LUCRETIUS
AND THE SALTY TASTE OF SEA AIR

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Summary: This article treats the sense of taste in Epicurean thought through the evidence in Lucretius' *De rerum natura*. It reconstructs Lucretius' account of what taste is and how it works, with a view to explaining instances like the taste of salt by the seaside, where we seem to taste at a distance. I argue that such instances are not exceptions, but examples that reveal more about the processes behind them. When analyzed in conjunction with the physiology of taste and the water cycle, the salty taste of sea air confirms the traditional view that the perception of flavor consistently occurs through direct contact with the object of perception, not through indirect contact with an intermediary. Moreover, it advances the understanding of what comes into contact, what the perceiver contributes to taste, and taste's sensory threshold.

INTRODUCTION

The sensory turn has led to a renewed scholarly interest in Epicurean theories about the senses, for which Lucretius' *De rerum natura* offers some of the most important evidence. While the preponderance of that attention has been devoted to the sense of sight, there have also been studies on the rest of the so-called five senses, as well as on other perceptions, the nature of sensible qualities and their relationship to the senses' spheres of discrimination, the role of the senses in epistemology,

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and the possibility of synaesthesia.[1] In the context of the debates about touch, the sense of taste has also come under scrutiny. The testimony of *De rerum natura* (hereafter *DRN*) is particularly important in these cases as there is no explicit discussion of either in what survives of Epicurus' works.[2] The discussion in other Epicurean sources is minimal.[3] The traditional scholarly perspective is that the Epicureans believed that the sense of taste functions through direct contact between the sense organ and the object of perception, i.e. between the tongue and food or drink.[4] It is generally thought that, in this, taste is like the sense of touch, which also operates through direct contact, whereas the senses of sight, hearing, and smell entail the apprehension of objects at a distance via contact

1 On smell, see Koenen 1997. On sound, see Koenen 1999; Koenen 2004; Holmes 2005; Zinn 2018. On touch, see Maurette 2014: esp. 312-15; Sedley 2018. On taste, see Rosenmeyer 1996 and, regarding taste in ancient thought more generally, Rudolph 2018a and Rudolph 2018b: esp. 49-54 on the atomists. On other perceptions, such as that of time and of the self, see e.g. Verde 2008; Zinn 2016; Németh 2017: esp. ch.1. On sensible qualities and the senses' spheres of discrimination, see e.g. Sedley 1989; Furley 1993; Monet 1996; O'Keefe 1997. On the role of the senses in epistemology, see e.g. Fowler 1984; Everson 1990; Asmis 2009; Vogt 2016. On synaesthesia, see Walters 2013. These topics are not mutually exclusive nor treated as such by the aforementioned studies, many of which contribute substantially to multiple topics. Broader studies that also include treatment of many of these topics include Asmis 1984; Long & Sedley 1987: esp. 1.72-90, 2.75-93. The work of scholars like Solmsen (e.g. 1961), Schoenheim 1966, Striker 1977, Glidden (e.g. 1979a, 1979b), and Taylor 1980, while perhaps too early to be considered part of the sensory turn per se, is also noteworthy and has contributed significantly to subsequent scholarship on these topics.

2 I have found none. Other scholars concur. Regarding taste, see e.g. Bailey 1947: 3.1257; Rosenmeyer 1996: 138; Koenen 1997: 167 n. 18. Regarding touch, see e.g. Asmis 1984: 105 n. 2; Koenen 1997: 163 n. 1.

3 The most important example is PHerc. 19/698, which may be from Phld. *De Sensibus*; on this, see p. 181 below. See also Plut. *Adv. Col.* 1109c, 1110b-c.

4 See e.g. Bailey 1947: 3.1179, 3.1253; Asmis 1984: 105, 111, 115-16; Asmis 2009: 102.

with intermediaries.[5] Others have suggested that all of the senses are reducible to touch.[6] Schoenheim and Rosenmeyer propose specifically the touch of effluences.[7] In support of the possibility that taste might work this way, both mention the salty taste we experience near the sea (*DRN* 4.222-24, 6.928-30).[8] The Epicureans believed that the senses do not err.[9] This phenomenon points to a potentially illustrative conundrum: how is it possible to taste at a distance? According to Lucretius, while *DRN* does not explicitly explain everything, it does offer one enough to work out the rest for oneself.[10] In this way, apparently exceptional phenomena present opportunities to reveal further complexities of the processes which led to them.[11] This study thus reconstructs the physiological mechanisms underlying the sense of taste, with a view to explaining the salty taste of sea air and other instances of taste at a distance. In the process, it also brings to bear evidence from Epicurean discussions of the water cycle. It argues that, in fact, the salty taste of sea air is no exception; rather, it is the apparently exceptional case that proves the rule, so to speak, with implications for our understanding of the Epicurean theories about what one tastes, how taste works, and taste's sensory threshold.

5 See e.g. Sedley 2018: 68. On the close relationship between touch and taste in ancient thought more generally, see e.g. Weddle 2017: esp. 105-6, 118; Rudolph 2018a: 1-2; Rudolph 2018b: 45, 49, 51.

6 For an overview of scholars who at times seem inclined to that interpretation, see Sedley 2018: 67-8, on whose contribution to the debate, see pp. 180-81 below.

7 Schoenheim 1966; Rosenmeyer 1996. On what is meant by effluences, see pp. 153-56 below.

8 Schoenheim also cites the bitter taste we experience near the mixing of wormwood; Schoenheim 1966: 80, 86 n. 2; Rosenmeyer 1996: 144. For an overview of the state of the text in the second instance of these lines, see Bailey 1947: 3.1694.

9 On the Epicurean belief in the reliability of the senses and their role in epistemology, see Lucr. *DRN* 4.478-99. Epic. *RS* 23, 24; Diog. Laert. 10.31-32. The bibliography on this subject is vast; see n. 1 above for some important contributions.

10 Lucr. *DRN* 1.400-9.

11 See e.g. pp. 194-97 below on the taste of honey, Koenen 2004 on the echo, and Glidden 1979a: 168 on the role of the bizarre.

THE STATE OF THE QUESTION

The sense of taste is a capacity of all living creatures. One of the traditional five senses of the body, Lucretius explicitly attributes it to both humans and animals. All are born with this essential property and from birth learn to use it through experience, in a process of trial and error. It generally helps one to seek suitable nutrition, avoid poison, and thus to survive.[12] Lucretius' main account of taste occurs in the fourth book of *DRN*, following the treatment of sight (4.54-378) and optical illusions (4.379-468), his refutation of skepticism and argument for the epistemic reliability of the senses (4.469-521), and the explanation of hearing (4.522-614). In brief, it proceeds as follows:

4.615-16	Taste can be understood according to a logic similar to that which explains how the other senses work.[13]
4.617-21	We experience taste in the mouth, via the tongue and palate. The flavor comes from food.
4.622-26	When we taste different flavors, we also experience pleasure and pain, depending on the shapes of the particles involved.
4.627-32	The pleasures of taste cease once ingestion occurs. Any food will suffice for nourishment, provided that it meets certain basic conditions.
4.633-41	Some food is better suited to some creatures than to others.

12 See e.g. Lucr. *DRN* 4.633-62, 823-59, 5.1032. The faculty of smell also aids in seeking food, avoiding poison, and survival; 4.684-86.

13 These lines evoke and bring forward the sense of Lucr. *DRN* 4.522-23. See also 4.489-96, 6.981-87.

4.642-62	Different sorts of creatures experience the same food differently. This is due to differences in the creatures' physical makeup.
4.663-72	Similarly, when we are sick, things taste different to us than they usually do.

Lucretius then moves on to the sense of smell (4.673-705). This much is fairly uncontroversial. The debate about taste primarily revolves around the details of the interpretation. Before presenting a more in-depth treatment than has thus far been attempted, a sketch of that debate is in order.

Consideration of taste is often closely linked to that of touch, in both the ancient and modern discussions of Epicurean theory. As stated above, the traditional view is that both touch and taste operate through direct contact with the objects of their perception. Others have proposed an indirect contact mechanism. This idea has a history. Lucretius' emphasis on *tactus* and on the role of contact in the materialist physics of the senses led some scholars to question whether all of the senses can be reductively explained by the sense of touch.[14] Two of the advocates of this theory – that indeed they can be – are Schoenheim and Rosenmeyer.[15] Both also argue that touch is in fact the registering of contact specifically with various kinds of effluences, different sorts for the different senses; by their logic, taste is the registering by touch of contact with effluences of taste-bodies or flavor [16] However, Schoenheim acknowledges that with taste '[t]here are not normally effluences as such. It is the objects themselves we taste, even though we do squeeze

14 See n. 5 above.

15 Schoenheim 1966; Rosenmeyer 1996. Cf. Glidden 1979a: 177-78 n. 15; Furley 1993: 91-92.

16 Schoenheim 1966: esp. 74, 77, 81, 86 n. 2, 87; Rosenmeyer 1996: esp. 137-38, 140, 141-42, 143.

the taste out of them'.[17] She reaches a similar conclusion about the role of effluences in the sense of touch.[18] Schoenheim nevertheless takes 'the salty taste of sea water and the bitter one of wormwood, which we can perceive without actually drinking the water or eating the herb' as evidence for the role of effluences in all of the senses, at least in some cases.[19] While Schoenheim treats taste in the context of her larger arguments about touch, it is Rosenmeyer's main topic and he considers it in far greater detail. He argues that chewing liberates effluences of flavor from food.[20] These effluences, not the food, enter our passages and lead to taste.[21] Thus all taste occurs at a distance from the source object, whether the relatively small distances in our mouths or the perceptible larger distance of 'the salty flavor of the sea breeze'.[22] In order to address their arguments, we must first consider what is meant by 'effluence'.

On one reading, effluents are simply bodies which flow out from a source object. Effluence refers collectively to a stream of effluents. Some effluents emanate continuously from the surface, as do *simulacra*, the ultra-fine films that give rise to vision. They have the same shape and color as their source object, but do not share its other properties. Other effluents are emitted from deep within an object, like odors, sounds, and smoke.[23] While *simulacra*, sounds, and odors are microscopic, one can see smoke.[24] The *simulacra*, odors, and sounds are intermediary stimuli that

17 Schoenheim 1966: 80.
18 Schoenheim 1966: 85.
19 Schoenheim 1966: 80, 86 n. 2.
20 Rosenmeyer 1996: esp. 137-40. Rosenmeyer uses the terms effluence, film, and *simulacra* to refer to the same entities; Rosenmeyer 1996: 135 n. 4.
21 Rosenmeyer 1996: 138-39, 143-44.
22 Rosenmeyer 1996: 138, 144. Cf. e.g. Asmis 1984: 111.
23 On the positions in the source objects from which these effluences are emitted, see e.g. Lucr. *DRN* 4.90-97, 694-97. That *simulacra* do not replicate the structure of the object beyond the arrangement of constitutents on its surface, see 4.65-71, 87-89, 110-11, 196.
24 Lucr. *DRN* 4.54-126, 143-46; Epic. *Ep. Hdt.* 47-48. See also Bailey 1947: 3.1694.

– barring distortion – allow us to perceive certain properties of the thing from which they originated by preserving some continuity with the relevant aspects of that object's nature.[25] Smoke, on the other hand, is an example of effluents that do not function as intermediaries and have a nature fundamentally distinct from that of their source object. On this minimal reading, it seems plausible to hold, as for example Bailey does, that effluences of some sort could be involved in the salty taste of sea air – whether or not they are involved in taste more generally.[26] Other interpretations of 'effluence' exist as well. For example, Schoenheim suggests that the effluents particular to their respective senses are miniatures of the original objects, with the partial exception, as noted above, of the effluences that cause touch and taste.[27] According to Rosenmeyer, the emitted particles involved in sight transmit the structure of the source object, but those involved in hearing, smell, taste, and perhaps certain kinds of touch, are identical to their source objects, as microscopic replicas or extensions thereof.[28] Atomic vibration within an object or πάλσις is generally thought to be the proximate cause of certain emissions, like the emission of *simulacra*. Rosenmeyer takes πάλσις to be the

25 *Simulacra*, more specifically, preserve the color and shape of an object (or at least the shape of its color) and thereby allow one to perceive those properties of the object. Odors do not begin from a single larger particle of odor, but are sent forth as they form, preserving and transmitting the scent of the source. A sound is emitted from an object as a single particle, which breaks up into smaller but otherwise identical particles, allowing the perception of the original sound. They also preserve and enable perception of part of the nature of their source. It is in a thing's nature to make particular sorts of sounds and not others, as with the different sorts of sounds that creatures of different species are capable of making. It is also in a thing's nature to make sounds that consistently have certain characteristics, as with the distinctiveness of the voices of different individuals that features in voice identification.

26 Bailey 1947: 3.1208-10, 1694; cf. 3.1253. Other scholars who seem to share this minimalist interpretation include Sedley (1989: 126) and Furley (1993: 83-84, 91-92).

27 Schoenheim 1966: 74, 78, 86 n. 2.

28 Rosenmeyer 1996: 135-37, 144, 146-49.

cause of all effluences.[29] While Koenen is inclined to view vision and olfaction as involving such 'automatical' or involuntary emissions, she views hearing and taste as generally involving 'non-automatical emissions', or emissions which living creatures cause deliberately. She suggests, however, that automatical emissions might be involved in the taste of liquid and the salty taste of sea air.[30] Nevertheless, as Koenen notes, in Lucretius' actual explanations of hearing (*DRN* 4.522-614) and taste (*DRN* 4.615-72), he makes no reference to effluences, i.e. to a flowing away of particles involved in those sensory processes.[31]

These scholars have raised a series of related questions about what taste actually is for the Epicureans: What exactly does one perceive? What is the relationship between that thing and the sense of taste? Is any contact with the thing itself or with bodies that flow from it? If the latter, are those bodies fundamentally like their source, and where do they come from? How does one come into contact with what one perceives? What part of the body does – in other words, what is the sense organ of taste? How does that lead to the experience of taste? And, finally, do we contribute anything to those perceptions? These questions will be addressed in context. First it will be useful to return to the issue of touch.

The Epicurean account of the universe is materialistic: the universe is comprised of bodies and void, their properties, and the interactions of these entities – interactions such as the collision of atoms zinging about in space. Lucretius uses the word *tactus* to signify contact, as well as a number of ideas and processes that involve bodies touching each other. Nevertheless, as Sedley notes, Lucretius distinguishes between touch as a sense involving contact and touch as contact itself. Sedley also argues that Lucretius understands a further duality within the former: internal

29 Rosenmeyer 1996: 136, 146-48.
30 Koenen 1997: 166.
31 Koenen 1997: 165-66. See also Rosenmeyer 1996: 149.

touch and external touch – a distinction that seems shared by the Epicurean author of PHerc. 19/698, who may have been Philodemus. According to Sedley, internal touch is the body's capacity for awareness of certain states and changes within it, including some from which pleasure and pain arise. The body thus shares with the other sense organs the ability to sense its own internal state. External touch is the body's capacity for awareness of contact with things that are adjacent to or penetrating it.[32] The 'touching of touching' (*tactus … tactūs*, *DRN* 2.434), then, is 'an awareness, by the *tactile sense*, of direct corporeal *contact*' with or within the body. This capacity for 'internal tactile awareness of contact' is the sensory faculty of the body, as body, that we call the sense of touch.[33] It follows that, while all the senses operate through contact (whether direct or indirect via contact with intermediaries), their perceptions do not necessarily entail the registering of all instances of contact by the tactile sense.[34] Therefore, they cannot be reductively explained by the sense of touch.

The distinctions with which Sedley analyzes touch can also advance the discussion of taste. For the remainder of this article, unless quoting another, I use the term 'sensory faculty of taste' when referring to the ability we generally call 'the sense of taste'; a manifestation of that faculty that is our phenomenal experience, I call 'the perception of x' (where x is what one registers awareness of), 'an instance of taste', or 'the sensation of taste'. All of these expressions use an appositional genitive. With 'the mechanism of taste', I refer to how the faculty achieves perceptions; a 'sense organ of taste' is a site where that process and the sensations that seem to arise from it occur. The 'object of perception' is the thing whose properties one seems to perceive phenomenally; a

32 Sedley 1989: 126, 129-32. Sedley 2018: esp. 64-72. See also Glidden 1979a: 161-63.
33 Sedley 2018: 72.
34 Sedley 2018: esp. 67-74.

'sense object' or 'intermediary' is a stimulus which is different in nature but whose properties at some underlying level make possible that phenomenal perception. At times, the object of perception is also called 'the source object' or 'source'. When I simply use 'taste', I do so generally. I apply the same conventions in discussing the other sensory faculties and the perceptions associated with them.

THE MECHANISM

What taste is and how taste works are closely bound up for Lucretius. He begins his account in book four by characterizing taste as the feeling or perception of *sucus*. He then goes on to describe how *sucus* is produced when one eats (*DRN* 4.615-21):

> nec, qui sentimus sucum, lingua atque palatum
> plusculum habent in se rationis plus operaeve.
> principio sucum sentimus in ore, cibum cum
> mandendo exprimimus, ceu plenam spongiam aquaï
> siquis forte manu premere ac siccare coëpit.
> inde quod exprimimus per caulas omne palati
> diditur et rarae per flexa foramina linguae.[35]

> Nor do the tongue and palate, by which we perceive *sucus*, require the least bit more argument or effort to explain themselves. Firstly, we feel *sucus* in the mouth when we squeeze the food by chewing it, just as if by chance someone begins to press and to drain dry a sponge full of water with the hand. Then all that we squeeze out is distributed

35 Quotations from *De rerum natura* follow the Latin text of Rouse & Smith 1992.

> through the openings of the palate and through the winding passages of the porous tongue.

On one reading, *sucus* is a liquid substance that comes from food (*cibus*) because of mastication. The analogy with squeezing water from a sponge suggests it is mastication that releases *sucus* from the food. Saliva does not seem to be involved.[36] In conjunction with the nearby mention of liquid in the mouth (4.624), the analogy confirms that *sucus* is liquid. It is therefore likely that one operative meaning of the word is 'juice'. This is its primary signification in the Latin language and throughout *DRN*, though its full meaning is somewhat more complicated, as we shall see.[37] The repetition of *exprimimus* and its root *premo* in three successive lines emphasize that chewing food includes squeezing it – perhaps indeed juicing it. While the teeth doing the squeezing are not explicitly mentioned in the way that the hand is, line 4.615 may be evoking them with its heavy spondees. With respect to mirroring, the concentration of elisions in the opening five lines is also worth noting.[38] Taken together, they seem to support the view that the sensory faculty of taste operates through direct contact between the parts of one's mouth and the food, at least on a phenomenal level. Given the tendency for correspondence

36 Lucretius is not unaware of its existence. It is mentioned twice in the poem, once in the context of food as being poisonous to snakes (Lucr. *DRN* 4.638), and once in the context of kissing (4.1108); on the latter, see Rudolph 2018a: 16-17. Perhaps Lucretius views it as something which we generally produce in the mouth in anticipation of consuming food or drink, which then aids in swallowing it.

37 See *sucus*, *OLD* and pp. 193-97 below. Scholars working on *DRN* generally translate *sucus* as juice, flavor, or taste; see e.g. Bailey 1947: 3.1254-55; Godwin 1986: 45, 130; Rosenmeyer 1996: 138.

38 The elisions are: *lingua atque* (Lucr. *DRN* 4.615), *plusculum habent* (4.616), *mandendo exprimimus* (4.618), *spongiam aquaï* (4.618), *premere ac* (4.619). See also Bailey 1947: 3.1255; Godwin 1986: 130.

between the perceptible and the imperceptible, the reader can reasonably expect that there is also direct contact on the microlevel.[39] These lines depict what they describe in other respects as well, clarifying their meaning. In 4.618-19, *mandendo exprimimus* and *premere ac* highlight the action of pressing on something by embodying it; *spongiam aquaï*, in turn, mirrors the initial physical intertwining of and connection between the food and its *sucus*.[40] Moreover, the reader, if reading aloud, is pressing out auditory representations of these textual phenomena. Indeed, mentioning the effort of the *lingua* to explain itself may well have encouraged reading aloud. In the explanation of hearing and sound production just beforehand, *lingua* signifies the tongue and speech; the use of *exprimimus* also echoes it. The reader is thus likely to be particularly attuned to the auditory experience.[41] This trend continues in lines 4.620-21 by mirroring with the use of hyperbaton. Here the phenomena are represented visually, and the reader can apply the understanding gained from the preceding explanation of sight. *Quod* and *omne* are distributed to the first and fifth feet, respectively, and the placement of *omne* illustrates that the *sucus* is *per caulas ... palati*. Similarly, the substance's distribution *per flexa foramina* is bracketed by *rarae ... linguae.* Both constructions mimic the porousness of the tongue and palate, a subject to which we shall return shortly. These lines may also illustrate, as Godwin suggests, the winding path of the *sucus* (as juice) as it is absorbed.[42] The repetition of *per* highlights both the absorption and its pervasiveness. Lucretius thus inscribes into the very structure of lines 4.617-21 how the *sucus* comes into the

39 On this tendency, see e.g. Schrivers 1978; Schiesaro 1990.

40 The particles of *sucus* are likely dispersed throughout the food, like the water in the sponge, not necessarily just deep-seated, like bodies of odor; for further discussion, see pp. 187-88 below. For the view that they are deep-seated, see Bailey 1947: 3.1253-55, following Robin.

41 On Lucretius' use of *exprimo* and on his use of the auditory potential of the text for philosophical disambiguation, see Zinn 2018: 132 and 138-39, 146, respectively.

42 Godwin 1986: 130.

apertures and entrances, the passages and inlets, of the tongue and palate. The knowledge of the senses discussed beforehand, if applied, would prime the reader for this explanation and facilitate it. So, we perceive *sucus* when it is released from the food by chewing and the juice enters the pores of our tongue and palate. Their passages must then interact with the juice in a way that gives rise to perception. Before we turn to that perception and the other potential meanings of *sucus*, let us consider the sense organs in more detail.

As we have seen, Lucretius identifies both the tongue and the palate as sense organs of taste.[43] He emphasizes this in various ways. Lucretius foregrounds them in the first line of his explanation. There, their role in perceiving *sucus* is confirmed by *qui*, which refers to both, and they serve together as subject of *habent*, indicating their common or shared action.[44] The elision in the expression which introduces them, *lingua atque palatum*, as well as the parallelisms in the pleonastic prepositional phrases of 4.620-1, perhaps further illustrate their common function. So might the partial chiastic echo of 4.615 in 617, particularly if one takes *in ore* to refer to them collectively by synecdoche. Even today we speak of one's palate as a metonymy for that individual's particular taste or discernment. Then too *palatum* evoked both physical taste and psychological preference. The vault of the mouth was also associated with the vault of the heavens.[45] Lucretius may in fact have a multivalent meaning of *palatum*

43 Today we add the pharynx to these and focus on receptors on the surface, like the taste buds on the tongue and palate, rather than thinking in terms of pores and passages. For an overview of modern, scientific approaches to the study of taste, see Rudolph 2018a: 5.

44 It may also refer back to Lucretius' explanation of sound production in the immediately preceding account of hearing. The tongue and lips feature prominently in that mechanism. However, it is not implausible that Lucretius may also have been aware of the role of the palate in the production of some sounds. There are references to it among his Roman contemporaries; see *palatum, OLD* §1c.

45 See *palatum, OLD*; Cic. *ND* 2.18.49. That association is activated, if not reinforced, by Lucretius' use of *templa* at 4.624, even though the word seems to have a different

in mind throughout his account of taste, encompassing a range of its literal and figurative uses. In his view, both the tongue and palate play an important role in the mechanism of taste. As *rarae … linguae* (4.621) reminds us, the distinction between each sense organs' apparent surface and its inner passages may be somewhat spurious. All assemblages contain void; the amount depends on how closely their constituent bodies are interlocked and – in the larger, more complex assemblages – on their internal and external structures. Thus, all seemingly solid macroscopic bodies are actually porous, and, through some of these pores, they have the potential to emit and receive matter.[46] These bodies include living creatures.[47] Every living thing is both unique and of a kind; moreover, all creatures are both made up of many different constituents and have many constituents in common.[48] To the extent that creatures differ in appearance and nature, their constitutions also differ, including the passages with which their bodies are riddled.[49] The sense organs of taste are a particularly telling example (*DRN* 4.649-51, 655-62):

> semina cum porro distent, differe necessest
> intervalla viasque, foramina quae perhibemus,
> omnibus in membris et in ore ipsoque palato.
> …
> namque figurarum ratio ut motusque reposcunt,
> proinde foraminibus debent differre figurae,
> et variare viae proinde ac textura coercet.

primary meaning in that context; see pp. 187-91 below. Compare *templum*, *OLD* §1, 4c. See also Bailey 1947: 3.1255.

46 See e.g. Lucr. *DRN* 1.329-69, 483-97, 511-17, 532-37, 565-76, 2.100-8, 4.90-94, 6.936-58, 981-97, 1009-11, 1034-39, 1084-86.

47 Lucr. *DRN* 4.858-76.

48 Lucr. *DRN* 1.584-98, 2.342-51, 583-88, 661-72, 4.642-48, 6.981-87, 1034-36.

49 Lucr. *DRN* 2.718-29, 4.645-72 (on which, see below).

> hoc ubi quod suave est aliis aliis fit amarum,
> illi, cui suave est, levissima corpora debent
> contractabiliter caulas intrare palati
> at contra quibus est eadem res intus acerba,
> aspera nimirum penetrant hamataque fauces.
>
> Furthermore, since the seeds differ, it is necessary that the gaps and pathways, which we call passages, differ in all of the members and in the mouth and the palate itself ... For indeed as the configuration and motions of the seeds' shapes require, the shapes of the passages ought to differ accordingly, and the pathways ought to vary accordingly, as the structure compels. By this, when what is sweet to some happens to be bitter to others: for that one to whom it is sweet, very smooth bodies ought to enter the openings of the palate in a caressing manner, but, on the other hand, to those for whom the same thing inside is acerbic, doubtless rough and hooked bodies penetrate the inlets.

Lucretius thus accounts for our different tastes, i.e. what foods different creatures find preferable and even suitable.[50] In short, the shapes of one's passages influence what sorts of bodies enter and by this influence our perception.

The constitution of the tongue and palate is worth treating in further detail. Lucretius uses the palate as the exemplar (4.651, 660), coordinate with its figurative meaning as the organ of discernment, while confirming the generalizability of his remarks.[51] Lines 4.652-62 elaborate on 4.649-51. In lines 4.655-57, Lucretius presents a two-fold concept of passage shape: the shape of the channel, which affects what can fit through

50 Lucr. *DRN* 4.633-41, 6.970-78.

51 On the figurative meanings of *palatum*, see pp. 185-86 above. The generalizability to the tongue and the rest of the body, including the other sense organs, is confirmed by *omnibus in membris et in ore ipsoque palato*, Lucr. *DRN* 4.651.

it, and the shape of the route that would be traced by whatever journeys through it.[52] With respect to the shape of a channel, there is a further duality. Lucretius often uses the same word to refer to both the passages and their points of entry, as here with *fauces* (4.662), as well as with *caulae* and *foramen* throughout the account of taste.[53] While some passages may seem well-suited to admit bodies of particular shapes and sizes, this is not just a matter of square pegs and round holes, so to speak. A roundish channel of a particular size could potentially admit a smaller body with a spikey or angular shape. The shape of a given channel also is not necessarily regular, much less the same as the shape of its entrance.[54] Moreover, these shapes are not necessarily stable; they may change, for example, with illness.[55] These considerations suggest that there are not particular pores for sweet and others for bitter and that which bodies one interacts with on any given occasion of tasting is influenced by a host of factors, including the make-up of both the perceiver and the object of perception. The passages are also not necessarily distinct pathways that progress in a more or less linear fashion from the surface towards some destination, like a series of traffic tunnels under a river. Rather, as *flexa foramina* (4.621) earlier and *ac textura coercet* (4.657) here may imply, the porousness of these sense organs could best be described as a three-dimensional web, a myriad of passages of various description – woven together into networks and not entirely interconnected. They are intricate

52 Lucr. *DRN* 4.655-57.

53 The device of synecdoche supports this, of course, and sometimes the distinction is even moot in context. See *fauces OLD* §1, 3, 4. For other views, see Bailey 1947: 3.1259; Godwin 1986: 132; Rouse & Smith 1992: 328. In light of Lucr. *DRN* 4.622-29, it is unlikely that Lucretius is referring at 4.662 to the throat, although that is the primary meaning of *fauces* at 4.628.

54 See Lucr. *DRN* 2.381-97, 4.652-54 especially *modis multis* (4.654).

55 Lucr. *DRN* 4.663-72. It is conceivable that illness may change the number of passages, the identity of the passages, or just the shape in which their perimeters are configured (keeping how many and which are open to interaction).

routes with many potential twists, turns, and choke points; some even lack an opening to the world beyond the body.[56] Here, with *intrare*, *intus*, and *penetrant* (4.661-62), Lucretius stresses the penetration of the passages more than before, with *diditur per ... per* (4.620-21), which the echo of *caulas ... palati* also recalls. Lines 4.652-62 also point to parallels between the mechanism of taste and other sensory mechanisms. To the extent that passages serve as a filter, allowing some things to pass through and not others, the particular selectivity of one's passages is not specific to the tongue and palate; each of the sense organs is open to interacting with its own sorts of stimuli.[57] In the mechanism of sight, for example, *simulacra* penetrate the pupils of the eyes (4.331, 719); in that of hearing, auditory stimuli insinuate themselves into or otherwise penetrate the ears (4.525, 544, 613), and, in smell, olfactory stimuli, the nostrils (2.415, 683). That of touch may also at times work this way (2.434-35); with macroscopic entities, at least, the mechanism seems to generally involve the outermost surface of the body, not its passages, as shown by the sensory threshold for external touch.[58] In at least four of these senses, then, the contact that leads to perception involves the penetration of suitable

56 Compare Lucr. *DRN* 4.90-94, 599-602.

57 Lucr. *DRN* 2.680-87, 4.489-96, 6.981-87. See also Epic. *Ep. Hdt.* 49-53; Plut. *Adv. Col.* 1109a-1110d; Asmis 1984: 115-17. Thus, sounds have no taste, so to speak, although they are pressed out through the throat, passed through the mouth, and shaped by the tongue. On the mechanism of sound production and the senses' respective spheres of discrimination, see n. 1 above.

58 Evidence for the sensory threshold for external touch comes in part from microscopic bodies that are felt collectively like a blow to the exterior surface of the body or stubbing one's toe on a rock, as with wind and cold; Lucr. *DRN* 4.259-68. For another interpretation, see Rosenmeyer 1996: 137. It also comes from macroscopic objects whose contact is not registered by the sensory faculty of touch, such as dust, cobwebs, and feathers. It seems that, due to their size and/or lightness, they do not stir perception-bearing motion (*sensifer motus*) in the particles of the *anima* dispersed throughout the flesh; Lucr. *DRN* 3.374-95.

stimuli into the passages of the body. Wherever those instances of contact occur, whether contact with an intermediary or with the object itself, that site seems to be identified as the sense organ. Thus, for Lucretius, the tongue and palate are the sense organs of taste in that the interactions which give rise to their perceptions occur in their passages and the shape of those passages at least partly determines which particles these sense organs are likely to interact with.[59]

The interactions reveal more about the mechanism. They occur once the *sucus* and the passages meet (*DRN* 4.622-26):[60]

> hoc ubi levia sunt manantis corpora suci,
> suaviter attingunt et suaviter omnia tractant
> umida linguai circum sudantia templa.
> at contra pungunt sensum lacerantque coorta,
> quanto quaeque magis sunt asperitate repleta.
>
> By this, when the bodies of the flowing *sucus* are smooth, sweetly they touch upon and sweetly they stroke everything around the moist dripping regions of the tongue. But, in contrast, the bodies that attack our sense prick and tear, each in proportion to their roughness.

These lines establish the fundamentals of how the interactions work at the level of microscopic assemblages and structures, priming the reader for the development of the ideas at 4.658-62. Comparing these two parts of his account, Lucretius emphasizes the tongue and palate each in turn, with his use of *linguai* at 4.624 and *palato* at 4.660; the parallels between their passages and the structure and functions of these organs suggest

59 See also Lucr. *DRN* 4.706-21.
60 See Lucr. *DRN* 4.620-21 above.

that each may also refer to the other by metonymy. The content and words of 4.622-26 and 4.658-62 not only resonate with each other, they also recall and bring to bear an earlier account of the relevance of stimulus shape to perception, within which taste features prominently: 2.398-443.[61] As Friedländer and Synder have shown, Lucretius choses words that illustrate the shape of what they name through the pattern of their sounds.[62] Through *DRN* 2.398-443, 4.622-26, and 4.658-62, taken together, Lucretius shows that the shape of the stimulus not only affects whether or not it can interact but also the nature of the interaction. Both at the entrances and within the passages, smooth bodies of *sucus* make contact of a gentle touching or stroking nature.[63] This gives rise to the perception of sweetness, which is pleasurable; the anaphora of *suaviter* (4.623) signifies both.[64] Rough bodies of *sucus* make contact that pricks or tears (4.625), depending on whether their shape is just rough or also hooked. The chiastic presentation at 4.622-6 highlights the contrast between the smooth and rough bodies and their respective sorts of interactions.[65] In fact, the echoing sections of the accounts are structured around similar contrasts, most also introduced by *at contra*.[66] The reader

61 This account is itself a key exemplum in Lucretius' larger proof of the diversity of the shapes and sizes of the atoms or first-beginnings, comprising Lucr. *DRN* 2.333-477.

62 Friedländer 1941: 358-63; Snyder 1980: 91-92.

63 For contact by gentle touching, see *tango* and its compounds: *iucunde tangere* Lucr. *DRN* 2.403, *attingunt* 4.623. For contact by caressing, see *tracto* and its compounds: *tractentur* 2.399, *tractant* 4.623, *contractabiliter* 4.660. Lucretius often uses *tracto* and its compounds to indicate a sort of caressing motion, i.e. stimulation by stroking; see *tracto*, *OLD* §1, 2; Bailey 1947: 3.1259; Godwin 1986: 132.

64 See also *iucunde tangere* Lucr. *DRN* 2.403.

65 The arrangement is: stimulus shape, nature of physical interaction, location, nature of physical interaction, stimulus shape. It is perhaps no coincidence that *circum* (all around) occupies the central position.

66 Lucr. *DRN* 2.398-401 (*at contra* 400), 402-7 (*at contra* 404), 422-25 (*at contra* 424), 426-30 (*sunt etiam ... sed magis* – which, by variation, illustrates the phenomenon), 4.658-62 (*at contra* 661).

thus knows that 4.625-26 refers to two kinds of roughness. In book two, Lucretius states that when things are made from barb-like constituents, ones that have hooks with sharp, curved points, they tear their way into the body. This gives rise to some variety of harsh sensation, like the perception of a sour, bitter, or even repugnantly foul flavor, which is implied to be painful. However, when they are made from somewhat jagged constituents, i.e. ones with small angles that jut out a bit, there is a kind of tickling contact that stimulates perceptions of another sort, like of acidic, spicy, sharp, or otherwise tingly flavors.[67] Lines 4.625-26 indicate that this pointy sort also have the potential to be unpleasant, perhaps depending on the degree of their roughness.[68] In the elaboration of 4.626 at 4.662, the elements of *aspera … hamataque* should thus be understood both on their own and as a hendiadys: 'rough bodies and hooked bodies' and 'bodies that are roughly hooked'.[69] Lucretius therefore conceives of sweet and bitter as opposite ends of the flavor spectrum; there are other possibilities in between.[70]

Lines 4.615-26 also provide evidence for Lucretius' views on the speed of the interactions. His use of temporal clauses, adverbs, and participles reflects the apparent simultaneity of the perception of *sucus* and the underlying interactions with the bodies of *sucus*. These also seem to coincide with the perceptions of pleasure and pain; that implication at 2.398-407 and 2.422-30 is confirmed by 4.627-29, where Lucretius states that the pleasure from the *sucus* ends at the boundary of the palate, i.e. upon ingestion, the end of the process or mechanism of taste. The apparent

67 See esp. Lucr. *DRN* 2.398-407, 422-30, 461-70.

68 Compare Lucr. *DRN* 2.470.

69 See also *levibus atque rutundis* Lucr. *DRN* 2.402, and the echoing lines 2.404 and 2.424 where the constructions mirror the phenomenon of interlocking constituents metrically as well as when taken as instances of hendiadys.

70 On ancient and modern thought about the 'basic tastes' and the range of possible 'tastes', see Rudolph 2018a: 4-5.

coincidence of pleasure and pain with different sorts of contact – contact, that is, between the bodies of *sucus* and the passages of the tongue and palate – supports the argument that all of the sense organs are able to register awareness of their own internal states.[71] That said, distribution, penetrating, colliding, stroking, pricking, tearing, and ingesting are themselves processes.[72] All take some amount of time. If the perception of *sucus* occurs when one chews the food, with no apparent delay, and potentially lasts until the *sucus* is ingested, with no apparent lingering, then one's sensations and the interactions underlying them must only seem to coincide, and each interaction of the mechanism must occur much faster than the speed at which perception arises.[73]

Now, to what precisely does *quod exprimimus* (4.620) refer, and what are these *corpora suci* (4.622)? What is the experience to which Lucretius refers when he says *sentimus sucum*? According to Lucretius, atoms or first-beginnings lack certain properties generally possessed by larger, perceptible assemblages. The first-beginnings of things, being actually solid as well as immutable and indestructible, do not give off or break up into smaller bodies.[74] They are therefore dry of juice (*suco ieiuna* 2.845) and have no *sapor* of their own to contribute to the properties of assemblages.[75] This is the first instance of *sucus* in *DRN*. In the last, Lucretius characterizes *sapor* as originating from *sucus*.[76] So far it would seem that

71 See p. 181 above. The ability of the tongue and palate to register both the different sorts of contact and their own internal state may approach our notions of mouth-feel, excepting the contribution of aroma, which Lucretius does not seem to admit. Our contemporary discourse on taste sometimes approaches one's experience of food and drink through the vector of mouth-feel and there are multiple interpretations of the concept; see Rudolph 2018a: 5.

72 With respect to pleasure and pain, see also Lucr. *DRN* 2.963-66.

73 On the speed of our perception of time relative to other sensory mechanisms, see Zinn 2016.

74 See e.g. Lucr. *DRN* 1.169-71, 215-24, 234, 483-502, 2.842-64.

75 Lucr. *DRN* 1.778-81, 2.583-88, 854-59.

76 Lucr. *DRN* 6.986-87.

Lucretius uses *sucus* for juice and *sapor* for flavor, a property (apparently) of food or drink at the phenomenal level, registered by the sensory faculty of taste. But Lucretius also uses *sucus* to refer to both the fluid and flavor at once, as he seems to at 4.615 and possibly 4.617.[77] He also occasionally uses *sapor* this way, as perhaps with *sorsum sapor insinuatur | sensibus*.[78] Moreover, at 4.627-29 *sucus* must mean flavor, because, although one no longer experiences flavor once one ingests and distributes a nutritive substance, one still experiences pleasure if and as one's constitution is restored by that substance.[79] Nevertheless, it is those substances which have a pleasurable flavor that one tends to pursue.[80] Just as *sucus* can refer to juice and, by metonymy, to the flavor whose perception it gives rise to, so too *sapor* can refer not only to flavor, but also to the sensory faculty that perceives it. It is as the sensory faculty of taste, for example, that *sapor oris* (4.487, 494) helps to establish the epistemic reliability of the senses.[81] The one instance of *sapor* in Lucretius' account of taste comes at the end, where he demonstrates the validity of his mechanistic arguments through their potential to make sense of a common epistemological explanandum: the paradoxically bitter flavor of honey during illness.[82] Generally speaking, when honey is in one's mouth, it has a sweet, pleasurable flavor.[83] As we have seen, this means that round,

77 Lucr. *DRN* 3.216-30, esp. 223, 226.

78 Lucr. *DRN* 2.684-85. On *insinuo* in *DRN*, see Farrell 1988: esp. 183-84.

79 Lucr. *DRN* 1.350-57, 2.711-19, 963-72, 4.858-76, 4.1091-93.

80 Hence, despite Lucretius' assurance that the sort of food does not matter beyond serving its nutritive function, one still administers the medicinal, bitter wormwood in a cup rimmed with honey; Lucr. *DRN* 1.936-42, 4.11-17, 630-32. The scholarly literature on the pursuit of pleasure and avoidance of pain in Epicureanism is vast; for a recent overview of the subject, see Woolf 2009.

81 Lucr. *DRN* 4.469-521. See also, e.g. 2.510.

82 Lucr. *DRN* 4.663-72. For other ancient attempts to deal with this paradox, see e.g. Bailey 1947: 3.1260; Godwin 1986: 132; Rouse & Smith 1992: 328.

83 Lucr. *DRN* 1.938, 2.398-99, 2.505, 4.13.

smooth bodies are entering the passages of the tongue and palate.[84] Lucretius tells us that when one is sick, one's constitution sometimes undergoes changes that can affect perception (*DRN* 4.668-72):[85]

> fit prius ad sensum ut quae corpora conveniebant
> nunc non conveniant, et cetera sint magis apta,
> quae penetrata queunt sensum progignere acerbum;
> utraque enim sunt in mellis commixta sapore –
> id quod iam supera tibi saepe ostendimus ante.
>
> It happens that the bodies which were previously suited for feeling now do not fit, and that the rest are more apt, those which, when they have penetrated the sense organ, are able to produce an acerbic sensation. For both [sorts of bodies] have been mixed together in the *sapor* of honey – a thing which above I have already shown you often before.

Here Lucretius employs words and constructions with a plurality of meanings. The expression *ad sensum* functions together with the polyptoton of *convenio* as well as with *apta*. These simultaneously signify the bodies' coming together with the sense organ, their physical (in)congruity with its passages, and their (un)suitability for causing feeling.[86] In 4.670, *sensum* is sylleptic, signifying both the sense organ (whether the

84 According to Lucretius, the constituents of honey are not so smooth, round, or light as those of water, which is also sweet; therefore it is more viscous than water. Lucr. *DRN* 3.189-202.

85 See p. 188 above.

86 In *DRN*, Lucretius uses *sensus* to mean a range of things, sometimes simultaneously, including sensation, the sense organs, and the senses or sensory faculties. See e.g. Glidden 1979a: 155. I hope to develop this further in a subsequent study.

tongue or palate) that is penetrated by these other bodies and the unusual feeling to which these interactions give rise. Lucretius highlights the fact that he has already demonstrated the logic behind this by simultaneously stating and depicting it, with the pleonasm interspersed throughout last line, *iam supera ... saepe ... ante*; this synchysis perhaps serves as also a visual mnemonic of the sorts of bodies in question, imitating their characteristic interlocking – and thus evoking the hooked shapes which lead both to interlocking and to the perception of a harsh or bitter flavor, which the reader now knows is painful.[87] These lines thus show that perception is affected by the issue of fit, with respect to size and shape. The bodies of *sucus* which used to enter the sense organ no longer fit, but now the rest (*cetera*) – i.e. those which usually do not fit – are better suited to the passages and thus for causing sensation. Under those circumstances one experiences different perceptions. The flavor of honey thus has the potential to be experienced as either sweet and thereby pleasurable or as bitter and thereby painful due to honey's mixed composition, with *sapor mellis* signifying both. As we have seen, different creatures experience the same foods differently because their passages are open to interactions with different constituents.[88] Similarly, we perceive flavor differently when our passages have changed significantly. Confirming 4.659-62, then, bitter and sweet are real, not conventions; they are two potential perceptions of the flavor of the very same thing (*eadem res*).[89] Which sensations one experiences thus depends to some extent on what one contributes to the process. It is telling that the one time the expression *corpora suci* occurs is in the context of the mechanism of taste. Because one's constitution influences which bodies are selected for interaction and, by this, how one experiences the property

87 Lucr. *DRN* 2.398-407 (esp. 404-5), 422-30.

88 Lucr. *DRN* 4.633-63. See pp. 186-90 above.

89 Following Epicurus, contra Democritus and the Sceptics. Democritus B9 (SE *M.* 7.135) DK; Sedley 1983: 33; Long & Sedley 1987: 1.37; Wardy 1988; Warren 2002: 7-9, 193-94.

of flavor, the expression is pointed. As *sucus* is *quod exprimimus,* thus *corpora suci* may be read both as a periphrasis and not. As a periphrasis, it nevertheless emphasizes the salient aspect of the thing to which the expression refers – namely, the constituent bodies of the juice that, through their interactions, give rise to the perception of flavor.[90]

Until the discussion of honey, the account of taste has been concerned with *cibus*, apparently as what we might call 'solid food'.[91] Honey is a liquid.[92] Lucretius divides all food into two categories: dry (or solid) food and liquid food.[93] Thus, unless otherwise specified, one should read *cibus* as signifying 'nutritive substance' – more precisely, 'assemblage containing some potentially nutritive constituents' – and any comments about *cibus* should be understood to apply to both solids and liquids.[94] Given these things, the mechanism of tasting liquids should somehow be self-evidently contained in the broader account of tasting food. We will return to this shortly. For the time being, let us simply note that one can perceive the flavor of liquids.

SEAWATER AND THE WATER CYCLE

Brackish rain was a recognized phenomenon in antiquity. Both it and the salty flavor of seawater were explananda of paradoxography at least as

90 Lucretius often uses periphrases in this way.

91 Of course, 'solid' food is a bit of a misnomer, given that all assemblages contain void; on which, see p. 186 above.

92 See Lucr. *DRN* 1.938, 4.13. The periphrasis *mellis liquore* emphasizes the bodies which would give rise to the perception of a sweet, pleasurable flavor, which is pertinent in these contexts.

93 Lucr. *DRN* 1.809, 859-65, esp. 864. For examples, see 2.390, 661-68.

94 Only some of their constituents are nutritive, i.e. fit for constructive incorporation by a given creature once ingested and absorbed. See e.g. Lucr. *DRN* 2.661-99, esp. 661-68 and 677-79, 709-17, 4.633-41, 865-76.

far back as Aristotle.[95] There was also a tradition of Roman writing about water. Topics included the composition of water, which sorts were beneficial and harmful, where they came from, and why. It included authors such as Vitruvius, Seneca the Younger, Pliny the Elder, and Columella.[96] All of these thinkers regard water as a sort of admixture, the flavor of which varies depending on what it is mixed with.[97]

Lucretius expresses similar views on the composition of water and the flavor of liquids. According to *DRN*, fluidity is an essential property of water.[98] Something liquid or fluid is smooth, round, light, and flowing – with an ease contingent upon how smooth, round, and light its constituents are; water is a paradigmatic example of this.[99] Indeed, he calls fresh water 'sweet'.[100] It is nevertheless an admixture or solution in that it contains a variety of constituents, not just what we might call water molecules.[101] In book two's account of the relevance of stimulus shape to perception, Lucretius presents honey and milk as exemplars of substances with a sweet, pleasant flavor; wormwood and centaury epitomize the bitter, wine lees and elecampane the tingly.[102] In antiquity, honey, milk, and wine were commonly mixed with other liquids, like water.[103] It is not clear whether here Lucretius is referring to the herbs or to the tinctures or mixtures made with them. When Lucretius does specify the one or the other through periphrasis or context, he describes the flavor consist-

95 Arist. *Mete*. 2.3.358b2-6, 359a18-b22; Bakker 2016: 122.
96 Rogers 2018: 4-10.
97 They might not be surprised by the modern problem of acid rain.
98 Lucr. *DRN* 1.451-54, esp. 443.
99 Lucr. *DRN* 2.451-55, 3.189-202. It is also characterized as soft; 1.809.
100 See e.g. Lucr. *DRN* 2.474, 5.271, 6.637, 890, 894, 1266.
101 See e.g. Lucr. *DRN* 2.661-68. Milk is also sweet, pleasant, and contains nutritive constituents; 2.398-403, 5.812-15. On both, see 1.885-87.
102 Lucr. *DRN* 2.398-430.
103 Cilliers & Retief 2008: esp. 10-14. See also Lucr. *DRN* 1.260 likening neat milk to undiluted wine, and the note of Rouse & Smith 1992: 22.

ently. Indeed, as we shall see, it is to wormwood solutions (*diluta … absinthia*) – i.e. mixtures of the herb (solute) and the water in which it has been dissolved (solvent) – that the sea is compared in Lucretius' references to the salty taste of sea air.[104] Seawater, according to Lucretius, is a mixture of smooth, round bodies with other constituents that are round but rough; although these do not have hooks, they are sufficiently rough (*squalidus*, *asper*) so as to wound the sense organs and give rise to the perception of seawater's bitter (*amarus*, *acerbus*), unpleasant flavor.[105] Conceivably both its smooth and rough constituents enter our passages, as, upon their separation, that liquid becomes sweet.[106] Similarly, Lucretius implies that when fresh or sweet water and seawater are juxtaposed, the same person can perceive the flavor of each and thereby distinguish them.[107] These things suggest that one perceives the flavor of seawater through interactions with the seawater itself. Moreover, since – as we will see – Lucretius makes explicit that wormwood solution and seawater have the flavor associated with their solutes (and not the flavor of their solvent, water), the flavor of a substance is not necessarily determined by the numerical predominance of the constituents entering the passages of the tongue and palate. In other words, the quantities of constituents do not matter as much as their qualities and the interactions to which they are thus suited. Numerical predominance or concentration presumably impacts the strength or weakness of the flavor. Regardless, with respect to their relative contributions to one's perceptions, the harmful interactions take precedence over the pleasurable. Thus, when

104 Lucr. *DRN* 4.222-24, 6.928-30. Wormwood as or in liquid, see also: 1.936, 1.941 (*absinthi laticem*), 4.11, 4.16 (*absinthi laticem*). Wormwood as herb: 4.123. Centaury as herb: 4.125.

105 Lucr. *DRN* 2.456-77; on the state of the text, see Bailey 1947: 2.878-81.

106 Lucr. *DRN* 2.474-77.

107 Lucr. *DRN* 6.890-94.

noxious solutes are mixed with water, they take precedence in the flavor of the solution.[108]

It now is possible to turn to the passage of *DRN* that initiated this investigation: 4.217-29. It follows a lacuna and is repeated with minor variation at 6.923-35.[109] In book four it functions as part of Lucretius' account of *simulacra.*[110] At the outset, Lucretius presents a list of assemblages which flow from their respective sources; they are:

1) The intermediaries of sight, or *simulacra*, which stream off of all macroscopic things.
2) Odors, the intermediaries which come from deep within certain assemblages and effect the perception of scent.
3 & 4) Coldness from rivers and heat (or fire) from the sun – perhaps evoking frost and fire, which are among the exemplary things within the purview of the sensory faculty of touch.[111]

108 Phenomenological precedence coincides with but is not necessarily caused by this. Some solutions are made with solutes that engage as little as possible with the senses, so that the solutes can stand out more, as with perfumes; Lucr. *DRN* 2.846-53. For a similar view of predominance and precedence, see e.g. Rudolph 2018b: 51-53.

109 The contents of the lacuna may be partially reflected by Lucr. *DRN* 6.921-22. Lines 6.923-25 repeat 4.217-21 with minor variations that do not significantly impact meaning. The two most crucial lines for the purposes of this study, 4.222-23, are repeated verbatim at 6.928-29, as are 4.225-29 at 6.930-35 if the reconstructions are correct. See esp. Bailey 1947: 3.1208-10, 1694; Godwin 1986: 106; Godwin 1991: 160; Rouse & Smith 1992: 292-93, 563-65; Dyson 1995: 256.

110 In the context of book six, it functions as part of the recapitulation of previously demonstrated points that are necessary to explain magnetism; on the structure and function of the account of magnetism, see e.g. Clay 1983: 189-91; Rosenmeyer 1996.

111 Lucr. *DRN* 2.431-33. Lucretius characterizes heat, for example, as an essential property of fire (see *DRN* 1.451-54, esp. 453); by synecdoche, he uses it both ways. Similarly, cold is used to signify both a property and some micro or macroscopic structure which has that property. See also e.g. 1.298-304, 483-503, 3.288-306, 5.592-613,

5) Wall-gnawing spray, from the waves of the sea.[112]
6) Voices (4.221), the bodies deliberately emitted by living creatures that can interact with the passages of the ears, effecting hearing.

Some of these assemblages emanate from the surface of their sources (1 and 5). Others are emitted from deep within (2 and 6). With the rest it is unclear (3 and 4). Only in (3) (4) and (5) are the sources of these assemblages specified. All except (5) are microscopic bodies. All could be considered effluences, according to the minimal notion. The ocean spray at any rate does not seem to be included as an intermediary of perception and, excepting size, it is identical in nature to its source. After the voices borne on the breeze, Lucretius introduces the controversial seventh and eight examples (*DRN* 4.222-24):[113]

> denique in os salsi venit umor saepe saporis,
> cum mare versamur propter, dilutaque contra
> cum tuimur misceri absinthia, tangit amaror.
>
> Finally, moisture of salty flavor often comes into the mouth when we are near the sea, and when we watch diluted wormwood be mixed before us, the bitterness reaches us.

637-42. The language and mechanics of temperature and thermodynamics are complex and a subject worthy of further investigation.

112 Lucr. *DRN* 4.220-21: *... aestus ab undis | aequoris exesor moerorum litora circum*. For the interpretation of *aestus* here as 'spray'; compare 1.719. See also *aestus, OLD* §6; Bailey 1947: 3.1694; West 1969: 11-12; Godwin 1986: 107. Godwin also compares the spray with Lucr. *DRN* 1.311-21.

113 For other renderings of this passage, see Bailey 1947: 1.373, 375, 563; Godwin 1986: 25; Godwin 1991: 71.

The intratextual echoes between these lines and the accounts of taste in books two and four discussed above suggest that the sections are in dialogue with each other. The dialogue itself is the controversy. As we have seen, some scholars take 4.217-29 as a whole to refer to effluences, as microscopic replicas of their sources, and thus argue that taste, at least in some cases, works through effluences.[114] Bailey seems to think that it concerns effluences, on the minimal notion, and that they lead to the perception of flavor in some analogous way to eating and drinking.[115] In my view, these lines are an analogy between *simulacra* and other bodies that move through the air, such as the wall-gnawing spray of the sea. At any rate, the entire list proves that there are particles, both micro and macroscopic, which are constantly separating from their sources and stream off in all directions. However, only some of these are intermediary stimuli in mechanisms underlying perception. Lucretius' focus is on *simulacra*, odors, and sounds; he suggests as much at 4.225-29.[116] The omnipresence of those intermediaries explains why perception occurs continually and without interruption, specifically with respect to sight, smell, and hearing. This supports the long-established view that they operate through indirect contact with the objects of their perception. Now, the spray, the seawater, and the wormwood solution are all liquids; I believe that this suggests the way forward with respect to the question of taste.[117]

Lucretius' account of the water cycle is significant for the interpretation of the taste of sea air and the taste of wormwood at a distance. Some

114 See esp. Schoenheim 1966: 74, 80; Rosenmeyer 1996: 135-37; Koenen 1997: 166 n. 15.

115 Bailey 1947: 3.1209-10.

116 Lucr. *DRN* 4.225-29, 6.930-35.

117 Lucr. *DRN* 4.219-24.

of the account is part of Lucretius' treatment of Epicurean meteorology.[118] As with so many topics in *DRN*, Lucretius actually develops one's understanding of the water cycle across the poem, expecting the reader to connect and relate the various passages. In his greater proof that there are unseen bodies in nature (1.265-328), Lucretius states (*DRN* 1.305-10):

> denique fluctifrago suspensae in litore vestes
> uvescunt, eaedem dispansae in sole serescunt;
> at neque quo pacto persederit umor aquai
> visumst nec rursum quo pacto fugerit aestu.
> in parvas igitur partis dispargitur umor,
> quas oculi nulla possunt ratione videre
>
> Again, clothes hung up on the wave-breaking shore grow damp; the same clothes spread out in the sun become dry. But we did not see in what way the moisture of water soaked through, or how it fled away with the warmth. Liquid is therefore dispersed into small particles which the eyes are in no way able to see.

This demonstrates that Lucretius has a concept of evaporation and condensation.[119] The echoes of this passage in book six suggest that Lucretius is referring to seawater.[120] Brown rightly comments on the physical embodiment of the processes in 1.305-10.[121] Lucretius seems to believe that evaporation can occur with liquids of various sorts, thus *umor aquai* is not

118 The letter from Epicurus to Pythocles (Diog. Laert. 10.84-117) is another important source on Epicurean meteorology. On the water cycle in *DRN* and Epicurean meteorology, see e.g. Montserrat & Navarro 1991. On other potential valences of Lucretius' account of the water cycle, see Nethercut (forthcoming): ch. 4.

119 See also Lucr. *DRN* 5.383-91. For a somewhat different interpretation of these processes, see Montserrat & Navarro 1991: 297-301.

120 Lucr. *DRN* 6.470-72, 616-18. See pp. 207-8 below.

121 Brown 1984: 98.

simply a periphrasis.[122] Openness to multiple explanations is a feature particularly of Epicurean meteorology.[123] However, Lucretius repeatedly highlights two main causes of evaporation from bodies of liquid: the wind lifting or sweeping up droplets from the surface and the sun detaching them from it and drawing them off.[124] Similarly, lightning can cause the flash evaporation of wine.[125] Evaporated droplets do not neatly fit the concept of an effluence outlined above. They are more like emanations than emissions, but they are taken up, not sent forth. Moreover, they are neither automatical or non-automatical in the way that Koenen describes effluences; they do not flow from their source due to atomic vibration or due to a non-necessitated force pressing them out.[126] Relative to their sources, they flow away due to external necessitated causes. In *DRN* 1.305-10, form, content, and context imply that the last two lines are gnomic, that all bodies of liquid, great and small, have the potential to be dispersed similarly. In this exemplary case, the seawater is being dispersed into tiny particles (*parvas ... partis*) of seawater, not into parts which are unlike the whole. These droplets are like the aforementioned *aestus*, the spray of oceanwater – just smaller, small enough to be microscopic.[127] While it is not clear just how small they are, it is reasonable that minimal microstructures of the liquids, perhaps akin to what we call molecules, would be the easiest to take up or extricate. Therefore, the

122 Lucr. *DRN* 6.470-534; see also 3.435-36.

123 Recently, see Hankinson 2013; Verde 2013; Bakker 2016; Verde 2018.

124 See e.g. Lucr. *DRN* 1.277-79, 5.264-68, 383-92, 6.616-26, and, with respect to the water being raised or taken up 6.451-534. On the mechanism by which the sun does this, see West 1969: 82; Montserrat & Navarro 1991: 298. Rouse & Smith 1992: 398. Although the earth also sends up moisture to the clouds, this may be occurring with moisture that it has pressed out to the surface; see Lucr. *DRN* 5.483-88.

125 Lucr. *DRN* 6.231-38.

126 See p. 176 above.

127 See also Bailey 1947: 2.649.

smallest possible 'droplets' that could still be called, e.g., seawater probably predominate. Lucretius therefore does not understand evaporation or condensation as a fundamental change; nothing passes outside the boundaries of its nature and ceases to exist as such.[128] Rather, he views evaporation and condensation as the scattering and assembling of microscopic droplets of liquid.[129] Both Lucretius and Epicurus account for the formation of clouds, precipitation, and other meteorological phenomena in this way.[130]

Other parts of the water cycle reveal more about the composition of seawater. In Lucretius' narrative of the infancy of the world in book five, the sea was among the parts of the cosmos for which the earth provided the first beginnings. The others included the air, aether, stars, sun and moon. Their constituents were smoother, smaller, and rounder; thus the earth squeezed them out (*expressere* 5.453, *expressus* 5.487) through its sparse passages (*per rara foramina terrae*, 5.457) as its own constituents became more intertwined amongst themselves (*magis inter se perplexa*, 5.452).[131] The sea was salty from the beginning; Lucretius, perhaps following Empedocles (fr. 55), here describes it as salty sweat (*salsus ... sudor*) from the earth.[132] If evaporation is not a way of distilling water and Earth's water supply began as seawater, where does freshwater come from? Consider Lucretius' comments on desalination in book two (2.464-77). In his proof of the shapes of the constituents which comprise droplets of seawater (*sudor ... maris*, 2.465), Lucretius seems to be describing a

128 Lucr. *DRN* 1.670-71, 792-93, 2.753-54, 3.519-20.

129 This is not far off the mark, compared with the modern understanding of evaporation – relative to individual molecules of H_2O and of other evaporating liquids, like alcohol.

130 Lucr. *DRN* 5.261-80, 460-66, 6.451-534, 608-30; Epic. *Ep. Pyth.* 99-100, 106-9; Taub 2009: esp. 120-21.

131 Lucr. *DRN* 5.443-509, esp. 449-59, 480-88. See also 5.794. Montserrat & Navarro 1991: 293.

132 Lucr. *DRN* 5.487-88. Gale 2009: 143.

practice of salt production still used in the Mediterranean. Brine is channeled through a sluice gate into collection pits or earthenware pans. The liquid gradually departs and eventually salt crystals remain.[133] In Lucretius' contemporary Rome, this process was also used to collect materials for other products, such as perfume.[134] As we have seen, Lucretius believes that all macroscopic assemblages contain void and thus are porous. The wetness in caves, from water permeating through stone, is among his first proofs of this.[135] Earthen pits and vessels should thus be permeable as well; indeed, they are. According to Lucretius, wine and olive oil generally percolate through some vessels, depending on the size of their pores.[136] In the case of desalination, seawater does too. Its roughly shaped elements adhere to the earth or earthenware, separating out. The remaining liquid seeps through into a pit where it too can potentially be harvested. Repeated percolation filters out more rough elements, leaving behind the salt and literally smoothing (*mansuescat*) the rest. In other words, the acerbic seawater (*Neptune corpus acerbum*) no longer exists; bitter salt (*taetri primordia viri*) and sweet water (*umor dulcis*) remain.[137] For Lucretius, seawater is thus a solution (or what he might call a mixture) of salt and water. Aristotle has a similar account of filtration using a wax vessel, but acknowledges salt-harvesting by evaporation; Hippocrates favors evaporation and Pliny admits both distillation by filtration and evaporation and salt-harvesting by evaporation.[138] For

133 On ancient salt-harvesting practices and salt uses, see esp. Plin. *HN* 31.37-45 and e.g. Kurlansky 2002: 61-79, esp. 63-64. On modern salt-harvesting practices, see e.g. Laszlo 2001: 42-56.

134 Longhurst 2007.

135 Lucr. *DRN* 1.346-49.

136 Lucr. *DRN* 2.391-97, 6.231-38.

137 Lucr. *DRN* 2.464-77.

138 Arist. *Mete.* 2.3.358b34-359a6, 359a22-b4; Hippoc. *Aer* 8. Plin. *HN* 31.37-45, esp. 37. On experiments such as filtration using a wax vessel, see Taub 2003: 102-3.

Lucretius, a larger scale process of desalination by filtration supplies rivers and springs with fresh water; the subterranean channels of liquid are still briny, but by the time they emerge they yield fresh water.[139] These in turn renew the sea.[140] Indeed, this seems to be the reverse of the process by which Lucretius explains the creation of the seas in the infancy of the world. Whereas then the saltwater could pass through the pores of the earth, now the passages of the earth are sufficiently entangled that the salt bodies no longer pass through easily, but rather cleave to the earth on account of their roughness. The same roughness of the same bodies wound the passages of the tongue and palate and cause the salty flavor of seawater. It also explains the ability of the sea spray (*aestus ab undis*, 4.219) to wear or eat away at the walls near the shore.[141] The epithet *exesor moerorum* (4.220) emphasizes that the composition of the *aestus* and the *salsi umor saporis* (4.222) are the same.

Lucretius believes that seawater is one of the primary sources of the *umor* contained in the clouds. As stated above, in book six, Lucretius revisits the water-logged clothes of 1.305-10. In meaning and word choice, he recalls salt-harvesting, the wall-gnawing *aestus*, and the salty taste of sea air. At 6.470-5 the condensation of seawater on hanging garments is proof of its evaporation. The stickiness of the moisture (*umoris adhaesum*) on them emphasizes the salty constitution of the seawater. Lucretius takes this as an indication that moisture of the same sort (*consanguineae*) is contained in the clouds. He elaborates on these ideas in his explanation

139 Lucr. *DRN* 5.268-72, 6.631-38; the use of *virus* (5.269, 6.635) perhaps recalls the filtered *taetri primordia viri* (2.476). On subterranean rivers' existence, see 6.540-41. See also Montserrat & Navarro 1991: 295.

140 Lucr. *DRN* 1.230-31, 1031-32, 2.589-91, 6.890-94.

141 See also Lucr. *DRN* 1.326-27 and, perhaps, 4.1286-87. On the imagery, see West 1969: 11-12.

of rain at 6.495-516.[142] While the former refers to clouds near the sea by implication, the latter does so explicitly (*DRN* 6.503-505):

> concipiunt etiam multum quoque saepe marinum
> umorem, veluti pendentia vellera lanae,
> cum supera magnum mare venti nubila portant.
>
> The clouds also often take up much marine water as well, just like hanging fleeces of wool, when the winds carry them above the vast sea.

This confirms that clouds can contain evaporated seawater.[143] Lucretius posits many sources for the clouds' moisture over the course of *DRN*. The sea and rivers are the primary sources; others include lakes, streams, moisture from the earth, and bodies entering our sky and aether from the infinity beyond.[144] To explain rain which does not taste salty, multiple explanations seem available to Lucretius, including clouds from freshwater sources, clouds whose concentration of evaporated seawater was sufficiently diluted by evaporated freshwater, and a filtration process, such that – on the way down – the aether functions analogously to the aforementioned earth filter. Conversely, if a sufficient portion of the moisture in a cloud had come from seawater, it should in due course return to the surface as brackish rain.

142 With *consangineae* (Lucr. *DRN* 6.475) see also *cum sanguine* (6.501) in a related analogy and with *vestes suspensae* (6.471-72) see *pendentia vellera lanae* (6.504).

143 Cf. Montserrat & Navarro 1991: 300, 308 n. 72.

144 Lucr. *DRN* 5.463-66, 6.470-516.

THE SALTY TASTE OF SEA AIR

These threads can now be pulled together and brought to bear on the salty taste of sea air and the bitter taste of wormwood at distance. The key lines bear repeating (*DRN* 4.222-24):

> denique in os salsi venit umor saepe saporis,
> cum mare versamur propter, dilutaque contra
> cum tuimur misceri absinthia, tangit amaror.
>
> Finally, moisture of salty flavor often comes into the mouth when we are near the sea, and when we watch diluted wormwood be mixed before us, the bitterness reaches us.

Many sorts of bodies move through the air; some we can see, most we cannot. Moisture, for example, exists in the air near the sea. It exists in the form of the spray of the waves, droplets of seawater that are barely visible to the naked eye. It also exists as microscopic droplets of seawater that the sun and wind raise up from its surface. These evaporated particles of seawater reach the clouds above and the clothes and fleeces on the shore. It follows that these same microscopic droplets of seawater could also reach us when we are nearby. As we have seen, the perception of the flavor of a liquid occurs through direct contact between one's passages and the constituents of the liquid which they admit, with any potentially harmful constituents contributing disproportionately to one's perceptions. The primary constituents of seawater are salt and water. One perceives a somewhat harsh or bitter flavor when the structures of the tongue and palate interact with seawater, due to the roughness of the elements of salt that it contains. In other words, a salty flavor is a sort of bitter flavor. The roughness of these constituents also wounds one's

passages a bit, making that flavor unpleasant. Therefore, when we are near the sea, we perceive a salty flavor because liquid enters one's mouth and that liquid is in fact seawater – evaporated seawater, microscopic droplets like those that gather in the clouds, clothes, and fleeces. The case of wormwood is similar. Lucretius says its bitterness reaches or touches (*tangit*, 4.224) us; this is evidence that evaporated microscopic droplets of a tincture of wormwood come into contact with the sense organs of taste when the solutions are mixed before us.[145] We do not register our contact with these droplets in any way other than through their interactions with the passages of the tongue and palate. Unlike the *aestus*, we do not see them. While we might feel the drops of the spray on the skin if we met with their splash, we do not have tactile awareness of an individual microscopic droplet, or even of a mist.[146] It seems, then, that the sensory threshold of taste is lower than that of external touch. That said, it is unclear just how many of these microscopic droplets it would take for the passage-riddled tongue and palate to register the least perception of flavor. Perhaps it would suffice to interact with a single droplet of seawater or wormwood, the smallest possible. However, more may be required. Lucretius' emphasis on proximity to the sources suggests that perception is more likely where there is a greater concentration of the evaporated moisture.[147] Alternatively, the emphasis on proximity may simply reflect the longevity of those droplets and/or their potential airtime if not taken up to the clouds. The larger and heavier an airborne particle, the shorter the distance it tends to travel before falling to the surface and/or decomposing.[148]

145 Perhaps compare Lucr. *DRN* 4.622-26, esp. *attingunt* and 626-27.

146 Lucr. *DRN* 3.374-95, esp. 383.

147 Similar processes and considerations influence our susceptibility to contagion; in other words, we take in diseases in the form of unseen airborne bodies. Fire can also kindle at a distance in this way. Lucr. *DRN* 6.1128-30, 900-4; Epic. *Ep. Pyth.* 93.

148 Lucr. *DRN* 4.687-705.

One does not deliberately take in these evaporated particles of liquid, nor does one feel or register awareness that they have come in until one perceives their flavor; this implies that one does no chewing, no pressing out of *sucus*, no processing of any kind prior to interaction. The perception of salty flavor therefore arises from interaction with the microscopic droplets themselves. In other words, the seawater, as seawater, enters the passages of the tongue and palate. The wormwood solution itself does too. It follows that all of the relevant constituents are of suitable size and shape. Lucretius implies that, of all the things that we can generally see, pure water is comprised of the smoothest, roundest, lightest constituents; to it he compares the mind and its ease of motion.[149] The constituents of the wormwood dissolved in water, probably larger than those of the water, as well as rough with hooks, must nevertheless also be sufficiently small so as to also enter. Since one perceives the flavor of microscopic droplets of liquids through direct contact, it stands to reason that one also perceives the flavor of a drink of liquid without chewing and through direct contact. As we have seen, the mechanism for perceiving the flavor of liquid should be evident from the mechanism for perceiving the flavor of food more generally. I propose that there is no need to press out the *sucus* in order to perceive the flavor of liquid – and that there is no need because it is the *sucus*.[150] With drink then, some of the liquid will flow into one's passages automatically and without emission or emanation. To call this *sucus* an effluence may stretch even the minimal notion beyond the point of utility. Perhaps more importantly, the interactions occur with object of perception itself, not with an intermediary that only partially reflects its nature. I further propose that when one presses *sucus* out of apparently solid food by chewing, as water

149 Lucr. *DRN* 3.177-205; see also 3.241-44, 425-29.

150 For this reason, Lucretius can compare the *sucus* which Earth produced to nourish the first living creatures to breastmilk; Lucr. *DRN* 5.811-15.

from a sponge, the juice that one extracts is liquid food, a solution of water and miniscule particles of the foodstuff, particles perhaps like molecules. All food contains at least some amount of water.[151] Moreover, the other constituents of the food would probably dominate in the perception of flavor. Therefore, juicing solid food allows one to perceive the flavor of the food itself, also without an intermediary.[152] In short, the perception of flavor involves interacting directly with the object of perception in all three cases. For this reason, microscopic drops of evaporated wormwood solution have the same distinctive bitter flavor as both a cup of the medicinal tincture and the plant itself. In turn, the consistent flavor of these substances serves as evidence that the same constituents are interacting with the passages of the sense organs.

CONCLUSION

In conclusion, the salty taste of sea air and other cases which seem to imply the perception of flavor at a distance are only apparently a paradox. In fact, they are consistent with the mechanism of taste that Lucretius offers and, indeed, fundamental to fully understanding it. As per the traditional view of Epicurean theory, the sensory faculty of taste does operate through direct contact with the object of its perception. Flavor is a property of that food or drink; it manifests at the level of experience.

151 See e.g. Lucr. *DRN* 2.875-80, 3.223-27. By this logic it is conceivable that saliva could play a role in one's ability to perceive the flavor of things that are not food, like rocks and other minerals that lack *sucus* (3.786), perhaps if sufficiently small particles thereof somehow break off into the saliva and if the passages of the tongue and palate are open to both. However, given the value that Lucretius places on empiricism, it may be worth noting in this vein that one does not normally perceive the flavor of one's own saliva.

152 See also Bailey 1947: 3.1253.

For Lucretius, the phenomenal and the physiological are two closely related ways of understanding the same thing. Taste is both the perception of flavor and the process that underlies that sensation. Physiologically, taste is the mechanism by which one feels or registers awareness of juice. Specifically, the perception of flavor occurs when food, drink, or suitably shaped constituents thereof flow into the passages of the tongue and palate, i.e. the sense organs. In Lucretius' view, both the tongue and palate play an important role in shaping one's tastes and one's preferences. They determine what one is literally open to tasting. The shapes of the constituents, on the other hand, influence the possible perceptions of flavor and whether that sensation coincides with pleasure or pain. If the food is not liquid, then the liquid food or juice that it contains, a solution of food particles and water, enters the passages once it is squeezed out. In either case one's passages do not interact with an intermediary that only partially reflects the nature of the source object; they interact with the thing itself, whatever part of it they are open to. If one supposes that one is perceiving the flavor of seawater or that of wormwood at a distance, this is because one does not realize that the distance has been overcome – an error of reason. In fact, one is coming into direct contact with the object of perception. Microscopic droplets of seawater are taken up from the sea into the air nearby. In the same way, microscopic droplets of wormwood evaporate from vats where the solution is being mixed. These airborne droplets – although extremely tiny – have not become something else. For this reason, when they come into the mouth and enter the passages of the tongue and palate, the interactions are the same, as are the flavor and its (un)pleasantness. It may take more than one to stir the perception of flavor. Regardless, individually or collectively, the droplets are too small for other sensory faculties to register awareness of them by other means, either in transit or when they make contact. To put it plainly: Lucretius' example of the salty flavor of sea air

is no exception. Near the sea, we taste airborne evaporated seawater. Therefore, under certain circumstances, we taste things that we seem not to see or touch. The Epicureans believe taste is that sensitive, that discriminating.

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