

GALEN ON THE ELEMENTS OF OLFATORY SENSATION

In different sources for the Galenic doctrine of smell there appear different elements in the nature of the sense of smell. What we shall suggest is that these accounts are as likely to vary because of varying emphasis as because of error in the copying of manuscripts. In the surviving works of Galen (AD 129?–199) mention of the sense of smell and its objects can be found in four places: (1) *De instrumento odoratus*; (2) *De usu partium*, VIII, 6; (3) *De placitis Hippocratis et Platonis*, VII, 5–6; (4) *Compendium Timaei Platonis*, 15¹). Each of these works offers a different

*) The final version of this paper was completed while I was an NEH Fellow and member of the School of Historical Studies, Institute for Advanced studies (Princeton), during the year 1979–80. I am most grateful for these supports.

1) These surviving works, with statements relevant to smell, cannot be dated absolutely. Studies on their dates allow the following conclusions. While *De usu partium* and *De placitis*, especially the latter, were composed over some length of time, the sections relating to smell were both written after A.D. 169 and before 180. *De usu partium*, VIII, was written prior to *De placitis*, VII. *De instrumento odoratus* seems to have been composed not long after *De usu partium* and before *De placitis*, VII. On these three works see Johannes Ilberg, "Über die Schriftstellerei des Klaudios Galenos," *Rheinisches Museum für Philologie*, N.F. 44 (1889), 219, 229; 47 (1892), 508–509. In *De instrumento odoratus* Galen refers to his *De facultatibus naturalibus*; in *De placitis* Galen refers to *De instrumento odoratus*, thus placing *De instrumento odoratus* nicely in a relative chronology. For the fourth work, *Compendium Timaei*, dating is speculative. Ilberg, *ibid.*, 52 (1897), 598, says that the *Eight Synopses of Platonic Dialogues*, of which the *Compendium Timaei* seems to have been a part, was "probably" written as part of Galen's youthful studies (long before the other three works concerned), but Ilberg gives no strong reason for this notion. The editors of the *Compendium Timaei*, arguing from internal evidence of common doctrines (not applicable to the doctrine of smell, however!), consider it to have been written about the same time as *De placitis*, VII, with the *Compendium* being completed earlier (before A.D. 176). See *Galenii Compendium Timaei Platonis*, edd. Paul Kraus and Richard Walzer (London: Warburg Institute, 1951), pp. 1–4, esp. 4. Considering that Galen had in mind his modification to Platos' *Timaeus* when writing the *Compendium*, I find it highly unlikely that the *Compendium* was a juvenile work. Apparently conclusive evidence is Galen's statement at the end of *De placitis*, VII (Kühn V 647, Müller 648, De Lacy 478), that he has discussed in "no other treatise" the Platonic texts which he has just quoted in Book VII. It seems we must place the

piece for the patchwork we must put together. The essential question we wish to answer is: How did Galen understand the nature of the sense of smell?

I. Galen's Monograph on Smell

A detailed account of the working of the organ of smell appears in *De instrumento odoratus*²). In brief outline it is described as follows. While inhalation through the nose always accompanies the perception of odor, that perception does not take place in the nostrils but rather in the olfactory bulbs and anterior ventricles of the brain itself. The brain actually draws in and expresses air³) by dilation and contraction, making pos-

Compendium Timaei later than this statement. The relative chronology of the sources we are considering seems to be: *De usu partium*, VIII; *De instrumento odoratus*; *De placitis Hippocratis et Platonis*, VII; *Compendium Timaei Platonis*. In order best to explain the doctrine of olfactory sensation, a non-chronological order of discussion will be used. The differences in the texts do not require the assumption of an evolving and changing doctrine of olfactory sensation, based upon an established chronology of the writings.

2) Edited and translated by Jutta Kollesch, in the series *Corpus Medicorum Graecorum*, Supplementband 5 (Berlin: Akademie Verlag, 1964); ed. Karl Gottlob Kühn, *Galenii opera omnia* (Leipzig: Knobloch, 1821), II, 867-886; transl. Jonathan Wright, "The Organ of Smell (Translated from Kühn's Greek and Latin Texts)," *The Laryngoscope*, 34 (1924), 1-11. Kühn's edition is less dependable than Kollesch, because Kühn's edition derives from only one MS. (see Kollesch, pp. 19-22), while Kollesch uses three MSS., including one quite superior to Kühn's source (Kollesch, pp. 9-19). Wright's translation into English suffers from the same limitation as well as from some liberties taken in translating; however, it can be used, if controlled by the translation given by Kollesch. The reader may compare Rudolf E. Siegel, *Galen on Sense Perception* (Basel: Karger, 1970), pp. 140-157, which is useful for anatomy but undependable for physiology. More satisfactory than Siegel for anatomy is Emilie Savage Smith, "Galen's Account of the Cranial Nerves and the Autonomic Nervous System," *Clio Medica*, 6 (1971), 77-98, 173-194; see pp. 81-84 on the olfactory extensions. For criticisms of Siegel's book see the review in *Isis*, 63 (1972) 116-118.

3) The text at this point speaks of drawing in outside air (*aer*) by dilation of the brain, which does not receive any "air" (*pneuma*) except during this activity. The shift of terms (*aer* to *pneuma*) may be significant. *De instr. odor.* 5, 19-20 (ed. Kollesch, p. 54, lines 25-26; Kühn II 877, 14-15); Kollesch (ed. cit. p. 55) uses "Luft" throughout, while the Latin and English translations preserve the variation (Kühn V 877; Wright p. 9). It is unclear whether Galen understands a pneumatic substance, drawn from the outer air, to be the only thing actually reaching the ventricles of the

sible the perception of odors carried in by the air. In the case of the sense of smell alone the brain is the primary organ of perception because of the olfactory lobes extending from the anterior ventricles down to the sieve-like bones at the beginning of the nose. At this point, pores in the tunic lining the nose permit the passage of odors in the form of vapor⁴). The nature

brain, or if the conceives of the outer air as such to reach the brain. There is some reason to assume the former (*pneuma* only), since Galen says later that "the whole respiration is carried on by the brain to preserve the correct amount of heat in the heart" (*De instr. odor.* 6, 6; Kollesch 62, 9-10; Kühn II 884, 12-14), and we know that a major function of "vital *pneuma*" is preserving the balance of innate heat. See Owsei Temkin, "On Galen's Pneumatology," *Gesnerus*, 8 (1951), 180, and Leonard G. Wilson, "Erasistratus, Galen, and the *Pneuma*," *Bulletin of the History of Medicine*, 33 (1959), 310-314. But in the sentence immediately preceding that just quoted, Galen speaks of the benefit of inhaled cold air (*aer*) for the sunstruck brain. On balance, I am inclined to believe that Galen conceives the air (*aer*) itself to be drawn into the brain, and he may understand *pneuma* as the effective part of the air for purposes of sensation and systematic cooling. Galen's concern with the inhalation of air all the way to the brain as well as his use of the term *pneuma* may connect him with a tradition tracing its legendary roots back to Alcmaeon. According to Theophrastus, *De sensu*, 25, Alcmaeon "taught that a person smells by means of the nostrils, drawing the inhaled air (*pneuma*) up to the brain, in the respiratory process." See John Isaac Beare, *Greek Theories of Elementary Cognition from Alcmaeon to Aristotle* (Oxford: Clarendon Press, 1906), p. 131; Beare also remarks (pp. 131-132) that Plato, *Phaedo*, 96B seems to have Alcmaeon in mind in referring to smell taking place in the brain. The legendary tradition to which Galen may be relating is that referred to by Calcidius, *In Timaeum*, ch. 246 (J.H. Waszink, ed., *Timaeus a Calcidio translatus commentarioque instructus*, Plato Latinus, vol. 4, London, Warburg Institute, 1962, pp. 256-257), who traces the medical tradition of human dissection back to Alcmaeon, also makes Alcmaeon the discoverer of the optic nerve and four tunics of the eye, and then interpolates this discovery of the nerves into Plato's physiology of sense perception. While Calcidius runs the tradition back to Alcmaeon explicitly, Galen traces such a tradition only back to Hippocrates. Both Galen and Calcidius, however, according to Jaap Mansfeld, seem to have the same tradition in mind and even the same literary source "revealing" the tradition. The only difference is Galen's wish to honor Hippocrates, while Calcidius seeks a longer pedigree. For further detail on this intriguing hypothesis, see Jaap Mansfeld, "Alcmaeon: 'Physikos' or Physician? With Some Remarks on Calcidius' 'On Vision' Compared to Galen's Plac. Hipp. Plat. VII," *Kephalaton. Studies... C.J. de Vogel*, edd. J. Mansfeld and L.M. de Rijk (Assen: van Gorcum, 1975), pp. 26-38; there are no references to smell here.

4) I draw all the elements in this brief summary from my reading of Galen's *De instrumento odoratus*; however, they are scattered throughout the tract. Concerning Galen's conjecture of pores in the tunic, see Smith,

of this vapor is the point at issue, for variations in its makeup appear in different Galenic works. In his monograph on the sense of smell Galen says.

And finally, its [the nasal lining's] material composition does not correspond to its sense objects, as do the other sense organs. As the organ of sight is like light, that of hearing like air, even as the organ of taste is wet and spongy and that of touch hard and earthlike, so each special organ has been designed by Nature to be similar to its sense object. Thus the sense organ of smells should be vaporous, not in any way hard and earthy like the membrane in the nostrils, which, besides being of this sort, does not proceed at all by way of larger nerves, which it certainly would, and surely in precedence to the tongue, because it [the sense of smell] would hold third rank among the sensitive organs, for diagnosis of the more volatile [or subtle] substances⁵).

Just prior to this passage Galen provides his fullest account of the nature of the olfactory vapor when he says,

[Nature] made the visual organ most lightlike, for it alone senses brilliance and light, and airlike the organ of hearing, since it is intended to sense the noises in the air. So also Nature formed the organ distinguishing tastes, the tongue, from the wetter elements of the body. *Between air and moisture [on the one hand] and fire [on the other hand]* (my emphasis)⁶) is the matter sensed by smell, being neither as rarefied as

"Galen's Account," p. 83, for Galen's statement (in *De anat. admin.* X, 7) that he "came close to being able to observe" the pores.

5) *De instr. odor.* 3, 4-5; Kollesch 40, 23-42, 5; Kühn II, 863, 17-864, 10.

6) The emphasized phrase is a crucial part of the text. As will be argued below, there is no absolute doctrinal reason to expunge the phrase *kai pyros*, which introduces fire to the list of elements associated with smells. Here I wish to clarify only points of grammar and syntax. While the preposition *metaxy* surely means "between" at this point, the series of three objects following the preposition is not necessarily incorrect. If the preposition is meant to relate a group of two objects on one side to a single object on the other, the sentence is correct with the *kai pyros* retained. Adding some slight weight to this interpretation is the appearance of *te* in the phrasing *aeros te kai hygrou*, which can create a special relationship between *aeros* and *hygrou*, distinguishing them together from *pyros*. In this interpretation I add the emphasis of probability to a suggestion given to me by Professor Harold Cherniss, who noted that it is a possibility. I bear the responsibility for the emphasis, which should not be imputed to Professor Cherniss. For the text, see ed. Kollesch 40, 2-3.

air nor as dense as moisture. For whatever streams off the surface of a body is the substance of odorous matter. One recognizes this quite definitely with roses and with things similarly simple, which swiftly become smaller and drier than they were, showing unambiguously that the moister parts have escaped from their substance⁷).

Taking the two passages together we learn that Galen follows an old teaching on the organs of sensation, the doctrine that like senses like, derived ultimately from Empedocles⁸) and endorsed by Plato⁹). Each of the senses is based upon one of the four elements, which is the characteristic constituent of both the sense organ and the sensed object. Because there are five senses and only four elements Galen follows the Platonic account¹⁰) for odors, placing them and the sense of smell in the category of vapor. This vaporous sense holds third place among the senses, between taste and touch on one hand and sight and hearing on the other¹¹). What the vapor is, how it is generated, what is its essential nature, its exact relationship to odors – here we find the ambiguity in Galenic writings.

The nature of the Galenic sense of smell is vaporous. What is the nature of vapor? In *De instrumento odoratus* we can find three basic statements to use in solving the problem. First, the sense of smell is between air and water in density. Next, the

7) *De instr. odor.* 2, 10–12; Kollesch 38, 24–40, 8; Kühn II, 862, 3–16; Wright's translation here (p. 3) is incorrect at just the crucial point.

8) Beare, *Greek Theories*, p. 205.

9) *Ibid.*, p. 215; see *Timaeus* 65B–68B generally.

10) Beare, *Greek Theories*, p. 142; *Timaeus* 66D–E. Here Plato goes beyond Empedocles, who seems to have considered the sense of smell to operate simply by means of air. Theophrastus criticized Empedocles for failing to distinguish between breathing and smelling; see Beare, pp. 133–136, and Theophrastus, *De sensibus* 21–22 (in George M. Stratton, transl., *Theophrastus and the Greek Physiological Psychology before Aristotle*, London: Allen and Unwin, 1917, pp. 84–87).

11) Galen may well have in mind the Aristotelian passage placing smell midway among the senses. Aristotle, *De sensu et sensibilibus* V, 445a 5–14 (transl. W. S. Hett, Loeb Classical Library, London, Heinemann, 1957, pp. 258–259): “As the number of the senses is odd, and an odd number always has a middle unit, smell would seem to be a middle term between the tactual senses – viz., touch and taste – on the one hand, and on the other the senses which perceive through a medium, viz., sight and hearing... creatures smell in both air and water. So the object of smell is common to both spheres; it belongs to the tangible and also the audible and the transparent; so it was reasonably described as a dipping or washing of the dry in the wet and fluid.”

object of smell is related to air, water, and fire. Last, volatile substances, sensed by smell, are emitted from objects and lose *some* moisture at the time of emission. Of special interest is the mention of air, water, and fire, for this trio of elements has created a difficulty for the editors of the Greek text. All three appear in Kühn's edition¹²), but the Latin translation appearing with Kühn's text omits the mention of fire, giving only "inter naturam aeris et humoris"¹³). The addition of *kai pyros* is preserved as an interpolation in the text by Jutta Kollesch, who expunges the phrase completely in her translation¹⁴). While the phrase appears in all three manuscripts, she remarks that it very likely entered the text initially as a marginal gloss and later was fully incorporated. The problem as explained by Kollesch is one of consistency. Since Galen also speaks of vapor between air and water in our italicized quotation, she finds the inclusion of fire both inconsistent and in contradiction to what Galen¹⁵) and Galenic writers¹⁶) have said elsewhere. But both these claims

12) II, 862, line 9 (Greek).

13) *Ibid.*, line 10 (Latin), from the 1609 Venice (Juntine) Latin edition.

14) Kollesch 40, 3; 41, 2-3. It should be noted Kollesch does not argue that the phrase *kai pyros* is grammatically incorrect or syntactically nonsensical (see above, n. 6). In her discussion of the three extant mss., the earliest from the late twelfth or early thirteenth century, she shows that L² (marginalia and glosses to L) does not suggest an excision of *kai pyros*.

15) Kollesch cites *De inst. odor.* 3, 5 (p. 42, 1) for the mention of the sense of smell as *atmoëides*, but all this can safely be said to mean is "vaporous", which begs the question. Her references (p. 81, n. 1; p. 38, n. to lines 38, 24-40, 5; p. 40, n. to lines 2-4) to other works are constructed so as to smooth out the differences in the texts of Galen. The strongest reason for omitting *kai pyros* is the most apparent sense of the phrase which immediately follows, for that phrase characterizes the qualities of odorous matter and in doing so mentions only the lightness of air and the density of water, saying nothing about fire. Yet this reason does not categorically exclude the mention of fire, although persuasive counterargument is needed. To begin such argument I would say that the characterizing phrase refers to the placing of the odorous matter in terms of relative density, not in terms of exclusive makeup.

16) To refer to Galenic writers is not to answer the question, for writers like Nemesius of Emesa characteristically made Galen more consistent than Galen's texts allow. Kollesch (p. 81, n. 1) cites Nemesius for the composition of vapor from air and water only. See Nemesius, *De natura hominis*, ch. 11, in the edition of C.F. Matthaei (Halle: Gebauer, 1802), printed in Migne's *Patrologia graeca*, 40, col. 657; also ch. 6 (PG 40, 636). Many "improvements" on Galen appear in Nemesius' writings on the brain

are inexact. Galenic writers do not necessarily speak for Galen, and Galen himself may not mean what at first glance appears to be the case¹⁷). What we wish to discover is some way in which the addition of fire to air and water may, in fact, account reasonably for the nature of vapor and odor. Kollesch has reason in her argument against retaining *kai pyros*, but there are many circumstances which support an acceptance of the phrase, either as a part of Galen's original composition or as an insertion by a Galenist who knew his Galen well enough to make the addition. First, not only the lateness of the manuscripts but also the truncated nature of the treatise as we have it suggest a history of the text which leaves the authenticity of *kai pyros* a very open question. Second, if the phrase was added after the original composition and by someone other than Galen, it represents an awareness of Galen's discussion of smell later in the same treatise, for he later refers to the heating as well as the cooling properties of odors, which have in turn an Aristotelian precedent. (All of this we will deal with systematically below.) Third, the mention of fire here may be seen as a juxtaposition to the elements air and water, with each side meant to account for one or another kind of odor; the subsequent reference to air and water only is restricted to giving the relative density of odorous matter, not its exclusive elemental makeup. At present we hypothesize that Galen's monograph on the olfactory sense includes the element fire along with the elements air and water in explaining the nature of odors, and that the phrase *kai pyros* here in question may have come into the text anywhere from Galen himself to the late twelfth century. We retain the phrase, because it is at least possible and it calls clear attention to an important part of Galen's understanding of smell elaborated later in the treatise. This leaves us with a notion of vapor as characterizing the density and *some* of the qualities of odors, which in turn derive from more than a combination of the elements air and water. Let us now inspect other Galenic texts and then return to *De instrumento odoratus*.

and the senses. We are left, however, with the possibility that the *kai pyros* itself may be the addition of a Galenic writer.

17) As Kollesch carefully notes (p. 81), both Cornarius and von Arnim considered the *kai pyros* unacceptable, presumably because of meaning, since the text does carry the phrase.

II. Other Galenic Texts

In *De usu partium* Galen offers a much less useful discussion for our purposes, although he does commit himself a bit further to the Empedoclean-Platonic conception of the way odors and the sense of smell match each other. In book 8, chapter 6, he says,

Indeed vapor is nearly as much inferior to air as regards the fineness of its particles as air is to brightness. Also from what is plainly to be observed in daily life, we can understand how broad the pores of the covering in this region must be. For when occasionally the nostrils are obstructed by something, as Plato says somewhere¹⁸), "No odor filters through, and only the air, free of odors, follows [the path]." Surely it is clear, as such an observation proves, both that the [particles of] vapor are larger than the obstructed pores, and that the covering of the olfactory sense instrument must be made looser-textured than the vapor¹⁹).

Galen's further commitment here is to the particulate character of each of the elemental sense objects and vapor (and odor) as well. More especially he follows Empedocles and Plato in conceiving the distinction between different sense-particles to be at least partly quantitative, though not going as far as these predecessors in making the distinction purely stereometric²⁰). Most germane to our subject is the initial sentence quoted, despite its vagueness. When Galen writes that vapor is *nearly as much* inferior in particulate fineness to air as is air to brightness (the luminous and pure aspect of the element fire), we might suppose that vapor is meant to be more watery than airlike. But we are not told anything about the interval between air and water. If that interval is much greater than the interval from "brightness" to air, then vapor is more airlike. All we really have is an ordering: brightness-air-water. We do not know the intervals.

In *De placitis Hippocratis et Platonis*, book 7, Galen offers no further clarification but does bring the weight of repetition

18) *Timaeus* 66E.

19) *Galen de usu partium libri XVII*, ed. Georg Helmreich (Leipzig: Teubner, 1907), I, 469-470; transl. Margaret T. May, *Galen on the Usefulness of the Parts of the Body* (Ithaca: Cornell U.P., 1968), I, 405-406. I use May's translation.

20) Beare, *Greek Theories*, pp. 136, 141-144; see *Timaeus* 66D-E; also Theophrastus, *De sensibus*, 7 (transl. Stratton, pp. 70, 71).

to bear. In two places he says only that the organ of smell is vaporous²¹). Beyond this he adds, in chapter 6, a description of the objects of smell, saying, "This [smell] is a fifth sense-organ, even though there are not five elements, since the class of odors is intermediate between air and water, as Plato wrote in this passage in the *Timaeus*: 'As water changes to air and air to water, all odors have arisen in between'²²). The order of the senses is clear and the placing of vapor between air and water is equally clear. What remains unstated is whether a placing of vapor *between* air and water is the same as specifying a constitution *exclusively* of air and water.

In a work surviving only through an Arabic translation, the *Compendium Timaei Platonis*, Galen describes the Platonic doctrines of taste, smell, hearing, and sight in terms which generally fit well with the Galenic teachings²³). In summary fashion on the sense of smell he reports, "And its [the smell's] substance is thought to stand between air and earth, and cloud and vapor are of that nature"²⁴). The obviously variant "earth" is remarked by the editors of the text, who suggest that it should be "water"²⁵). Such an emendation, curiously enough, is questionable on the following grounds. First, there is at least one more variation in the text which helps make sense of the supposed error. Only four senses are mentioned or described. Touch is omitted, and the ordering of those senses given is taste-smell-hearing-sight. While sight and hearing are related respectively to fire and air, the sense of taste is said to be a perception of

21) Galen, *De placitis Hippocratis et Platonis libri novem*, ed. Iwan Müller (Leipzig: Teubner, 1874), 626, 12-13; 634, 3.

22) *De placitis* VII, 6, Kühn V 628, 16-629, 3; Müller 626, 16-627, 4; these editions are now superseded by Galen, *On the Doctrines of Hippocrates and Plato*, ed. and trans. Phillip DeLacy, *Corpus Medicorum Graecorum*, V 4, 1, 2 (Berlin: Akademie Verlag, 1980), p. 462, 20-24. The passages quoted follows immediately a reference to *De instrumento odoratus* as the work in which the author has fully treated the subject.

23) No discussion of the sense of touch appears here. *Galenii Compendium Timaei Platonis*, edd. Paul Kraus and Richard Walzer (London: Warburg Institute, 1951), chs. 15-16, pp. 19-22 (Arabic text), 67-72 (Latin translation). From what is preserved of Galen's commentary on the *Timaeus*, we can learn nothing more about this aspect of Galen's view on smell; see *Galenii In Platonis Timaeum commentarii fragmenta*, ed. Heinrich Schröder, app. by Paul Kahle (Leipzig: Teubner, 1934), pp. 7, 97.

24) Galen, *Compendium Timaei*, 15 (edd. Kraus and Walzer, Arabic p. 20, Latin p. 69).

25) *Ibid.*, Latin p. 69, n. 18; Arabic p. 20, line 12, the text has *ard* (earth), which the editors question and suggest instead *mā'* (water).

earthy particles which are liquefied and collected by the tongue²⁶). What we seem to have, if the unemended Arabic text is preserved, is a doctrine of four senses with the first (taste) being attributed to liquefied earth, the third (hearing) being attributed to air, and the intermediate sense (smell) being made a mixture of the two (air and earth).

In considering the possible source of this doctrine, whether error or intention, we find that the translator from Greek into Syriac was Ḥunayn ibn Iṣḥāq, while ʿĪsa ibn Yaḥya made the further translation from Syriac to Arabic, and Ḥunayn did not correct the work of ʿĪsa²⁷). Surely ʿĪsa could be assigned the “error” of turning the word for water into that for earth, but it is difficult to assume that he also construed the four-sense doctrine, including the connection of taste with the element earth. So we return to Ḥunayn, whose major work on the eye, we discover, contains a potential clue to our puzzle.

At two places in the *Ten Treatises on the Eye*²⁸) Ḥunayn mentions the object of smell as vapor and identifies its components. First, he says,

After hearing comes the sense of smell; its object is vapour, and vapour is something between earth and water and is not far behind the air in rarity. After the sense of smell follows that of taste; its object is water and what it absorbs [into itself]; for flavour is only possible when the water dissolves something solid and creates warmth in it²⁹).

At another point Ḥunayn summarizes,

... the sense of vision is fiery and luminous, the sense of hearing air-like, the sense of taste water-like, the sense of touch earth-like and the sense of smell vapour-like. As there are four elements, a sense was created for each one of them by which each is recognised, *i.e.* the phenomena arising in them which are perceptible to the senses. And next to perception is that emanation which arises from vapour, and this is perceived in an unusual manner, as vapour is some-

26) *Ibid.*, Arabic pp. 19–20, Latin pp. 67–68.

27) *Ibid.*, pp. 18–21, 97–98. See the account by Ḥunayn, *Über die syrischen und arabischen Galen-Übersetzungen*, ed. Gotthelf Bergsträsser (Leipzig: Brockhaus, 1925), p. 41, no. 124.

28) *The Book of the Ten Treatises on the Eye ascribed to Ḥunayn ibn Iṣḥāq (809–877 A. D.)*, ed. and transl. Max Meyerhof (Cairo: Government Press, 1928), hereafter referred to as “Ḥunayn.” I use Meyerhof’s translation.

29) Ḥunayn, p. 16.

thing halfway between air and water; so they become five [senses] without the existence of five elements³⁰).

Although the contrast in definitions of vapor is obvious, other questions should be addressed first. It has long been understood that Ḥunayn's primary intellectual loyalty was to Galen³¹) and that Galen's reputation in Islam owed much to Ḥunayn³²). Beyond this one can observe the many ways in which Ḥunayn selected from, systematized, and modified details of Galen's teachings³³). Concerning the two passages just quoted, it is worth noticing that the second passage appears in a part of the text where the author is following Galen's *De placitis*, book 7, in which we have seen that Galen explicitly identifies vapor to be between air and water. The first passage from Ḥunayn comes from the anatomical part of the text where he follows Galen's *De usu partium*, books 8 and 10, which does not define the constitution of vapor explicitly. It seems very possible that Ḥunayn turned here to Galen's *Compendium Timaei Platonis* for the further specification found concerning vapor, since Ḥunayn's accompanying description of the sense of taste is so close to that found in the *Compendium*. In fact, the description of taste by Ḥunayn might well be called a clarified version of that found in the *Compendium*; Ḥunayn also mentions solid, viz. earthy, parts dissolved in water, but he emphasizes water as the element proper to taste, despite the admixture. (He follows this with a description of touch as earth-like.) Since the reference in *Ten Treatises* to "earth and water" is definitely a part of the text and not a variant in one manuscript only³⁴), we have to ask: why earth and water rather than earth and air (as in Galen's *Compendium Timaei*)? There appears no basis for reconciliation of the divergent accounts at this point. The *Compendium* offers earth and air. *Ten Treatises* says earth and water first, air and water elsewhere. Either Ḥunayn's first statement is simply an error and should

30) *Ibid.*, p. 37.

31) A perusal of Meyerhof's footnotes to his translation of *Ten Treatises* will show the reader how thoroughly Ḥunayn depended on Galen for information.

32) Among various works see Ḥunayn, *Galen-Übersetzungen*, ed. Bergsträsser, passim, and the summary article by Max Meyerhof, "New Light on Ḥunayn ibn Ishāq and his Period," *Isis*, 8 (1926), 685-724.

33) I have shown this in a study of Ḥunayn's visual theory (to be published).

34) Meyerhof collated the two known mss. (see Ḥunayn, pp. xxxv-xxxvi, xlvi-xlix); the phrase in question appears at Arabic p. 84, line 18.

be assumed to correspond with his second statement, placing vapor between air and water; or his statements differ because of a difference in sources used, and the further difference between earth-water and earth-air must be explained by an error in paraphrasing the *Compendium* for use in the *Ten Treatises*. What Ḥunayn alerts us to, it seems, is the possibility of real differences in different works by Galen, which are then used by Ḥunayn.

The variations in different texts might be reduced to a series of *errors*, all diverging from the norm of vapor-as-air-and-water, thus cutting the Gordian knot. The variations can also be seen as variant *opinions* or as a combination of error and opinion. Or, we may look for an *internal consistency* among statements which appear to diverge. Let us begin to narrow down the probabilities. Among the errors we can certainly include the transition from Galen's *Compendium* to Ḥunayn's *Ten Treatises*. We propose that Ḥunayn used the *Compendium*, which placed vapor between earth and air, at one point in his work, and that there occurred an error (the perpetrator unknown) in replacing earth and air (*Compendium*) by earth and water (*Ten Treatises*)³⁵. This proposition seems to require that we assume Ḥunayn had two different conceptions of vapor in mind. That such an assumption is *not* necessary we shall attempt to show below.

III. Galen and Plato

The Galenic texts we have discussed provide enough for us to conclude that the olfactory sense is essentially vaporous and that the vapor is composed of air and water. We propose that such a definition *fits* the discussion of vapor in every one of the Galenic texts, but that the definition *does not exhaust* the content of every discussion. That is, it takes little interpretation to find this definition uniformly in Galen, but he chooses to emphasize different aspects of smell at different places. In review, the four texts give the following tabulation.

35) It is notable that the "error," the appearance of *ard* ("earth"), appears in *both* the *Compendium* and the *Ten Treatises*. On the hypothesis that it was not seen to be an error, we can consider it very likely that the word for earth was already in Ḥunayn's Greek text, from which he translated the *Compendium*. In fact, Ḥunayn knew and translated every one of the Galenic texts we are concerned with.

<i>text</i>	<i>elements mentioned in connection with vapor</i>
De instr. odor.	air and water, fire; air, water
De usu part.	vapor: air (almost): :air: light
De placitis	air, water
Compendium Timaei	air, earth

From looking at this summary we can see at the least that each text places air as an upper limit for the density of vapor, assuming a descending order of fire-air-water-earth, with the possible exception of *De instrumento odoratus*. But that text explicitly placed vapor between air and water with respect to density, so we shall look for the inclusion of fire there to mean something else. The *Compendium* certainly has air as the upper limit but says nothing about water, even though Galen quotes from Plato's *Timaeus* in *De placitis* to the effect that odors arise in the changing³⁶ of air to water and of water to air. Since Galen makes use of Plato for his elemental theory of the senses, we should remember the essential points made by Plato. In *Timaeus* 65 B–68 C there appear discussions of four of the special sensibles: taste (65 B–66 C), odor (66 D–67 A), sound (67 A–67 C), and color (67 C–68 C). While he previously mentions touch in general (61 C–64 A), Plato does not define it in terms of a single, characteristic element. Concerning smells he says,

The faculty of smell does not admit of differences of kind, for all smells are of a half-formed nature, and no element is so proportioned as to have any smell. The veins about the nose are too narrow to admit earth and water, and too wide to detain fire and air, and for this reason no one ever perceives the smell of any of them. But smells always proceed from bodies that are damp, or putrefying, or liquefying, or evaporating, and are perceptible only in the intermediate state, when water is changing into air and air into water, and all of them are either vapor or mist. That which is passing out of air into water is mist, and that which is passing from water into air is vapor, and hence all smells are thinner than water and thicker than air. The proof of this is that when there is any obstruction to the respiration and a man draws in his breath by force, then no smell filters

36) The emphasis on changing in connection with the appearance of odors is also the emphasis, according to the quotation by Maimonides, in the section on smell in Galen's *Commentarius* on Plato's *Timaeus*; see above, n. 23 (ed. Schröder, pp. 7, 97).

through, but the air without the smell alone penetrates. Wherefore the varieties of smell have no name, and they have not many or definite and simple kinds, but they are distinguished only as painful and pleasant...³⁷

Smells are always the result of a transitional state, an impermanent stage in the shifting from air to water or vice versa. Since none of the elements has odor, it arises in between the elements as vapor, or mist³⁸). Smells "proceed from" bodies which are undergoing some sort of vapor-producing change. Furthermore, as he says finally, there is no way to define smells in simple and definite terms. Plato conceives of some sort of substance, irregular in shape, between air and water in its ability to penetrate permeable barriers, as the essence of smell. He does not appear to consider earthy particles of the substance smelled, other than its vaporous emission, to pass with the vapor in causing the sense of smell. Yet there is room for hypothesizing here, since Plato says that neither air nor water has smell. It is not at all clear how something compounded of the qualities of non-odorous elements can have odor. Plato's answer to this seems to be that it is just the non-characteristic qualities of air and water *in transition* which account for smells. Galen apparently understood this explanation when composing his *Commentarius in Timaeum Platonis*, at the same time he was writing the later books of *De placitis* (including book 7)³⁹). While we have neither the Greek text nor a complete Arabic version of the *Commentarius*, there is preserved a section relating to smell in a quotation from Maimonides' *Aphorisms*. According to Maimonides, Galen says,

The ancients called the changing of one substance into another, different sort of thing "decay," like the changing of wine, if it sours, so that it becomes vinegar, and similarly the deterioration which occurs with some kinds of wood, until it crumbles and becomes as if it were dust and ashes. But the moderns among physicians and people in general use the word "decay" only for the changing, which destroys

37) *Timaeus* 66D-66E, transl. Jowett.

38) Any possible distinction between vapor and mist is neither exploited nor made clearer by Plato. In any case, for the purposes of this analysis the terms are interchangeable.

39) In *Platonis Timaeum commentarii fragmenta*, ed. Schröder, p. ix. Johannes Ilberg, "Über die Schriftstellerei des Klaudios Galenos," *Rheinisches Museum für Philologie*, N.F. 47 (1892), 511-512; 51 (1896), 177; reprinted, same title (Darmstadt, 1974), pp. 56-57, 72.

the substance itself, whereby smell then appears. But that happens only with the substances which tend more to mist and dampness⁴⁰).

While Galen understands the Platonic statement, he also appears to propose a limitation. He contrasts the ancients' use of the word with the moderns' use of the term, giving a much broader application for the ancients, including all kinds of corruption of substances. But the moderns apply the word only to the spontaneous deteriorations in which odors arise; these always involve a change toward moisture (between air and water). Galen's *Commentarius* thereby leaves open for further explanation those odors arising in substances whose transformations are not spontaneous and which may involve more than the emission of vapors.

What is Galen's attitude toward his Platonic source? His attitude, we must conclude, is generally respectful but in detail varies with the purpose for which he is writing. Probably the most pro-Platonic work by Galen is his *De placitis*, in which he shows how Plato, with Hippocrates, is more fully to be trusted in medical matters than other writers. In *De placitis* Galen argues against doctrines of Stoics, Epicureans, and Aristotle, for example in book 7 when discussing vision. Plato is used insofar as his writings are in accord with Galen's doctrine of vision, but Aristotle is used largely as a foil, a writer whose shortcomings are pointed out in detail⁴¹). In *De usu partium* Galen may still be said to use Plato's teaching on the sense of smell, but not as a standard to which others are compared disadvantageously. Finally, in *De instrumento odoratus* and the *Compendium Timaei* Galen appears to offer a reinterpretation of the Platonic doctrine, perhaps in pursuance to the limitation already suggested in the *Commentarius in Timaeum*. The reinterpretation in the *Compendium* incorporates the actual doctrine of Plato as a general framework but adds further specifications which, we shall see, bring us back to Galen's fullest treatment, in his monograph on the sense of smell.

Galen's reinterpretation found in the existing text of the *Compendium* proceeds implicitly to group together taste and smell, sight and sound. The latter pair occurs through some kind of medium. The former pair involves direct contact. In grouping smell with taste Galen extends the model of Plato's account of

40) Galen, *Commentarius*, ed. Schröder, pp. 7-8 (transl.), 97 (Arabic).

41) Galen, *De placitis*, VII, 7; ed. Müller, 637-641.

flavors to the account of odors. In *Timaeus* 65C–66C Plato basically describes flavor as a liquefied, or dissolved, form of particles of earth. He adds to this some specifications for different kinds of flavor, and these specifications make it clear that the earth particles may be carried in fully liquid form or may be carried in a “moist” form composed of air as well as water (plus the earth). The moist form, not vapor but very small bubbles of water-encased air-and-earth particles, is the origin of acidic flavors. Galen follows the Platonic account of taste, including the account of acid flavors, which Galen’s *Compendium* describes as flavors “which putrescence rendered as subtle parts in order to penetrate the fine veins [of the tongue]”⁴²). The model Galen seems to have in mind postulates earth particles in water (even involving bits of air for acids) to explain flavors, and then earth particles in vapor for odors. However, his phrasing is chosen to minimize the modification to Plato’s text and to provide a sense of relationship to the original. Therefore Galen says that the substance of odors is *between* earth and air and is of a cloudy and misty nature. The Platonic account of acid tastes as restated by Galen needs only a slight shift, from the incorporation in a bubbly matrix to the incorporation in a vaporous matrix, to become an account of acid smells. Finally, Galen’s *Compendium* makes a suggestive abbreviation of the *Timaeus*’ qualification that “... the varieties of smell have no name, and they have not many or definite and simple kinds, but they are distinguished only as painful and pleasant...”⁴³). The *Compendium* says only, “[and of odors] some are said to be pleasant, others irritating. Their individual types, however, have no name”⁴⁴). The variation from Plato is Galen’s omission of the strong qualifying clause that smells “have not many or definite and simple kinds.” As an epitome, the *Compendium* very reasonably omits this clarification. However, such an omission does permit a new interpretation, which is that smells have not been adequately categorized *yet*, because of their greater complexity. Such an interpretation would be highly improbable, if there were not correlative evidence elsewhere in Galen’s writing.

42) Galen, *Compendium*, pp. 68 (transl.), 20, lines 7–8 (Arabic).

43) *Timaeus* 67A; transl. Jowett.

44) Galen, *Compendium*, p. 69 (transl.), p. 20, line 13 (Arabic).

IV. Galen's Doctrine

In *De instrumento odoratus* we have not only the tri-elemental makeup of odors to reckon with, but other statements as well, which fit better with the reinterpreted Plato than with the original Plato. To reconcile the various Galenic texts concerned, we must find reasons for the inclusion in one text of earth in connection with smell and in another text of fire in connection with smell. *De instrumento odoratus* suggests such reasons. In the passages already quoted from this work⁴⁵⁾ we shall emphasize certain points. When the organ of smell is said to "be vaporous, not in any way hard and earthy, like the membrane in the nostrils,"⁴⁶⁾ Galen means to stress the limitations of the sensitive *neura* in the nostrils, which only record sensations proper to touch and not smells. The vapor, which characterizes the sense of smell, may yet be mingled in some way with earthy material when odors are created. We also find that odors arise from "the more volatile substances" (*ousias leptomerous*)⁴⁷⁾. The description of such substances includes their emission, at which point they become "smaller and drier"⁴⁸⁾, because the "moister parts"⁴⁹⁾ have dissipated, or evaporated, from their makeup. The emphasis in these phrases seems to rest on the lightness, dryness, and minuteness of the matter of odors; moistness apparently disappears or almost disappears as the odors become airborne.

The specific smells discussed in *De instrumento odoratus* add to our understanding of odors. At three places Galen mentions odor of roses⁵⁰⁾, for their cooling nature carries importance in his notion of smell. The only other specific smells he mentions are strong, even acrid, odors produced by the burning of "asphalt, cassia, myrrh, frankincense, storax"⁵¹⁾. These odors are distinctly aromatic and normally involve smoke as the result of burning. Also, as the result of burning, they seem to be relatively dry and possessed of heat. We have then, presented in close succession, an example of a cooling odor (roses) and examples of

45) See above at nn. 5, 7.

46) Kollesch, p. 42, 1-2; Kühn, 864, 5-7.

47) Kollesch, 42, 6; Kühn, 864, 10.

48) Kollesch, 40, 7; Kühn, 862, 14.

49) Kollesch, 40, 8; Kühn, 862, 15.

50) Kollesch, 40, 6; Kühn, 862, 13. Again, Kollesch, 48, 1-4; Kühn, 870, 3-6. Finally, Kollesch, 62, 5-12; Kühn, 884, 7-16.

51) Kollesch, 42, 20-21; Kühn, 865, 12-13.

strong, heating odors (asphalt, etc.). After exploring the location of the completed sense of smell and the passages leading thereto, Galen speaks at the end of the treatise about the ultimate utility of odors. Here he reveals a bit more clearly how such odors as previously mentioned are to be understood. Galen says,

That intense odors at once cause pains in the head, make it stuffy and heavy, sometimes even bringing on delirium, is also a sign that *some of the material itself* (my emphasis) reaches the brain. For the brain could not be affected to so violent and acute a degree just on the basis of a similar quality [viz., cool and wet]. Similarly it is now to be expected, when the brain suffers as a result of heatstroke, that the scent of roses is healthful. Whereas nothing less than roses, and also inhaled cold air, helps, so on the other hand very warm air rather clearly is deleterious. And when in fact the whole respiration is carried on by the brain in order to preserve the correct amount of heat in the heart, it is quite reasonable for the brain to provide this [equilibrium] first for itself, since by nature it is most susceptible of being injured through excessive heating up or cooling down⁵²).

With the relation of smelling to respiration as an activity intended to aid in balancing the body's vital heat there appears a much clearer framework for understanding the place of heat and cold in odors and the various modulations between extremes. Both the juxtaposition by Galen of fire to air and water, and his emphasis upon the variable elemental properties of odors, which must be able to carry varying degrees of heat and cold, take on greater meaning in the light of this teaching. The properties of odors have not only mechanical importance (size, density, lightness, etc.) but also teleological importance.

One further difficulty remains to be resolved, and the last quotation from *De instrumento odoratus* gives an answer. What does the element earth, mentioned in the *Compendium Timaei*, have to do with odors? We have just seen that Galen believes "some of the material itself" proceeds to the brain upon inhalation. This is especially evident with strong odors, like asphalt etc., and Galen even offers an experiment to show that solid matter may reach the olfactory lobes of the brain. He discusses a man affected with coryza, into whose nostrils a mixture of finely ground seeds of black cumin and oil was poured, who was

52) Kollesch, 62, 1-12; Kühn, 884, 1-16.

then directed to inhale sharply. Cure ensued, and in the process of being cured the man noted a severe pain deep inside his head after an especially vigorous inhalation of the mixture. Galen's analysis leads to the conclusion that at least part of the cumin must have entered the anterior portion of the brain by way of the olfactory passages. Repetition of this experiment led him to his basic theory that the sense of smell comes from the ventricles of the brain rather than some connected organ as with the other senses⁵³). This shows a probable reason for Galen's apparent inconsistency in mentioning earth at one place in those of his work still surviving. Dense matter, or earth, in the form of very small particles and not just the more rarefied components of the odorous substance is sometimes an essential part of odors. The connection of strong odors with the burning of dry earthlike substances has an interesting echo in the *Timaeus* itself, where Plato describes fire as something approaching a universal solvent, able to dissolve compounds of earth or water or air⁵⁴). Those odors arising from burning, normally accompanied by smoke, might well be characterized as odors involving some properties of earth, air, and fire and having density between water and air. Cooler odors would then be more purely vaporous, containing only the watery and airy qualities, not the earthy matter, of the odorous substance.

V. Galen and Aristotle

Galen's position, or positions, on the elements of olfactory sensation have important roots in the Aristotelian tradition. Although the Galenic conception of vapor as such, a substance and state which lie between water and air, goes behind Aristotle to Plato, Galen's broadened conception of odors, sometimes vaporous in the pure sense and sometimes carrying additional material substance (earthy) or properties of state (fiery), goes beyond Plato. While we may say that Galen stretches the Platonic tradition to include these additional elements, we shall be on much firmer ground after finding a source for the Galenic extrapolations. Aristotle's *De anima* and, more especially, his *De sensu*

53) The experiment is recounted in *De instr. odor.* 4, 3-6; Kollesch, 46, 1-20; Kühn, 868, 3-869, 9; transl. Wright pp. 5-6.

54) *Timaeus*, 60E-61B.

set forth most of the non-Platonic elements found in Galen's doctrine of smell. Just as Galen emphasizes more the airy and dry than the wet characteristics of smell, so Aristotle observes, "Smell belongs to the dry, as flavour does to the wet; and the organ of smell is potentially dry"⁵⁵). It is the *De sensu*, including two brief statements in chapters 4 and 5 and almost the whole of chapter 5, which seems to provide the mine that Galen quarries very selectively for parts of a doctrine of smell. Because Aristotle's general theory of the heart as central organ does not fit Galen's physiology, there are many basic differences in doctrine between the two, and Galen is not given to complimenting Aristotle, even when he seems acceptable. Galen's relative silence about Aristotle's contributions to the understanding of smell apparently stems from the great usefulness of specific aspects of Aristotle's theory despite the unacceptability of his overall theory of the sense of smell. And Galen's fullest account, in *De instrumento odoratus*, has already proven to be less than fully consistent itself. It is the separable Aristotelian components of Galen's theory that we must now identify.

Aristotle observes that if we wish to relate each of the senses to an element we shall relate smell to fire, and he says, "Now odour is a kind of smoky vapour, and a smoky vapour arises from fire. Hence the sense organ of smell is proper to the region about the brain; for the matter of what is cold is potentially hot"⁵⁶). Immediately we see here the inclusion of fire, burning, and a link with the heat of the brain. These concerns we recall are part of Galen's explanation of odors which are hot, not those which are cooling. Later Aristotle explicitly treats smells and flavors as "almost the same affection (*pathos*), though they do not occur in the same circumstances"⁵⁷). Speaking comparatively he considers man to have developed his sense of smell less than his other senses and less well than have other animals. Therefore we taste more accurately than we smell⁵⁸). This theme is a leitmotiv in Aristotle's *De sensu*, chapter 5, and allows for a great deal of transference from one sense to the other, if a reader

55) Aristotle, *On The Soul*, II, 9 (422a), transl. W.S.Hett (London: Heinemann, 1957,) pp. 124 (Greek), 125 (transl.).

56) Aristotle, *On Sense and Sensible Objects*, 2 (438b, 24-27), transl. W.S.Hett (London: Heinemann, 1957), pp. 226 (Greek), 227 (transl.).

57) *Ibid.* (440b, 29-31), pp. 238, 239.

58) *Ibid.* (440b31-441a2).

wishes simply to use rather than expound the doctrine there. If taste is a flavored wetness, according to Aristotle, then,

... smell will be the nature which the flavoured dry shows in a wet medium [moist air], and what is so conditioned will be an object of smell. That the effect is due to the possession of flavour is obvious from a consideration of those things which have, and those which have not smell. The elements, *viz.*, fire, air, water and earth, are odourless, because both those which are dry and those which are wet have no flavour, unless they form a combination. That is why the sea has a smell; for it has flavour and a dry ingredient⁵⁹).

Here a basic theme of Galen's doctrine of smell appears in very neat form. The "dry ingredient" of Aristotle's account is the inhaled air as medium, while the "flavor" is what is added, either by vaporous emission or by particulate emanation according to Galen's *De instr. odor*. Yet it is just at this point that Aristotle's and Galen's thoughts about smell clearly part. While Galen proceeds to imagine the process and purpose in essentially medical and physical terms, Aristotle insists on a more philosophical account, denying exactly those approaches which Galen seems to find so useful. Aristotle says,

Some people think that smell is a smoky vapour, which is partly earth and partly air... Vapour is a kind of moisture, but smoky exhalation... is a compound of air and earth; the former when condensed becomes water, but the latter becomes a kind of earth. But probably smell is neither of these; for vapour consists of water, and smoky exhalation cannot occur in water. Yet water-creatures have a sense of smell...⁶⁰).

Aristotle hereafter proceeds to discuss taste and smell in terms of the "nature of flavored dryness" in conjunction with the moisture in water and air respectively. He prefers to avoid discussion of smells as material substances and deals instead with their natures, qualities, and affections. This pervades his theory of one of the major purposes of smells, which has an obvious though curious relationship to Galen's theory. While Galen considers smells to be either cooling or heating and thereby to help balance and regulate the heat of the brain, Aristotle considers

59) *Ibid.* (443 a 7-13), pp. 248, 249.

60) *Ibid.* (443 a, 22-23), pp. 248-50, 249-51.

all smells to be potentially, naturally hot and to rise to the brain because of their lightness, providing greater health for that naturally cold part of the body⁶¹). Coming very close to Galen's favorite example of roses, which by their nature should cool the brain, Aristotle says, "man is conscious of and enjoys the smell of flowers and the like; for the heat and stimulation produced by these balance the excess of moisture and coldness in that region of the body"⁶²). Here we see the two theories diverging, with Aristotle's more conceptually consistent and Galen's more experimentally bound to an ambiguous position.

VI. Conclusions

In conclusion we can say that the apparent ambiguity, or even apparent error, in the extant texts of Galen's discussions of odors and the sense of smell derives from his very real awareness of difficult evidence to explain. The range of density for vapor seems to cause him no trouble. The composition of vapor, if vapor is to explain odors fully, is problematical. His fullest discussion appears in *De instrumento odoratus*, and this, as clarified by some Aristotelian notions in *De sensu*, seems to provide the only safe basis for interpreting (or correcting) what appears in any of Galen's other works.

Essentially, Galen's theory is enmeshed in a theory of heat equilibrium in the brain. Unlike Aristotle, Galen emphasizes the part of inspired air as well as certain cooling odors in cooling an overheated brain. These cooling odors seem to be emissions from volatile substances, which are drier (not necessarily fully dry) and carried by the air to the sense organ. The sense organ itself is vaporous, that is, capable of perceiving a whole range of "vaporous" odors, lying between water and air in density. But the sense of smell exists, according to Galen (following Aristotle), not *simply* through vapor in its ordinary sense (air-water alone) but through all the elements in some way. Earth-like matter is part of *some*, strong odors which penetrate to the brain, and these strong odors are considered hot and generally seem to be the result of burning. These hot odors can be useful to the brain in clearing out excesses of cold, dense humors. The

61) *Ibid.* (444a, 10-25), pp. 252-4, 253-5.

62) *Ibid.* (444a, 34-444b, 2), pp. 254, 255.

experimentally determined character of these odors and of the penetration of matter to the ventricles of the brain leaves Galen with no choice but to complicate his theory of olfactory sensation, remaining more traditional with his theory of cooling odors, departing more from tradition in his theory of heating odors⁶³).

If we return to our starting point, the variant texts themselves, we can say with reasonable probability that the two texts with the strongest apparent divergences, the *Compendium Timaei* and the *De instrumento odoratus*, are exactly those texts which show us the Galenic predicament – how to account for olfactory sensations which can in no way be described in terms of vapor alone. In the summary of Plato there appears an inclusion of earth to account for the stronger odors. In Galen's monograph on the organ of smell the importance of fire appears to account for the heating quality of some smells. It seems less likely that Galen (or Galenists) changed position, and rather that different aspects of a complex understanding found emphasis at different times.

University of Kentucky Bruce Stansfield Eastwood

63) Galen's account of the details of smelling seems more influenced by observation than by philosophy. Even so, it should be noticed that Aristotle, in a context not explicitly related to the senses, provides philosophical support for Galen's doctrine. In *De generatione et corruptione*, book 2, while discussing the transition of one element to another by means of coming-to-be and passing-away of qualities, Aristotle describes the transformation from a combination of air and earth to either fire or water. He says (*De gen. et corr.* 331 b, 19–26), "...Fire and Water will result from Air and Earth; for when the heat of the Air and the dryness of the Earth pass-away, there will be Water (for the moisture of the Air and the cold of the Earth are left), but when the moisture of the Air and the cold of the Earth have passed-away, there will be Fire, because the heat of the Air and the dryness of the Earth, which are... the constituents of Fire, are left. Now the manner in which Fire comes-to-be is confirmed by our sense-perception; for flame is the most evident form of Fire, and flame is burning smoke, and smoke is composed of Air and Earth." Translation from Aristotle, *On Sophistical Refutations; On Coming-to-be and Passing-away*, trans. E. S. Forster (London: Heinemann, 1955), p. 283. It is clear that this Aristotelian statement would fit neatly with Galen's notion that smelling helps to maintain an equilibrium of heat in the brain. While Galen must have been aware of, and perhaps encouraged by, this statement – it is, after all, basic to the doctrine of elemental qualities used by Galen – he makes no reference to the argument. I would explain this state of affairs by arguing that Galen preferred experimental to philosophical reasoning in physiology.