

1. *A Description of Perception in De Somno et Vigilia 1*

In *On Sleep and Waking 1* Aristotle provides us with something like a definition of ‘perception’ which at first glance seems perfectly clear: 454a8–10 ἡ δὲ λεγομένη αἴσθησις ὡς ἐνέργεια κίνησις τις διὰ τοῦ σώματος τῆς ψυχῆς ἐστὶ (‘What is called sense-perception, as actuality, is a kind of movement διὰ τοῦ σώματος τῆς ψυχῆς’).

Though the words of this formulation are perfectly plain, and it seems unproblematical at first sight, two important choices need to be made, before the passage can be translated correctly:

(a) What is the meaning of the preposition διὰ?

(a1) Should it be taken causally in the sense of ‘through the agency of’ or ‘through the mediation of’, or

(a2) should it be taken locally in the sense of ‘through’?

(b) What is perception a movement of?

(b1) Is perception called ‘a kind of movement of the soul’ or

(b2) is perception called ‘a kind of movement of the body of the soul’?

J. I. Beare, in: W. D. Ross (ed.) vol. 3 (1931), translates: ‘what is called sense-perception, as actuality, is a movement of the soul through the body.’ (Likewise in J. Barnes [ed.] 1984, vol. 1, 721.)

So this author opts for (b1) and (probably) for (a1). And (b1) is the preferred choice of all modern authors.⁴ Yet this way of translating the passage calls for some critical comments.

4) W. S. Hett (1936) 321 follows the same line even more explicitly: “and what we call sensation, as actuality, is a movement of the soul through the agency of the body”, though it is not certain that Beare’s “through” means the same as Hett’s “through the agency of”. H. J. Drossaart Lulofs (1943) 2* gives the medieval Latin translation, which is just as ambiguous as the Greek text: *sensus, ut actio, motus quidam per corpus anime est*. See also P. Gohlke (1947) 77: “die sogenannte Wahrnehmung ist aber, als Betätigung, eine Bewegung der Seele durch Vermittlung des Leibes”; J. Tricot (1951) 77: “perception ... est un certain mouvement de l’âme au moyen du corps”. R. Mugnier (1953) 65 follows suit with: “ce qu’on appelle la sensation, en tant qu’acte, est une espèce de mouvement de l’âme par l’intermédiaire du corps”. W. D. Ross (1955) 253 paraphrases: “perception as an actuality is a movement of the soul through the body”. He does not bother to comment. D. Gallop (1996) 63: “what is called perception, in the sense of exercise, is a certain movement of the soul by means of the body”; E. Dönt (1997) 102 follows the same line: “was wir aktuelle Wahrnehmung nennen, ist eine Bewegung der Seele mittels des Kör-

(1) After all, perception does not take place ‘through the agency of the body’, but through the agency of an object of perception.⁵ The movement caused by the object of perception is not caused by the body of the subject of perception. This movement does pass through the body of the subject of perception, ending up at the sensitive soul (in the region of the heart).

(2) Secondly, *διά* connected with a genitive of *σῶμα* is always used in a local sense,⁶ and never indicates the cause of something (cf. H. Bonitz, *Index Aristotelicus* 177a7–b3).

(3) Thirdly, it is unclear whether ‘the body’ refers to the whole visible body or to the ‘instrumental body’ with which the soul forms a natural unity.

(4) Next, we should note that in the Greek text the words *τῆς ψυχῆς* are remarkably far removed from the word ‘movement’, with which they are supposedly connected. If Aristotle meant what all modern translators assume, the formulation *κίνησις τις τῆς ψυχῆς ἐστὶ διὰ τοῦ σώματος* would be much more natural.⁷

pers”; A. L. Carbone (2003) 155: “la cosiddetta sensazione, in atto, è un certo movimento dell’anima attraverso il corpo”. See also P. J. van der Eijk (2003) 55: “Wat we waarneming noemen ... is een bepaald soort beweging van de ziel die zich door middel van het lichaam voltrekt” [what we call perception ... is a certain kind of movement of the soul which takes place by means of the body]. F. Solmsen (1961) 170 observes: “Here it is reassuring to learn that ‘the movement’ passes ‘through the body’”. C. H. Kahn (1966) 44 also translates “a movement of the soul (which is produced) through the body”, but adds: “or, more precisely, a movement which passes through the body and reaches ‘to the soul’” (referring to *Anim.* 1,4,408b16–7). But he thus overlooks the cardinal point that perception is a movement “through the body of the soul”.

5) Cf. *Anim.* 2,5,417a17.b20; 3,12,434b27–9. Cf. also 2,7,419a13: τὸ μὲν χρῶμα κινεῖ τὸ διαφανές, οἷον τὸν ἀέρα, ὑπὸ τούτου δὴ συνεχοῦς ὄντος κινεῖται τὸ αἰσθητήριον (‘Colour moves the transparent medium, e.g., the air, and this, being continuous, acts upon the instrument of perception’) and 419a27–8. Inasmuch as an αἰσθητήριον is part of the soul’s instrumental body, this passage also talks about perception as a movement of / through the body of the soul. Cf. also *Sens.* 2,438b22 and 3,440a18: κρεῖττον φάναι τῷ κινεῖσθαι τὸ μετὰ τῆς αἰσθήσεως ὑπὸ τοῦ αἰσθητοῦ γίνεσθαι τὴν αἴσθησιν, ἀφῆ καὶ μὴ ταῖς ἀπορροαῖς.

6) Cf. *Anim.* 2,11,423a10.16; *Sens.* 2,438b4f.: ἡ διὰ τούτου (air or light) κίνησις ἐστὶν ἢ ποιούσα τὸ ὄραν.

7) Michael Ephesius, In *Arist. Parva Naturalia* (CAG XXII 1) 43 paraphrases this as: ἡ κατ’ ἐνέργειαν αἴσθησις κίνησις ψυχῆς δι’ αἰσθητηρίων γινομένη and refers to *Anim.* 2,5. However, Aristotle says there: Ἡ δ’ αἴσθησις ἐν τῷ κινεῖσθαι ... συμβαίνει (416b33–4), but certainly not that it produces a movement of the soul.

(5) Also, there is no passage in the *Corpus* where Aristotle talks unequivocally about movement ‘of the soul’. We do see repeatedly that Aristotle connects the activity of perception with receiving stimuli and being moved by an object of perception, but this always relates to the movement of a specific physical body. In *On the Soul* 1,4,408a31–3 it seems at first sight as if Aristotle presents the soul as the principle of movement in a Platonic sense. But there, too, on closer inspection, it is the vehicle of the soul that is in motion and for which the soul is the (unmoved) principle of movement: *κατὰ συμβεβηκὸς δὲ κινεῖσθαι ... ἔστι καὶ κινεῖν ἑαυτήν, οἷον κινεῖσθαι μὲν ἐν ᾧ ἔστι, τοῦτο δὲ κινεῖσθαι ὑπὸ τῆς ψυχῆς* (‘It is, however, possible that it may be moved, and even move itself accidentally, e. g., that which contains it may be moved, and be moved by the soul’).⁸

(6) The main point, however, is that Aristotle extensively argued that the soul itself does not possess or undergo movement. ‘It is out of question that the soul possesses movement’, says Aristotle in *On the Soul* 1,3,406a2. According to him, motions and emotions of the soul can only be motions and emotions of the body with which the soul is inextricably connected.⁹ The text in *On Sleep* 1 must therefore mean that perception is a movement through ‘the body of the soul’. But what body can this be? It is either the visible body as a whole, or the (distinct) instrumental body of the soul. This case, which clearly involves perception and the connected *αἰσθητήρια* of the various forms of perception, strongly suggests that Aristotle is talking about the (instrumental) body of the soul in a narrow sense.¹⁰

This means that Aristotle in *On Sleep* 1 calls perception a movement ‘through the body of the soul’ and is emphatically

8) Cf. *Anim.* 3,10; *Phys.* 8,6,259b18–20.

9) See at length O. Gigon (1983) ‘Einleitung’ 214–7.

10) The main reason for the necessity of this conclusion is that the soul is already present in semen and in fruits / seeds (of plants). And not only is the soul present, but also all the soul-parts (*Anim.* 2,1,412b27. See especially the conclusion in 413a4: *μέρη τινὰ αὐτῆς*. The example of an eye is chosen because Aristotle is speaking about the sensitive part of the soul.). That which has the potentiality of perception must already be present in this phase. In other words: the *αἰσθητήρια* are present in the semen of animals and humans, whereas the ‘instrumental parts’ of the visible body for perception, like eyes and ears, have yet to be formed. For the distinction between *αἰσθητήρια* and ‘instrumental parts’ see §2.1. below.

saying that this movement continues μέχρις ‘as far as’ the soul (and no further).¹¹ To substantiate the above thesis, we will examine how Aristotle in *On the Soul* 1,3 rejects every theory which attributes any form of movement to the soul; and how in *On the Soul* 1,4 he speaks about emotions / perceptions of the soul and emphasizes that they should be taken as movements terminating in the soul or starting from the soul.

But if we are right that the sentence in *On Sleep* 1 should be read differently from how it has always been read, we also need to note that the passage does not offer a complete definition of ‘perception’. For ‘perception’ comprises more than just movement: there must also be a result, the reception of the form of the perceived subject ‘without matter’.¹² Aristotle says this explicitly in *On the Soul* 2,12,424a26–32 when he observes that the perceptive subject is a kind of λόγος (*ratio*) and that an excessively strong sensory stimulus can destroy the powers of perception: ‘if the motion of the instrument for perception is too strong, its λόγος is destroyed (which, as we saw, constitutes the perception)’.¹³ But that is not the point Aristotle emphasizes in *On Sleep* 1. There he only wants to determine where ‘sleep’ is to be situated. And he concludes that sleep is the condition of the entire sensory instrumental body of the soul when this instrumental body is non-active.

1.2 Aristotle’s Critique of Plato’s Doctrine of the Soul as Principle of Self-Motion

In *On the Soul* 1,3,405b31–406a2 Aristotle takes a closer look at the views of his predecessors, who regarded the soul as the principle of movement for the body of animals and human beings. He starts his argument emphatically there by stating: ἴσως γὰρ οὐ μόνον ψευδός ἐστι τὸ τὴν οὐσίαν αὐτῆς τοιαύτην εἶναι ὡς φασὶν οἱ λέγοντες ψυχὴν εἶναι τὸ κινεῖν ἑαυτὸ ἢ δυνάμενον κινεῖν, ἀλλ’

11) Cf. *Insomn.* 3,461a30f.: ἐκεῖθεν ἀφικνεῖσθαι τὴν κίνησιν πρὸς τὴν ἀρχήν (‘the movement which reaches the principle of sense comes from them’). Cf. Kahn (1966) 44.

12) *Anim.* 2,12,424a18; a26–28.

13) οὐ μὴν τό γε αἰσθητικῶς εἶναι οὐδ’ ἡ αἰσθησις μέγεθός ἐστιν, ἀλλὰ λόγος τις καὶ δύναμις ἐκείνου. ... ἐὰν γὰρ ἢ ἰσχυροτέρα τοῦ αἰσθητηρίου ἡ κίνησις, λύεται ὁ λόγος (τοῦτο δὲ ἡ αἰσθησις).

ἐν τι τῶν ἀδυνάτων τὸ ὑπάρχειν αὐτῇ κίνησιν ('it is not only false that the essence of soul is correctly described by those who say that it is what moves [or is capable of moving] itself, but it is impossible that movement should even be an attribute of it'). As an alternative he proposes that the soul is the principle of movement, without the soul itself being in motion. He gives the example of sailors who move because they are on board their ship, which sails while they themselves remain stationary (1,3,406a5–6; 4,408a31–3; Phys. 6,10,240b8–13).

After Aristotle has first argued at length why the soul itself cannot be in motion (1,3,406a12–b5), he examines in what way it can participate in movement. He then gives the example: a living being can be pushed. In that case the living creature moves, and therefore its soul does, too. But he continues by saying that something which is essentially moved by itself need not be moved by anything else, apart from the accidental movement of which he has given an example. Aristotle is thus saying that, though a living being can be called a self-mover, it can be argued that the soul of this living being is not itself in motion, but only sets in motion.¹⁴

Aristotle then continues with a proposition which has great significance for our inquiry. 'If the soul is moved, the most probable view is that what moves it are sensible things' (1,3,406b10–1; cf. Phys. 7,3,247a9–13¹⁵). This sentence is emphatically hypothetical. Aristotle is not saying here that perception is a movement of the soul. He only says that the entire process of perception seems to be a process in which the soul is 'moved'.¹⁶ But this is immediately followed by a radical rejection of this hypothetical possibility (1,3,406b11–5).

In 1,4,408b1–18 he proposes an alternative approach: 'We speak', he says there, 'of the soul as being pained or pleased, being

14) He had started in 1,3,406a3 by saying that not everything which sets in motion must itself be in motion, too. He refers there to "what was said before" (according to Jannone and Barbotin [1966] the reference is to Phys. 8,5).

15) On Physics 7 and the discussion about its chapters 2 and 3 cf. Manuwald (1971).

16) For this passage Jannone and Barbotin (1966) 13 n. 1 refer to the text of Somn. 1,454a7–11. They note there: "Aristote estime que la sensation n'est le propre ni du corps ni de l'âme pris séparément, mais du composé, et que la sensation, comme acte, est un mouvement de l'âme par l'intermédiaire du corps." This means that, in their view, Aristotle did talk about the soul 'being moved'. But this can be found neither here nor in Somn. 1.

bold or fearful, being angry, perceiving, thinking. All these are regarded as modes of movement, and hence it might be inferred that the soul is moved. This, however, does not necessarily follow' (408b1–5). And in 408b12–8 he makes his point clear: the soul is the (unmoved) principle of all the affections and perceptions of a living creature.

'To say that it is the soul which is angry is as if we were to say that it is the soul that weaves or builds houses. It is doubtless better to avoid saying that the soul pities or learns¹⁷ or thinks, and rather to say that it is man who does this with his soul. What we mean is not that the movement is in the soul, but that sometimes it terminates in the soul and sometimes starts from it – ὅτε μὲν μέχρι ἐκείνης, ὅτε δ' ἀπ' ἐκείνης –, sensation, e. g., coming from outside (and supplying stimuli as far as the soul), and reminiscence starting from the soul and terminating with the movements or states of rest in the αἰσθητήρια.' This is confirmed in *On Memory* 2, where Aristotle speaks at length of the 'movements' which play a role in the process of calling something to mind. But in 2,453a14 he declares that this process, too, is 'corporeal' – σωματικὸν πάθος.

It is very clear here that Aristotle wants to deny any movement to the soul, but considers the soul to be directly connected with the αἰσθητήρια, through which the movements / stimuli of the perceived objects pass. The soul is the receptacle of the λόγοι of the perceived objects' movements and of the forms without matter of these perceived objects. But it is not a body itself, and so it can never itself be in motion or be set in motion.

In 408b30–2 he sums up his findings:

Ἵτι μὲν οὖν οὐχ οἷόν τε κινεῖσθαι τὴν ψυχὴν, φανερόν ἐκ τούτων. εἰ δ' ὅλως μὴ κινεῖται, δῆλον ὡς οὐδ' ὑφ' ἑαυτῆς ('It is then obvious from these considerations that the soul cannot be moved; and, if it cannot be moved at all, it is obviously not moved by itself').¹⁸

17) Aristotle says of 'learning' in *Sens.* 1,437a11–9 that it particularly depends on hearing (the teacher's words). In *Gener. anim.* 5,2,781a26 ff. he explains in detail how the sensitive's soul's αἰσθητήριον of hearing is involved here (and this αἰσθητήριον consists of air cf. 781a23–4; *Sens.* 2,438b20; *Anim.* 2,8,420a4–7), and how the innate πνεῦμα is the entity which makes speech possible by causing vibrations in the windpipe and the vocal chords.

18) In *Mot. anim.* 6,700b4–6 Aristotle confirms these views formulated in *On the Soul*.

This is such a plain conclusion of a tightly constructed argument against the views of his predecessors, including Plato, that we will have to assume that Aristotle could not have spoken and, in fact, did not speak anywhere about perception as a movement of the soul. If anything of the soul is said to be moved by sensory stimuli, it is always the αἰσθητήριον or the instrumental body of the soul. Just as Aristotle argued at length in *On the Soul* 1,1,403a3–27 that affections are not movements of the soul but of ‘that which possesses soul’ and which is located ‘within’ (1,4,408b25), so he makes it clear in 1,4 that all perception is only possible through ‘the body of the soul’.

We should therefore not read into the text of *On Sleep* 1,454a8 that perception is a movement of the soul, but that perception is a movement through the body of the soul.¹⁹

But this should lead us to take a different view of *Physics* 7,2,244b11–2 as well. We read there:

ἡ γὰρ αἴσθησις ἢ κατ’ ἐνέργειαν κίνησις ἐστὶ διὰ σώματος, πασχούσης τι τῆς αἰσθήσεως (‘Actual perception is a motion through a body in the course of which the sense is afflicted in a certain way’).²⁰

This cannot refer to ‘the body’ in the sense of ‘the visible body’, because in *Physics* 7,3,247a5 Aristotle means exactly the same when he uses the words: ‘an alteration of the sensitive part (of the soul)’.²¹

19) So the preposition *διά* has the meaning ‘through’ in a local sense, as in *Anim.* 2,11,423a10–1, where intermediary bodies and αἰσθητήρια are also mentioned as the entities ‘through which the movements (of the sensory stimuli) take place’. See also 423a15–6 and *Sens.* 1,436b6: ἡ δ’ αἴσθησις ὅτι διὰ σώματος γίνεται τῆ ψυχῆ, δῆλον, where Beare and Hett translate: “through the medium of the body”, and Gohlke (1947): “durch den Leib der Seele zuströmt”. But the translation ‘through the medium of a body’ would have been more correct, certainly in view of the discussion in *Sens.* 2 on ‘the body’ of the αἰσθητήρια.

20) R. P. Hardie and R. K. Gaye, in: Barnes (ed.) (1984) vol. 1, 411 have the translation given above but with the words “through the body”. H. Carteron (1956) vol. 2, 79: “Car la sensation en acte est un mouvement qui a pour siège l’organisme et, en même temps, une certaine affection du sens.”

21) ἀλλοιουμένου τοῦ αἰσθητικοῦ μέρους. Ἀλλοιοῦται δ’ ὑπὸ τῶν αἰσθητῶν.

*1.3 Perception is not an Activity of the Soul in Itself,
nor of the Body (of the Soul) in Itself*

We should note that Aristotle gave his definition of ‘perception’ in an argument in which he postulated that sensory activity is not something proper either to the soul or to the body (of the soul) – 454a7.²² He added: ‘an activity is the activity of something potentially capable of it.’ He then continues with the passage we are investigating: ἡ δὲ λεγομένη αἴσθησις ὡς ἐνέργεια κίνησις τις διὰ τοῦ σώματος τῆς ψυχῆς ἐστὶ.

His meaning is therefore that perception is the realization of something that can be set in sensory motion.²³ But a movement is always the realization of a body’s potentiality. However, sensory movement can never be the movement of just any body. It must be an ensouled body.²⁴

But does not ‘the movement’ mentioned in *On Sleep* 1 remain vague if perception is only said to be ‘a kind of movement through the body of the soul’? Should not Aristotle specify what this movement is a movement of? In response, Aristotle could refer to *Anim.* 2,7,419a13 quoted above and remark that this movement ‘through the body of the soul’ is, of course, also the movement of that body of the soul as αἰσθητήριον.

By way of explanation, I note another passage from the *Parva Naturalia*. In *On Sense* 2,438b3 Aristotle says: ἀλλ’ εἴτε φῶς εἴτ’ ἀήρ ἐστὶ τὸ μεταξὺ τοῦ ὀρωμένου καὶ τοῦ ὄμματος, ἡ διὰ τούτου κίνησις ἐστὶν ἡ ποιοῦσα τὸ ὄραν (‘but whether light or air is the medium between the visible object and the eye, the motion through this medium is what produces vision’ – transl. Hett [1936] 225–7).²⁵

It is quite clear there that the movement derives from the perceived object, owing to whose effect the soul arrives at an act of

22) Thus taking up the theme of *Anim.* 1,1,403a3–27 and *Sens.* 1,436a6–11.

23) Cf. *Somn.* 1,454b12: αἰσθητικὸν δὲ τὸ δυνατὸν αἰσθάνεσθαι κατ’ ἐνέργειαν. And this movement of the αἰσθητήριον was due to a movement in the intermediary entity.

24) The Greek could also have read: διὰ τοῦ τῆς ψυχῆς σώματος (cf. 1,1,402a3) or διὰ τοῦ σώματος τοῦ τῆς ψυχῆς. But a construction as proposed here also occurs in Aristotle. Cf. *Anim.* 1,1,403a3: τὰ πάθη τῆς ψυχῆς.

25) Cf. Mugnier (1953) 26: “le mouvement passant par cet intermédiaire”; Beare, in: Ross (ed.) (1931) vol. 3: “caused by a process through this medium” is less clear, but the same is probably meant.

visual perception, and the movement passes through all the air between the object and the eye in order to reach it. The eye is the opening via which the movement continues in the soul's internal αἰσθητήριον for visual perception. The movement must also pass entirely through the αἰσθητήριον in order to finally reach the soul in the centre, as indicated in 438b5–11. It is this αἰσθητήριον which Aristotle refers to in *On Sleep* 1,454a8–10 as τοῦ σώματος τῆς ψυχῆς ('the body of the soul').

2. *Perception and the Instrumental Body of the Soul in Aristotle's De Sensu 2 and How the Four Elements are related to It*

2.1 *The Problem of the Subject Matter of De Sensu 2*

The foregoing makes it clear that Aristotle in *On Sleep* 1 describes perception as a movement of 'the body of the soul', i. e. of an αἰσθητήριον of the soul. In this connection Aristotle, *On Sense* 2 is also relevant to our inquiry, for it contains passages which are interpreted in such a way by the modern literature that Aristotle seems to attribute powers of perception to parts of the visible body. But the same chapter makes repeatedly clear that Aristotle adheres to the core notion of his theory of perception, viz. that (the soul as) the subject of all sensory perceptions is situated in the centre of the living being, near the heart.²⁶ And he is discussing there what kind of physical body is the constituent of which αἰσθητήριον of the soul.

First, I will note two passages which give rise to problems. This starts straightaway in 2,437a18–20 with the announcement of the subject. The section deals with the αἰσθητήρια in which the various powers of perception occur, and with 'the body':

Περὶ μὲν οὖν τῆς δυνάμεως ἣν ἔχει τῶν αἰσθήσεων ἐκάστη, πρότερον εἴρηται. τοῦ δὲ σώματος ἐν οἷς ἐγγίγνεσθαι πέφυκεν αἰσθητηρίους, ἐνίοι μὲν ζητοῦσι κατὰ τὰ στοιχεῖα τῶν σωμάτων.²⁷

26) See note 3 above.

27) For the expression τὰ στοιχεῖα τῶν σωμάτων cf. *Metaph.* Δ 3,1014a32. In the term στοιχεῖα Aristotle always recognized its metaphorical origin, i. e. from φωνῆς στοιχεῖα (cf. *Metaph.* Δ 3,1014a27–8). See also *Gener. anim.* 2,3,736b31: τῶν καλουμένων στοιχείων; *Phys.* 1,4,187a26; *Part. anim.* 2,1,646a13.

This leads all translators, with the exception of Mugnier and G. Romeyer-Dherbey, to conclude that Aristotle is referring to ‘the sensory organs of the body’. Beare, in: Ross (ed.) (1931) vol. 3, opens chapter 2 with the sentences:

Of the distinctive potency of each of the faculties of sense enough has been said already. But as to the nature of the sense organs, or parts of the body in which each of the senses is naturally implanted, inquirers now usually take as their guide the fundamental elements of bodies.²⁸

However, we need to connect this programmatic opening sentence with the final sentence of the chapter (439a4–5). Aristotle there talks about ‘the parts with powers of perception’ and also about ‘the body’:

καὶ περὶ μὲν τῶν αἰσθητικῶν τοῦ σώματος μορίων ἔστω τοῦτον τὸν τρόπον διωρισμένα.

Beare, in: Ross (ed.) (1931) vol. 3, has there:

This then is the way in which the characteristics of the bodily organs of sense must be determined.²⁹

28) Apparently, the second Greek sentence is taken to be equivalent to: τὰ δὲ αἰσθητήρια τοῦ σώματος ἐν οἷς ἐγγίγνεσθαι πέφυκεν τῶν αἰσθήσεων ἕκαστη. See also Hett (1936) 219: “As for the parts of the body in which, as their organs, the several senses are naturally engendered”; Gohlke (1947) 25: “In was für körperlichen Sinneswerkzeugen sie zustande kommen, das sucht man heute mit Hilfe der Urkörper zu erklären”; Tricot (1951) 5: “Quant aux organes sensoriels, parties du corps où résident naturellement les sens, ...”; Ross (1955) 186: “As regards the organs of the body in which they are found ...”; Lanza and Vegetti (1971) 1082–3: “La ricerca poi delle parti sensorie del corpo nelle quali avviene la percezione”; Barnes (ed.) (1984) vol. 1, 694: “But as to the nature of the sensory organs, or parts of the body in which each of the senses is naturally implanted, some inquire into them with reference to the elements of bodies”; Johansen (1997) 40; Dönt (1997) 49: “Was die körperlichen Organe betrifft, an denen die Sinne natürlicherweise auftreten ...”; Carbone (2002) 71: “Riguardo invece alle (parti) sensibili del corpo li cercano facendo riferimento agli elementi dei corpi.” The translation by Mugnier (1953) 23 is strikingly different: “Pour savoir quel est le corps qui intervient dans chacun des organes des sens, on cherche maintenant parmi les éléments des corps.” Likewise Romeyer-Dherbey (1991) 442: “Pour savoir quel est le corps qui se trouve naturellement dans chacun des organes des sens, ils cherchent maintenant parmi les éléments des corps.” However, their translations do not fit the construction of the sentence. They seem to take as subject of ἐγγίγνεσθαι πέφυκεν τὰ αἰσθητήρια, instead of τῶν αἰσθήσεων ἕκαστη.

29) See also Hett (1936) 229: “So much by way of description of the parts of the body which have perceptive faculties”; Gohlke (1947) 30: “Diese Bestimmungen über die Sinneswerkzeuge des Körpers mögen genügen”; Tricot (1951) 12: “les par-

But in the intermediate section the primary focus of Aristotle's attention is not on the composition of eye or ear and nose or tongue. And it would also be very strange if he had related non-homogeneous bodily parts like eyes or ears to natural elementary bodies, which are structurally homogeneous. In this chapter Aristotle does talk about αἰσθητήρια, but these are not identical with the bodily parts of eye, ear, nose and tongue.

We start by recalling that in *Parts of Animals* 2,1 Aristotle introduces his important distinction between homogeneous and heterogeneous parts of living beings. The heterogeneous parts are instruments for activities (ἔργα) and operations (πράξεις) – 646b12. For this reason, they can also be called ὄργανικὰ μέρη ('instrumental parts') – 646b26. As examples Aristotle lists: eye, nose, face, finger, hand, and arm (646b13–4). But they do not include αἰσθητήρια. 'Instruments of perception' are always homogeneous (647a5).³⁰ So if we follow the scheme of *Parts of Animals* 2,1, the eye is not an αἰσθητήριον. Αἰσθητήρια are homogeneous substances which correspond to the various objects of perception,

ties sensibles corporelles"; Mugnier (1953) 27: "Et que telles soient les considérations relatives aux parties sensibles du corps"; Lanza and Vegetti (1971) 1088: "Siano dunque così definite le parti del corpo preposte alla sensibilità"; Dönt (1997) 54: "So weit unsere Bestimmungen bezüglich der Teile des Körpers, die der Wahrnehmung fähig sind"; Carbone (2002) 79: "Riguardo alle parti sensibili del corpo, dunque, sia data definizione in questo modo".

30) According to Aristotle, the soul itself is not a body, but it is 'not without σῶμα' (*Anim.* 2,2,414a19–20; cf. 1,1,403a5–7). The soul's faculty of touch is also a function which the soul cannot perform 'without body'. An αἰσθητήριον is an instrument for perceiving material objects, and as such it is itself necessarily material, too. Inasmuch as Aristotle also assigns a role to the flesh and the tongue in the senses of touch and taste, but assigns to these parts of the body an intermediate role, Aristotle's words in 422b22 about 'the primary instrument' of the perception of touch, which is 'something else within', must refer to a material instrument of the (immaterial) soul. Cf. also 2,7,419a13, where the intermediary diaphanous air is contrasted with the αἰσθητήριον of seeing. In 423b30 he talks about 'τὸ αἰσθητήριον in which the sense of touch, as it is called, primarily resides'. Cf. 424a24. For τὸ πρῶτον αἰσθητικόν, cf. *Somn.* 1,454a23. But Aristotle uses also the expression τὸ ἔσχατον αἰσθητήριον – *Anim.* 3,2,426b15. See also 2,455a33: τὸ κύριον τῶν ἄλλων πάντων αἰσθητήριον; 455b10: τὸ πρῶτον ᾧ αἰσθάνεται πάντων; 456a21: ἐν τῷ πρώτῳ αἰσθητηρίῳ. Aristotle's definition of sleep in *Somn.* 3,458a28 is illuminating: it is said to be 'a paralysis of the first αἰσθητήριον to prevent it from functioning'. Clearly, there αἰσθητήριον does not stand for an eye or an ear, but for the soul's 'instrumental body for perception'.

which are homogeneous themselves, too. For these are air and water, in which movements occur which are registered by the sensitive soul (647a6–9). This allows us to formulate more clearly what an αἰσθητήριον actually is in Aristotle's view. It is the homogeneous matter which corresponds to one particular category of sensible objects, from the heart as far as the boundary of the visible body of the living creature.³¹ As regards hearing, this is the air present 'within' (Anim. 2,8,420a5), from the eardrum as far as the heart (as the seat of the soul). And as regards the eye, it is the diaphanous substance present 'inside' (Sens. 2,438b10), from the pupil of the eye (which consists of diaphanous water) as far as the heart (as the seat of the soul).³²

We will now first have to understand the beginning and the final conclusion of On Sense 2 properly, before we can follow the train of thought in the intermediate argument.

2.2 Alternative Explanation of the First and the Final Sentences of De Sensu 2

The explanation of On Sense 2 has also been misleading because scholars have always adopted the hylomorphic view of Aristotle's psychology. But Aristotle's primary concern in this second chapter is very different from what has been thought so far. He is actually discussing which natural, elementary body is basic to which kind of sense-perception.

I start with the conclusion in 439a4–5. What is meant by the words: καὶ περὶ μὲν τῶν αἰσθητικῶν τοῦ σώματος μορίων ἔστω τοῦτον τὸν τρόπον διωρισμένα? Aristotle is speaking here about 'the parts which possess powers of perception' and about 'the

31) Only the sense of touch itself forms an exception to this, as Aristotle explains in Anim. 2,11.

32) Thus Aristotle can talk of τὰ ὄμματα ὀρώοντα in Somn. 1,454a28. And thus the tongue can be presented as the last (or the first) part of the αἰσθητήριον of taste – Hist. anim. 4,8,533a24: τὸ τῶν χυμῶν αἰσθητήριον, τὴν γλῶτταν and a26; cf. Anim. 2,11,423a19: Εἰ μὲν οὖν καὶ ἡ ἄλλη σὰρξ ἠσθάνετο τοῦ χυμοῦ – and the (eardrums in the) ears of the αἰσθητήριον of hearing (Hist. anim. 4,8,533a34.b14).

body'. Every modern translator, here including Mugnier, has translated this as 'the parts of the body which possess powers of perception'. But this translation raises two serious problems.

(1) First: Aristotle cannot say that parts of the visible body possess powers of perception, for he believes that the soul possesses powers of perception and (the sensitive) part of the soul, too; and he never says that parts of the visible body possess powers of perception (although this has been argued by modern scholars in relation to some Aristotelian texts³³).

(2) Second: the point he is making in the entire chapter prior to his conclusion is not about 'parts of the visible body'. He is discussing the question which elementary body belongs to which 'part with power of perception'. This is made very clear in 438b20, where Aristotle says: *ἀέρος δὲ τὸ τῶν ψόφων αἰσθητικόν* ('that what perceives sound consists of air').³⁴ And he says that smell consists of fire, and *τὸ δ' ἄπτικόν γῆς* ('the touching [part] of earth'). He does this in a passage in which he presents the scheme which he would give as *εἰ δεῖ ... προσάπτειν ἕκαστον τῶν αἰσθητηρίων ἐνὶ τῶν στοιχείων* ('if we must ... connect each of the *αἰσθητήρια* with one of the elements'). Aristotle is thus engaged in an attempt to provide an alternative to the view of earlier thinkers, of whom he said in the beginning (437a20–1) that they tried to connect each of the five senses with one of the four elements.

Once this has been properly understood, we cannot but conclude that Aristotle in his final sentence is not talking about 'the body' of a human being or animal, but about 'the body of each of the instruments of sense'. We must therefore read the

33) For example by Ross (1955) 192, commenting on Sens. 2,438b8–10. Ross there argues that the power of sight is in the interior of the eye. In this he is mistaken, as is proved by Gener. anim. 5,2,781a20–2: *οἱ γὰρ πόροι τῶν αἰσθητηρίων πάντων, ὡς περ εἴρηται ἐν τοῖς περὶ αἰσθήσεως, τείνουσι πρὸς τὴν καρδίαν* ('For the passages of all the instruments of sense-perception, as is stated in the treatise *On Sensation*, run to the heart'; cf. M. Liatsi, 2000, 122) and by Part. anim. 2,10,656a27–8. We should at least note that Aristotle distinguishes between *τὸ μέσον τοῦ ὀφθαλμοῦ* – 2,437a32 – and *τὸ ἐντὸς τοῦ ὀφθαλμοῦ* – 2,438b11.

34) Ross (1955) 193 wrongly comments on this: "The ear (i. e. its interior) must be composed of air"; cf. Tricot (1951) 11: "la partie de l'oreille capable de percevoir les sons". But it is not the ear that Aristotle has in mind. Cf. Gener. anim. 5,2,781a23–4: *ὁ μὲν οὖν τῆς ἀκοῆς, ἐπεὶ ἐστὶ τὸ αἰσθητήριον ἀέρος κτλ.* ('Now the passage of the hearing, since the instrument of hearing consists of air ...').

final sentence in a radically different way from what has been customary so far.³⁵ Specifically, we should read it as follows:

This then is the way in which the (elementary, natural) body of the parts with power of sense-perception must be determined.

These ‘parts with power of sense-perception’ of which Aristotle speaks are therefore the αἰσθητήρια, which are constantly brought up in chapter 2. But these are not parts of the (animal or human) visible body. ‘Instruments of sense-perception’ must necessarily have something to do with the sensitive soul. And they are therefore parts of the sensitive soul. According to Aristotle, this soul is located in or near the heart (439a1).

But how can something of the sensitive soul which consists of earth be located near the heart? It is possible because the sensitive soul is inextricably connected with its instrumental body. This instrumental body also consists of earth,³⁶ and is consequently able to carry out tactile perceptions with regard to physical objects.

If we now return to the programmatic sentence of 437a19–20, it is striking that this sentence is about the αἰσθητήρια and ‘the body’, and it is immediately added that some inquirers explain this by means of ‘the elements of the bodies’. This must mean that there, too, ‘the body’ refers to ‘the (natural, elementary) body’ that must be considered connected with each of the αἰσθητήρια. So we should translate On Sense 2,437a18–20 as:

Of the distinctive potency of each of the faculties of sense enough has been said already. But as to the nature of the body of the instruments of sense (αἰσθητήρια) in which (each of the senses) is naturally implanted, inquirers now usually take as their guide the fundamental elements of bodies.³⁷

35) In that case it is no longer necessary to speak with Ross (1955) 193 about Sens. 2,438b16–439a4 as “this confused and difficult passage”, of which he also says: “The whole passage is not to be taken very seriously. It does not express A.’s mature view about the sense-organs.” Lloyd (1978) 222 did also not express Aristotle’s point correctly in his summary: “The problem is ... how the five senses are to be correlated with the four simple bodies.”

36) Cf. Anim. 2,11,423a12–7. On the topic of the sense of touch cf. Bos (2010).

37) Only T. Maudlin (1986) 59 seems to have had an intuition of this meaning, as appears from his translation: “Concerning the bodies in which, as sense-organs, [the senses] come to be, the modern seek them among the elements of bodies.”

‘The body’ in question must be the body of which the αἰσθητήρια consist.³⁸ The construction of the Greek sentence should thus be understood as: τοῦ δὲ σώματος τῶν αἰσθητηρίων ἐν οἷς ἐγγίγνεσθαι πέφυκεν (sc. τῶν αἰσθήσεων ἐκάστη), ἔνιοι μὲν ζητοῦσι κατὰ τὰ στοιχεῖα τῶν σωμάτων. The only strange thing here is the genitive τοῦ δὲ σώματος. But in view of the fact that this must evidently be the import of the opening sentence, which is then entirely parallel with the final sentence, we must either conclude that Aristotle finished the sentence differently from his original plan,³⁹ or that misinterpretation of the chapter led to an original τὸ δὲ σῶμα being wrongly changed into a genitive. In that case it becomes clear, why the original sentence put the emphasis on ‘the body’. The Greek of the sentence as it is currently understood should have read: τὰ δὲ αἰσθητήρια τοῦ σώματος κτλ.

This explanation is clearly supported by *Parts of Animals* 2,1,647a2–14. Aristotle states there in 647a12–4, as in our text: τῶν δ’ αἰσθητηρίων ἕκαστον πρὸς ἕκαστον ἐπιζευγνύουσι τῶν στοιχείων, τὸ μὲν ἀέρα φάσκοντες εἶναι τὸ δὲ πῦρ (‘the natural philosophers pair each of the αἰσθητήρια with one of the elementary bodies . . .’). He does this in the passage cited above, in which he introduces a distinction between ‘the instrumental parts’ and the αἰσθητήρια, which both occur in living creatures. The ὀργανικὰ μέρη (‘instrumental parts’, like hands and feet, but also eyes and ears) are ‘anhomioimerous’, i. e. they are not divisible into parts of the same kind. But perception occurs only in ‘homioimerous’ substances (647a5 f.).⁴⁰ In effect, Aristotle is saying there that an ‘instrument of sense-perception’ (αἰσθητήριον) is not a ‘sense organ’.⁴¹

38) In *Gener. anim.* 5,1,779b21–6, where Aristotle refers back to his expositions in *Sens.* 2 and *Anim.* 3,1,425a3–4 (τῶν δὲ ἀπλῶν ἐκ δύο τούτων αἰσθητήρια μόνον ἐστίν, ἐξ ἀέρος καὶ ὕδατος), it is also clear that he is talking about the natural body of which the αἰσθητήριον (779b25) consists.

39) Note that in this sentence Hett and Mugnier read νῦν, with the oldest manuscript, but Ross ἔνιοι. Perhaps we should add συζυγίαν, in conjunction with τοῦ σώματος on the basis of *Part. anim.* 2,1,647a13. Cf. *Sens.* 1,436a13; *Top.* 2,7,113a12. Prof. B. Manuwald has kindly mentioned to me (Περὶ) δὲ τοῦ . . . as a possible reading (referring to *Anim.* 3,3–4,429a8–10).

40) ἢ δ’ αἰσθησις ἐγγίγνεται πᾶσιν ἐν τοῖς ὁμοιομερέσι.

41) This is actually a strong reason for rejecting the traditional interpretation of σῶμα ὀργανικόν in *Anim.* 2,1,412a27 and b4–6 as ‘body equipped with organs’. For the σῶμα ὀργανικόν of the soul must at least include the capacity for percep-

His argument in 646b6 is: each of the senses has a certain kind of object, and each αἰσθητήριον is receptive to one of such objects of perception. (For these objects of perception are movements of air or diaphanous substances like air and water.) Therefore, these αἰσθητήρια themselves must be just as simple (as air and water). For these αἰσθητήρια must be of the same kind as that which they perceive. Hence, natural philosophers never tried to relate a hand or a face to earth, or water, or air, but they did do this for the αἰσθητήρια (647a9–14). So Aristotle here is emphatically not talking about the αἰσθητήρια ‘of the body’, but about ‘the body of the αἰσθητήρια’.

We can add that in the same chapter Aristotle remarks that in the process of generating a living being the homoiomerous parts are present before the anhomoiomerous ones (Part. anim. 2,1,646a24–b10). This must lead to the conclusion (which we do not explicitly find in Aristotle himself) that the αἰσθητήρια of the soul’s perceptive powers are present before the eyes and ears of the embryo. This is also the consequence of Aristotle’s thesis that not only the soul is inextricably connected with its instrumental body, but also ‘the parts’ (of the soul – Anim. 2,1,412b17–413a5). And the soul with its parts is already present in semen (albeit potentially) – Gener. anim. 2,1,735a4–22.⁴² This is all the more reason to assume that when in On the Soul 2,1,412a11–2; a15; a20; a28; b5 Aristotle talks about the ‘natural body’ of soul, he means there: a homogeneous body. And likewise in 2,4,415b18.

Actually, the subject chosen by Aristotle only provides material for a brief chapter. But nevertheless he pays a great deal of attention to the question whether the basic element of sight is fire, as Empedocles and Plato claimed, or something else (437a22–b16). Aristotle begins this question in a22 with the remark: ‘They all make vision (ὄψις) consist of fire.’⁴³ In doing so, Aristotle lumps

tion. But for Aristotle ‘a body equipped with organical parts’ (ὄργανικὰ μέρη) would be a body with feet and hands, and eyes and ears, but not equipped with instruments for perception.

42) Cf. Bos (2009).

43) Cf. Beare, in: Ross (1931): “But they hold the organ of sight to consist of fire”; Hett (1936) 219: “They all make vision consist of fire”; Gohlke (1947) 25: “Alle ordnen das Gesicht dem Feuer zu”; Tricot (1951) 5: “tous attribuent à la vue la nature du feu”; Mugnier (1953) 23: “Tout le monde rapporte la vue au feu”; Ross

many thinkers together. But he is not primarily concerned here with the constitution of the eye, but with the physical substance which makes sight (ὄψις)⁴⁴ possible.

In *On the Soul* 2,7 he had spoken at length about sight and argued that light makes the seeing of colour possible, because light spreads in everything that is ‘diaphanous’. In the world around us this is air. But water is diaphanous, too. So how can light stimuli penetrate to the sensitive soul? This access is provided by the eye, more specifically the pupil of the eye. Aristotle argues in detail that the pupil cannot consist of air, but that it can consist of water. This leads him to claim in 438b19 that the perceptive part (of the soul!) behind or ‘inside’ the eye must consist of water. Hence his proposition in 438b5 f.: καὶ εὐλόγως τὸ ἐντός ἐστὶν ὕδατος (‘And it is natural that what is within should consist of water’).

His remark about the blindness which can occur when a sharp blow to the temple damages the ‘tubes’ (πόροι) of the eye (438b14) underlines that ‘power of vision’ is ‘inside’ and is connected with the eye via these ‘tubes’.⁴⁵

Along the same lines, Aristotle says that ‘the part which perceives sounds’ consists of air, and that perception of smell consists of fire (438b20–1) – in that case, he uses both the term for perception (ὄσφρησις) and the term for the perceptive part (of the soul) (ὄσφραντικόν, 438b22). When he goes on to say in 438b26 that the αἰσθητήριον of smell is located near the brain, he does not mean that the nose is part of the brain (let alone that the nose consists of

(1955) 186: “They all make the organ of sight consist of fire”; Lanza and Vegetti (1971) 1083: “Tutti ritengono la vista propria del fuoco”; Dönt (1957) 49: “Alle lassen das Sehorgan aus Feuer bestehen”. It is clear that some translators are led by the Greek text and try to render ὄψις. But they cheat to a certain extent by introducing phrases like “ordnen zu” or “rapporter à”. Others wrongly make ὄψις into “the organ of sight”. In 437b22 Aristotle formulates the same idea, also with ὄψις.

44) Ross (1955) 187 translates ὄψιν in 437b13 and b26 as “the eye” and (the tacit ὄψιν) in 437b5 as “the substance of the eye”. Likewise Johansen (1997) 47 n. 37.

45) Cf. Johansen (1997) 91. This author suggests on p. 92 that “πνεῦμα is the content of all the πόροι that extend from the sense-organs and that it is in virtue of containing πνεῦμα that the πόροι are able to mediate sense-qualities to the heart”. But he refrains from a further analysis, since “the subject of πνεῦμα is a highly complex one”. D. K. W. Modrak (1987) 73–5 still rejected the idea of πνεῦμα being the vehicle for the transmission of sensory impulses. Cf. *Part. anim.* 2,10,656b16; *Hist. anim.* 4,8,533a12–5; *Gener. anim.* 2,6,743b35–7; 5,2,781a20–33.

air⁴⁶), but that the relatively cool location near the brain is suitable for effecting the perception of smells, which arise from a kind of dry evaporation (438b24), which is naturally also passed on to the centre of perception by ‘tubes’.

Entirely in keeping with *On the Soul* 2,11, Aristotle finally notes in 438b30 that ‘the part that perceives touch’ (of the soul’s instrumental body) consists of earth, and that ‘the part that perceives taste’ (of the soul’s instrumental body) is a specific variant of this.

References

- Barnes, J. (ed.), *The Complete Works of Aristotle. The Revised Oxford Translation*, 2 vols (Princeton 1984).
- Barnes, J., Review of S. Everson (1997), *CR* 49 (1999) 120–2.
- Bos, A. P., *The Soul and its Instrumental Body. A Reinterpretation of Aristotle’s Philosophy of Living Nature* (Leiden 2003).
- Bos, A. P., ‘The Soul and Soul-‘Parts’ in *Semen* (GA 2,1,735a4–22), *Mnemosyne* 62 (2009) 378–400.
- Bos, A. P., ‘The Soul’s Instrument for Touching in Aristotle, *On the Soul* II 11, 422b34–3a21, *AGPh* 92 (2010) 89–102.
- Bos, A. P. / R. Ferwerda, *Aristotle, On the Life-Bearing Spirit (De spiritu). A Discussion with Plato and his Predecessors on Pneuma as the Instrumental Body of the Soul. Introduction, translation, and commentary* (Leiden 2008).
- Bronstein, D., Review of A. P. Bos (2003), *Ancient Philosophy* 26 (2006) 422–7.
- Canarsa, M., *Una Lacuna Platonica. Il Problema della Relazione Anima-Corpo nella Prima Accademia Antica*, in: A. Fermani / M. Migliori (eds), *Attività e Virtù. Anima e Corpo in Aristotele* (Milano 2009) 43–82.
- Carbone, A. L., *Aristotele, L’Anima e il Corpo. Parva Naturalia. Introduzione, trad. e note* (Milano 2003).
- Carteron, H., *Aristote, Physique. Texte établi et traduit* (Paris vol.1 ³1961; vol.2 ²1956).
- Dillon, J., ‘Come fa l’Anima a dirigere il Corpo? Tracce di una disputa sulla relazione corpo-anima nell’Antica Accademia’, in: M. Migliori / L. M. Napolitano Valditara / A. Fermani (eds), *Interiorità e Anima. La ‘Psychè’ in Platone* (Milano 2007) 51–7.
- Dönt, E., *Aristoteles, Kleine naturwissenschaftliche Schriften, übersetzt und herausgegeben* (Stuttgart 1997).
- Drossaart Lulofs, H. J., *Aristotelis De Somno et Vigilia liber adiectis Veteribus Translationibus et Theodori Metochitae Commentario* (Leiden 1943).

46) Nevertheless, Ross (1955) 193 claims: “The ear (i. e. its interior) must be composed of air (b20). No reason for this is given.” Johansen (1997) 42 tries to wriggle out of the problem caused by the misinterpretation by suggesting: “we should probably understand him to mean something like this: the sense-organ of touch is ‘earthy’ rather than simply made of earth etc.”

- Everson, S., *Aristotle on Perception* (Oxford 1997).
- Eijk, P. J. van der, *Aristoteles, Over het Geheugen, de Slaap en de Droom*, vertaald, ingeleid en van aantekeningen voorzien (Groningen 2003).
- Ferwerda, R., *Aristoteles, Over Dieren*, vertaald, ingeleid en van aantekeningen voorzien (Groningen 2000).
- Ferwerda, R., *Aristoteles, Over Voortplanting*, vertaald, ingeleid en van aantekeningen voorzien (Groningen 2005).
- Gallop, D., *Aristotle on Sleep and Dreams* (Warminster ²1996).
- Gerson, L. P., *Aristotle and Other Platonists* (Ithaca 2005).
- Gigon, O., *Aristoteles, Vom Himmel; Von der Seele; Von der Dichtkunst* (München 1983).
- Gill, M. L., *Aristotle on Substance. The Paradox of Unity* (Princeton 1989).
- Gohlke, P., *Aristoteles, Kleine Schriften zur Seelenkunde* (Paderborn 1947).
- Gregoric, P., *Aristotle on the Common Sense* (Oxford 2007).
- Hett, W. S., *Aristotle, On the Soul, Parva naturalia, On Breath*, with an English translation (London 1936).
- Jannone, A. / E. Barbotin, *Aristote, De l'Âme* (Paris 1966).
- Johansen, T. K., *Aristotle on the Sense-Organs* (Cambridge 1997).
- Kahn, C. H., *Sensation and consciousness in Aristotle's psychology*, *AGPh* 48 (1966) 43–81; repr. in: Barnes, J. / Schofield, M. / Sorabji, R. (eds), *Articles on Aristotle* (London 1979) vol. 4, 1–31.
- King, R., *Review of A. P. Bos (2003)*, *CR* 57 (2007) 322–3.
- Lanza, D. / M. Vegetti, *Aristotele, Opere biologiche* (Torino 1971).
- Liatsi, M., *Aristoteles, De Generatione Animalium. Buch V. Einleitung und Kommentar* (Trier 2000).
- Lloyd, G. E. R., *The Empirical Basis of the Physiology of the Parva Naturalia*, in: G. E. R. Lloyd / G. E. L. Owen, *Aristotle on the Mind and the Senses* (Cambridge 1978) 215–39.
- Lloyd, G. E. R., *Aristotelian Explorations* (Cambridge 1996).
- Manuwald, B., *Das Buch H der aristotelischen «Physik». Eine Untersuchung zur Einheit und Echtheit* (Meisenheim am Glan 1971).
- Maudlin, T., *De Anima 3,1: is any Sense missing?*, *Phronesis* 31 (1986) 51–67.
- Migliori, M., *L'Anima in Aristotele. Una concezione polivalente e al contempo aporetica*, in: Fermani, A. / M. Migliori (eds), *Attività e Virtù. Anima e Corpo in Aristotele* (Milano 2009) 227–60.
- Modrak, D. K. W., *Aristotle. The Power of Perception* (Chicago 1987).
- Mugnier, R., *Aristote, Petits traités d'histoire naturelle. Texte établi et traduit* (Paris 1953).
- Quarantotto, D., *Causa Finale, Sostanza, Essenza in Aristotele* (Napoli 2005).
- Reale, G. / A. P. Bos, *Il Trattato Sul Cosmo per Alessandro attribuito ad Aristotele* (Milano 1995).
- Rijk, L. M. de, *Aristotle. Semantics and Ontology*, 2 vols (Leiden 2002).
- Romeyer-Dherbey, G., *Voir et toucher. Le problème de la prééminence d'un sens chez Aristote*, *RMM* (1991) 437–54.
- Ross, W. D. (ed.), *The Works of Aristotle* (Oxford 1931) vol. 3.
- Ross, Sir David, *Aristotle, Parva naturalia* (Oxford 1955).
- Schomakers, B., *Aristoteles, De Ziel* (Leende 2000).
- Solmsen, F., *Greek Philosophy and the Discovery of the Nerves*, *MH* 18 (1961) 150–97; repr. in: id., *Kleine Schriften* (Hildesheim 1968) Bd. 1, 536–82.

Tricot, J., Aristote, Parva Naturalia suivi du traité Ps. Aristotélicien De Spiritu, traduction nouvelle et notes (Paris 1951).

Wendland, P. (ed.), Michaelis Ephesii In Arist. Parva Naturalia (CAG XXII 1) (Berlin 1903).

Amsterdam

Abraham P. Bos