also subject to faultless disagreement. Two people may argue, for example, over whether auburn hair is red or brown.

Of course, there are also clear-cut cases: few, if any, would disagree that a ripe tomato is red. If someone does point to a ripe tomato and denies that it is red, we would probably assume that she is joking, or perhaps that we are misinterpreting her pointing gesture and she actually means to point at something else. But this is also the case with POTs: while different people find different things to be tasty, it is easy to find substances that nobody would find tasty. If someone does point to one of these revolting substances and declares it to be tasty, again we would normally conclude that it is a joke or a case of misinterpreted pointing.

I therefore speculate that vagueness itself requires the use of mixture models.

There is at least one theory of vagueness that makes a suggestion along these lines: "For an object to be (definitely) red is for it to be the case that the opinion of each of a sufficient number of competent and attentive subjects... would be that it was red" (Wright 1987:244). The requirement that *each* of the subjects judge the object to be red is unrealistic (Sainsbury 1991), but, if this requirement is dropped, Wright's idea can be naturally formalized in terms of a mixture model of the judgments of competent and attentive subjects: if the value of the mixture exceeds $d(\mathbf{red})$, the object is red, otherwise it is not.

If Wright's theory is on the right track, there is nothing so special about clarity or predicates of taste, and their meaning comes simply from their vagueness:

1. For an object to be red is for competent observers to have the opinion that it is red.

2. For a proposition to be clear is for competent reasoners to conclude that it is true.

3. For something to be tasty is for competent experiencers to perceive tastiness with it.

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