# ARISTOTLE ON THE COGNITION OF FUTURE IN NON-HUMAN ANIMALS: SENSE-PERCEPTION, *PHANTASÌA* AND IMAGINATIVE PROJECTION

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**Abstract.** Since Aristotle states more than one time that non-human animals have expectations about future, and since he denies that non-human animals have propositional attitudes (i.e., *lògos*) and maintains that their only cognitive powers are the sensory-perceptual ones, he is bound to admit that sensory-perceptual powers are, by themselves, a sufficient condition for expectations about future. I will here provide a tentative reconstruction of Aristotle's theory on expectation about future in non-human animals, as it is deducible from his scanty remarks in the *Parva naturalia*, *De anima* and *De motu animalium*.

**Keywords:** expectation; Aristotle; future; time; animals.

## 1. A LOOK AT ARISTOTLE'S CONCEPT OF TIME

Aristotle's natural philosophy focuses on the concepts of change (μεταβολή) and movement (κίνησις). At the beginning of the second book of *Physics*, we are told that natural beings[1] are different from all other beings because they have in themselves an internal principle of motion and rest[2]. Natural beings are beings whose relation to motion

[1] "Natural beings" are animals (ζῷα) and their parts, plants (φυτά) and their parts, and the so called "simple bodies" (τὰ ἁπλᾶ τῶν σομάτων: earth, fire, air, water). All quotations and mentions from the *Physics* will refer to William D. Ross, *ΑΡΙΣΤΟΤΕΛΟΥΣ ΦΥΣΙΚΗ ΑΚΡΟΑΣΙΣ. Aristotle's Physics*, Oxford, Clarendon Press, [1936] 1998. Abbreviations of titles of Greek works will conform to that of Henry G. Liddell, Robert Scott, Henry S. Jones, *A Greek-English Lexicon* (with a revised supplement), Oxford, Clarendon Press, 1996.

[2] "ἕκαστον […] ἐν ἑαυτῷ ἀρχὴν ἔχει κινήσεως καὶ στάσεως, τὰ μὲν κατὰ τόπον, τὰ δὲ κατ' αὔξησιν καὶ φθίσιν, τὰ δὲ κατ' αλλοίωσιν": "each of them has within itself a principle of motion and rest, in respect of place, or of growth and decrease, or by way of alteration" (*Phys.* II 1, 192b13-15). English translations of passages of the *Physics* are from Robert P. Hardie, Russell K. Gaye, *Physics by*

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is constitutive of their very essence: their nature-essence, i.e. their inner principle of being, is a principle of motion, differently articulated in the various kinds of natural beings.

The essentiality of the relation of natural beings to change and motion implies that also their relation to time – perceived time in the case of sentient living beings, organic time in all living creatures, physical time in all natural beings – is constitutive of their natures.

The relation posited by Aristotle between time (χρόνος) and change-movement is controversial[3]; there is anyway a certain consensus on the fact that Aristotle endows change and (specifically) the species of change which is motion[4] with an ontological and explanatory priority over all other manifestations of nature: it is such priority that drives him to define time as a proper attribute of motion[5], i.e. as its 'number' (219b2). This implies that natural beings are beings fully merged in temporality: they are beings whose essence is defined also through some relations to time. Before beginning this enquire about Aristotle's theory on non-human animals' cognition of future, it will therefore be necessary to say something about his theory on time: I will expose an idea of my own, which will be very far from the status of a fully blooded discussion of this very debated theme, and which will be meant simply as a working hypothesis for the main theme of this paper.

In *Phys.* IV 11, 219b15-23, Aristotle draws, among the domains of time, motion and magnitude, the following analogy: "*magnitude : motion : time = point : what-is-subject-to-locomotion : now*"[6]. The relations among magnitude, motion, time are (as the relations among point, moved body, now) relations of ontological dependence (ontological consecution, 'ἀκολουθεῖν'). The same consecution holds among the *properties of* magnitude, motion, time; *in primis* among their respective possessions of the properties

*Aristotle*, http://classics.mit.edu//Aristotle/physics.html (The Internet Classics Archive by Daniel C. Stevenson, Web Atomics), sometimes with some adjustments of my own.

[3] The critical literature about Aristotle's notion of 'time' is enormous, and it would be pleonastic just even try to give a minimal list of it; just to mention a single text for each of the last three decades, see Tony Roark, *Aristotle on Time. A Study on the* Phisics, Cambridge, Cambridge University Press, 2011; Ursula Coope, *Time for Aristotle.* Phisics *IV.10-14*, Oxford, Clarendon Press, 2005; Alessandro Giordani, *Tempo e struttura dell'essere. Il concetto di tempo in Aristotele e i suoi fondamenti ontologici*, Milano, Vita e Pensiero, 1995.

[4] According to the classification we find in *Physics* III 1, the species of motion and change correspond to the categories of being in which motion and change can occur (201a8-9): the change which is the generation or corruption of a substance is generation or corruption *tout court*; change which consists in the generation or corruption of a not-substantial property is movement, further specified, according to the categories, in growth-and-diminishing (movement in the category of *quantum*), alteration (movement in the category of *quale*) locomotion (movement in the category of *where*) (a10-15).

[5] Cf. *Phys.* IV 12, 220b24-26; VIII 1, 251b28.

[6] 15-17, 22-23, "ἀκολουθεῖ […] τῷ μὲν μεγέθει ἡ κίνησις, ταύτῃ δ' ὁ χρόνος […]· καὶ ὁμοίως δὴ τῇ στιγμῇ τὸ φερόμενον […]. τῷ δὲ φερομένῳ ἀκολουθεῖ τὸ νῦν, ὥσπερ ὁ χρόνος τῇ κινήσει": "for motion, as was said, goes with magnitude, and time, as we maintain, with motion. Similarly, then, the body which is carried along corresponds to the point […] But the 'now' corresponds to the body that is carried along, as time corresponds to the motion".

of quantity, continuity and divisibility: "διὰ μὲν γὰρ τὸ τὸ μέγεθος εἶναι τοιοῦτον ἡ κίνησις ταῦτα πέπονθεν, διὰ δὲ τὴν κίνησιν ὁ χρόνος"[7]. Among these properties there is also their mutual hierarchy according to the possess of the feature of being structured in a 'before-and-after' pattern: "ἐπεὶ δ' ἐν τῷ μεγέθει ἔστι τὸ πρότερον καὶ ὕστερον, ἀνάγκη καὶ ἐν κινήσει εἶναι τὸ πρότερον καὶ ὕστερον, ἀνάλογον τοῖς ἐκεῖ. ἀλλὰ μὴν καὶ ἐν χρόνῳ ἔστιν τὸ πρότερον καὶ ὕστερον διὰ τὸ ἀκολουθεῖν ἀεὶ θατέρῳ θάτερον αὐτῶν"[8]. Since the properties of time depend on the properties of motion, it is reasonable to expect that time will result to be something that depends on or belongs to motion[9].

Aristotle will accordingly seal the enquiry with the famous definition of time as "number of motion in respect of 'before' and 'after'": "ἀριθμὸς κινήσεως κατὰ τὸ πρότερον καὶ ὕστερον" (219b2); "number" must be here meant not as "that by which we count" (7, "ᾧ ἀριθμοῦμεν"), but as "what can be counted" ("τὸ ἀριθμητὸν", 7) or as "what is counted" ("τὸ ἀριθμούμενον", 6-9). Time is that aspect of movement on account of which movement can be counted and can be measured according to the 'before-and-after'[10]: time is the countability of motion according to the 'before-and-after'; if I assign to motion a countable order arranged in a before-and-after pattern (a sequence), I am spelling out the temporality of motion. Since motion is continuous, the number of motion with which time is identifiable will be a number in the way in which the extreme points of a segment are: such extremes articulate a continuum, by individuating that segment in the straight line on which it lays[11]. The phases of motion follow to each other in a consecution, of which we can try to sort out the unit of measure, which is, in its turn, a phase of the motion it measures – a particular motion in itself; *how many times* the motion which is the unit of measure will occur together with and within the motion it has to measure, such is the number of this measurable motion – its own time[12].

[7] *Phys.* IV 12, 220b26-27: "The movement has these attributes because the distance is of this nature, and the time has them because of the movement". Cf. 11, 219a12-14, too.

[8] *Phys.* IV 11, 219a16-19: "Since then 'before' and 'after' hold in magnitude, they must hold also in movement, these corresponding to those. But also in time the distinction of 'before' and 'after' must hold, for time and movement and magnitude always correspond with each other".

[9] *Phys.* IV 11, 219a8-9: "ἤτοι κίνησις ἢ τῆς κινήσεώς τί ἐστιν ὁ χρόνος. ἐπεὶ οὖν οὐ κίνησις, ἀνάγκη τῆς κινήσεώς τι εἶναι αὐτόν" ("Hence time is either movement or something that belongs to movement. Since then it is not movement, it must be the other").

[10] The 'before-and-after of motion follows from the 'before-and-after' of magnitude. Motion, *qua* numerable according to *its own* before-and-after, is time: time is the feature of motion by which motion can be measured according to its own before-and-after. In my construal, "κατὰ τὸ πρότερον καὶ ὕστερον" (219b2) will refer to the 'before-and-after' of motion, not to 'before-and-after' of time. If the syntagm in 219b2 would refer to the before-and-after of time, i.e. to a feature of time, the definition of time would contain a reference to a property of time, which (quite the opposite) should be deducible from the definition. *Since* time is number of motion with reference to the before-and-after of motion (219a22), also time will *therefore* have a 'before-and-after' property.

[11] *Phys.* IV 11, 220a14-16: "ὁ χρόνος ἀριθμὸς […] ὡς τὰ ἔσχατα τῆς γραμμῆς" ("time [is] number […] in the way in which the extremes of the line are". Transl. of my own).

[12] *Phys.* IV 14, 223b33-224a1: "in what is measured there is nothing above and beyond the unit of measure: except that what is measured is many times its own measure" ("παρὰ γὰρ τὸ μέτρον οὐδὲν ἄλλο παρεμφαίνεται τῷ μετρουμένῳ, ἀλλ' ἢ πλείω μέτρα τὸ ὅλον", trans. of my own). What is measured is the

This conception of time finds its concrete emblem in the tool that was used to measure it: the sundial. In a sundial, various position of the tip of the stick correspond to the various notches on the graduated scale; and various connections among the positions of the tip of the shadow and the notches will signal the various consecutive positions of the earthly place with respect to the Sun (before-and-after of motion); each position of the earthly place with respect to the Sun is an element in the countable succession of the various positions of that earthly place, in its whole trajectory, with respect to the Sun: it is an element of the circle (before-and-after of magnitude) which is run across by that place in its daily circle around the axis of the Earth; the various positions of the tip of the shadow on the graduated scale will thus refer to the various elements of the countable series of the positions of that place with respect to the Sun[13]. The fact that many positions of each earthly place with respect to the Sun are numerable is the temporality of the Earth-Sun system. If we individuate each single position within the entirety of the succession of all the positions, we will have individuated the temporality of the Earth-Sun system. By individuating the parts of this sequence, we individuate the phases of the day or of the year; by individuating how many times the movement of the tip of the shadow of the stick of the sundial repeats its cycle in a cycle of the Moon-phases (28¼), or in a waking-sleep cycle of my own body (1/1), we individuate the temporality of these processes.

In the light of this working-hypothesis about the model of 'time' Aristotle presumably assumed, let us try to see what he has to say about the animals' cognitive access to time.

## 2. WHICH COGNITIVE ACCESS TO PAST AND FUTURE DO NON-HUMAN ANIMALS HAVE?

For the sake of what we will have to say, it is important to know that the Greek terms that name the three parts of time (past, present, future) are noun-participles: "τὸ παρὸν" means both "the present" and "what is present, the present thing or state of affairs", "τὸ γενόμενον" means both "the past" and "what has passed, the past thing or state of affairs", "τὸ μέλλον" means both "the future" and "what has to come, the future thing or state of affairs".

To the three parts of time (and to the things, events, states of affairs that can be referred to them) three forms of cognition correspond:

> οὔτε γὰρ τὸ μέλλον ἐνδέχεται μνημονεύειν, ἀλλ' ἔστι δοξαστὸν καὶ ἐλπιστόν […],
> οὔτε τοῦ παρόντος, ἀλλ' αἴσθησις· ταύτῃ γὰρ οὔτε τὸ μέλλον οὔτε τὸ γενόμενον

repetition for *tot* times of its measure: "γνωρίζομεν […] τῷ ἑνὶ ἵππῳ τὸν τῶν ἵππων ἀριθμὸν" ("we know […] the number of the horses by one horse as the unit", 12, 220b21-22). The fact that motion will be made of the repetition for *tot* times of the motion which serves as a unit is its temporality: that *tot* is exactly its time.

[13] On sundials and the principles of their way of measuring time, cf. Renzo Morchio, *Scienza e poesia delle meridiane*, Genova, ECIG, [1988] 2003; our point is treated at p. 13.

> γνωρίζομεν, ἀλλὰ τὸ παρὸν μόνον. ἡ δὲ μνήμη τοῦ γενομένου. […] τοῦ μὲν παρόντος αἴσθησις, τοῦ δὲ μέλλοντος ἐλπίς, τοῦ δὲ γενομένου μνήμη (*Mem.* 1, 449b10-11, 13-15, 27-28).[14]

> Now to remember the future is not possible, but this is an object of opinion or expectation […]; nor is there memory of the present, but only sense-perception. For by the latter we know not the future, nor the past, but the present only. But memory relates to the past. […] for the present is object only of perception, and the future, of expectation, but the object of memory is the past.[15]

While for past and present Aristotle mentions just one cognitive power for each (sense-perception, αἴσθησις, and memory, μνήμη), which are both cognitive powers that pertain to the sensory part of the soul (cfr. *Mem.* 1, 450a13-14), and which are both carefully distinguished by him from the power to formulate opinions about present or past state-of-affairs[16] (a move which makes clear that Aristotle is here interested just in the cognitive access we have to these two parts of time through the sensory functions), as far as cognition of future is concerned, two terms are introduced: "opinion" (δόξα) and "expectation" (ἐλπίς), without that we are told whether the "καὶ" ("and") which connects them has an epexegetic value (in which case, expectation should be meant as a form of opinion, and would therefore pertain to the intellectual part of the soul), or, rather, points to the relevance, here, of two different functions. As a consequence, we cannot tell whether, when, in 449b26-28, Aristotle mentions expectation as the only kind of cognition focused on future, this happens because expectation has absorbed opinion (and we are thus faced with a notion of 'expectation' that can include forms of opinion), or, rather, because Aristotle has decided to discard opinion in the present discourse, because the discourse he is here starting will treat only the sensory functions – in which case, we will have to mean that expectation pertains to the sensory part of the soul[17].

[14] All quotes and mentions of *Parva naturalia* will refer to William D. Ross, *Aristotle. Parva naturalia*, a revised text with introduction and commentary, Oxford, Clarendon Press, 1955.

[15] Translation by John I. Beare, *On Memory and Reminiscence by Aristotle* (http://classics.mit.edu/Aristotle/memory.html, The Internet Classics Archive by Daniel C. Stevenson, Web Atomics).

[16] In *De an.* III 3, 428b2 ff. sense-perception about a present situation is explicitly distinguished from the opinion which we can form about the same present state-of-affairs on the basis of that instance of sense-perception. As far as memory is concerned, it is 'emancipated' from opinion by the same act by which it is classified as pertaining to the sensory part of the soul. In *Mem.* 1, 451a8-11, Aristotle also mentions a clinical case, Antipheron from Oreus, who was unable to make a distinction between his own opinions about his own past experiences and the genuine memories he could or could not have about his past experiences: it is thus clear that, in Aristotle's opinion, an opinion about the past is not a memory. All quotations and mentions of the *De anima* will refer to William D. Ross, *Aristotle. De anima*, edited with introduction and commentary, Oxford, Clarendon Press, 1961.

[17] No help comes from the exam of the lemmas "ἐλπίς" and "ἐλπίζειν" in Hermann Bonitz, *Index Aristotelicus*, Graz, Akademische Druck- und Verlagsanstalt, 1870 (reprint: Darmstadt, Wissenschaftliche Buchgesellshaft, 1960), where – apart from this passage – only passages where the two terms have very generic meanings are listed: the very meanings that were commonly used for them in the everyday language of Aristotle's time, in which (as it happened for the terms referring to memory) they could refer also to acts of reasoning and opinion.

By luck, an exam of the occurrences of "φόβος" ("fear") and derived terms reveals that Aristotle endowed with fear at least some of the animals he thought to be not endowed with reason and intellect, and fear certainly belongs to expectation[18]. Some forms of cognition about future, i.e. of expectation, seem to be explicitly credited by Aristotle to non-human animals: this kind of expectation will not need any usage of reason and intellect, and should therefore be comprised (as memory is) among the powers that belong to the sensory part of the soul. At this point, we can raise the problem: why does the *corpus Aristotelicum* lack a theory about expectation, parallel to that about memory? And why does Aristotle, who is so careful in demarcating memory from opinion about the past, shows such a few interest in distinguishing, in the cognition about future, the sensory aspect from the opinative one?

This strikes as a difficult point, since Aristotle devotes no less than two texts to the explanation of animal action, an explanation for which the distinction between human and non-human animals, and the fact that the aim of the action is in the future, are clearly relevant: *De anima* III 9-1 and *De motu animalium*.

## 3. NON-HUMAN ANIMALS' COGNITION ABOUT THE AIMS OF THEIR OWN ACTIONS

Aristotle provides its own explanatory model about intentional animal action in *De anima* III 9-11 and, in a more refined way, in the *De motu animalium*. Intentional action is, by definition, an action directed toward an end, and Aristotle analyzes it as such. Aim-directed intentional action presupposes a cognitive apprehension of the aim, which is furnished by the so called '*phantasìa*' (φαντασία), a term which is usually left untranslated (and which is presumed to correspond to the modern concept of 'sensory representation' or 'imagination'[19]):

[18] Cf. *HA.* VI 11, 566a25: some sharks lay their eggs in safe places because they fear ("διὰ τὸ φοβεῖσθαι") for their offspring; VI 29, 578b17: the female deer lays the offspring near the roads for fear ("διὰ τὸν ... φόβον") of predators; VIII 1, 588a22: ascription of "fears and audacities" ("φόβοι καὶ θάρρη"), i.e. confident or fearfully attitudes toward future, to some non-human species in general (Pierre Louis, *Aristote. Histoire des animaux*, Paris, Les Belles Lettres, 1964-1969).

[19] Enormous, since 1978, is the literature on this topic, among which I choose to mention just some titles: Stephen Cashdollar, "Aristotle's Account of Incidental Perception", *Phronesis*, vol. 18, 1973, pp. 156-175; Victor Caston, "Why Aristotle Needs Imagination", *Phronesis*, vol. 41, 1996, pp. 20-55; Dorothea Frede, "The Cognitive Role of *Phantasia* in Aristotle", in Martha C. Nussbaum, Amélie Oksenberg Rorty (eds.), *Essays on Aristotle's* De Anima, Oxford, Clarendon Press, 1992, pp. 279-296; Jean Frère, "Fonction représentative et représentation. φαντασία et φάντασμα selon Aristote", in Gilbert Romeyer Dherbey, Cristina Viano (eds.), *Corps et âme : sur le* De anima *d'Aristote*, Paris Vrin,1996, pp. 331-348; Bernard Hubert, "Veille, sommeil et rêve chez Aristote", *Revue de philosophie ancienne*, vol 17, 1, 1999, pp. 75-111; Jean-Louis Labarrière, "Imagination humaine et imagination animale chez Aristote", *Phronesis* 29, 1984, pp. 17-49; "Aristote, l'imagination et le phénomène: l'interpretation de Martha Craven Nussbaum", *Phronesis* vol. 37, 1992, pp. 22-45; René Lefebvre, "La phantasia chez Aristote: subliminalité, indistinction et pathologie de la perception", *Les etudes philosophiques*, 62, 1997, pp. 41-58; Kimon Lycos, Aristotle and

> ὅλως μὲν οὖν, ὥσπερ εἴρηται, ᾗ ὀρεκτικὸν τὸ ζῷον, ταύτῃ αὐτοῦ κινητικόν· ὀρεκτικὸν δὲ οὐκ ἄνευ φαντασίας· φαντασία δὲ πᾶσα ἢ λογιστικὴ ἢ αἰσθητική. ταύτης μὲν οὖν καὶ τὰ ἄλλα ζῷα μετέχει. (*De An.* III 10, 433b27-30)
>
> Thus, then, in general terms, as already stated, the animal is capable of moving itself just in so far as it is appetitive: and it cannot be appetitive without imagination. Now imagination may be rational or it may be imagination of sense. Of the latter the other animals also have a share.
>
> τὰ μὲν γὰρ ὀργανικὰ μέρη παρασκευάζει ἐπιτεδείως τὰ πάθη, ἡ δ' ὄρεξις τὰ πάθη, τὴν δ' ὄρεξιν ἡ φαντασία· αὕτη δὲ γίνεται ἢ διὰ νοήσεως ἢ δι' αἰσθήσεως. (*MA* 8, 702a17-19)[20]
>
> For the [bodily] affections suitably prepare [to movement] the organic part, desire [prepares] the affections, and *phantasia* [prepares] the desire; and *phantasìa* comes about either through thought or through sense-perception.[21]

According to this theory, the explanatory factors in animal motion are two: *phantasìa* and *òrexis* ("desire") The noun "ὄρεξις", from "ὀρέγεσθαι", "to stretch the arms in order to grasp", points to an intention of the agent toward features in the external environments. The animals' motion from one place to another obeys to a form of teleology that is not reducible to the 'blind' (non-cognitively directed) teleology of nutritive faculty, since it is directed by an *òrexis*; *òrexis* is always directed toward an *orektón* ("ὀρεκτόν", object of desire: in the case of fear, the way to avoid the risk), which moves the animal in virtue of being grasped through *phantasìa*[22].

Plato on "Appearing", *Mind*, vol. 73, 1964, pp. 496-514; Deborah K.W. Modrak, "Φαντασία Reconsidered", *Archiv für Geschichte der Philosophie*, 68, 1986, pp. 47-69; Maria Michela Sassi, "Aristotele: linee di una teoria della mente e dell'immaginazione", in Rita Bruschi (ed.), *Gli irragiungibili confini. Percorsi della psiche nella Grecia classica*, Pisa, ETS, 2007, pp. 195-216 ; "Aristotele fenomenologo della memoria", in Maria Michela Sassi (ed.), *Tracce nella mente. Teorie della memoria da Platone ai moderni*, Edizioni della Normale, Pisa, 2007, pp. 25-46; Malcom Schofield, "Aristotle on the Imagination", in Geoffrey E.R. Lloyd, Michael Owen (eds.), *Aristotle on the mind and the senses*, Cambridge University Press, Cambridge, [1978] 1979, pp. 99-140; Annick Stevens, "Unité et verité de la phantasia chez Aristote", *Philosophie antique. Problèmes, Renaissances, Usages. Questions aristotèliciennes*, vol. 6, 2006, pp. 183-199; Kenneth Turnbull, "Aristotle on Imagination: De anima iii 3", *Ancient Philosophy* , vol. 14, 1994, pp. 319-334; Michael V. Wedin, *Mind and Imagination in Aristotle*, New Haven & London, Yale University Press, 1988.

[20] Till 2018 the only good critical edition of the *De motu animalium* was Martha C. Nussbaum, *Aristotle's* De motu Animalium. Text with Translation, Commentary and Interpretary Essays, Princeton, Princeton University Press, [1978] 1985, which I am here quoting. In 2018 it has been joined by Oliver Primavesi and Klaus Corcilius, *Aristoteles. Über die Bewegung von Lebewesen. De motu animalium*, Griechisch-Deutsch, Hamburg, Felix Meiner Verlag, 2018, an outstanding work of scholarship, which brings an enormous amount of new information about the text and its tradition. In our passage the new edition prefers the reading "ἐπιτεδείως ἔχειν": "the affections prepare the organic part so as to be suitably disposed to movement". The concept expressed by the two versions of the text seems to be exactly the same.

[21] Translations of passages of *De motu animalium* are from Martha C. Nussbaum, *Aristotle's* cit., sometimes with some adjustments of my own.

[22] On this topic it is still of paramount importance Martha C. Nussbaum, *Aristotle's* De motu cit., *per totum* (and specifically the essay "The Role of Phantasia in Aristotle's Explanation of Action", pp. 221-269); but see also: Monique Canto-Sperber, "Le rôle de l'imagination dans la philosophie aristotélicienne

This model, which sketches the psychical functions at stake, receives its anchoring to physiology in *MA* 8, 701b34-702a1:

> ἐξ ἀνάγκης δ' ἀκολουθεῖ τῇ νοήσει καὶ τῇ φαντασίᾳ αὐτῶν θερμότης καὶ ψύξις. τὸ μὲν γὰρ λυπηρὸν φευκτόν, τό δ' ἡδὺ διωκτόν, ἔστι δὲ τὰ λυπερὰ καὶ ἡδέα πάντα σχεδὸν μετὰ ψύξεώς τινος καὶ θερμότητος.[23]
>
> Of necessity the thought and phantasìa of these [*int.* of what has to be pursued of avoided: cf. b34] are accompanied by healing and chilling. For the painful is avoided and the pleasant pursued, and all painful and pleasant affections[24] are nearly always accompanied by chilling and heating.

The causal consecution Aristotle tries to figure out seems to be this: representation of what should be pursued is, by definition, representation of pleasant things; representation of pleasant things produces pleasure; pleasure produces heating in the body; heating in the body sets the limbs in motion. Aristotle will repeat the concept: fear, audacity, sexual arousement and "other bodily affections, painful and pleasant" ("τἆλλα τὰ σωματικὰ λυπηρὰ καὶ ἡδέα", 702a3-4) are accompanied by heating and chilling, in single parts of the body or in the whole body; "memories and anticipations" ("μνῆμαι δὲ καὶ ἐλπίδες", 702a5, trans. mine), "using things of this kind as likenesses" ("οἷον εἰδώλοις χρώμεναι τοῖς τοιούτοις", a5-6) of the remembered and expected thing, items or events, do cause the same affections; heating and chilling

de l'action", in Gilbert Romeyer Dherbey, Cristina Viano (eds.), *Corps et âme : sur le* De anima *d'Aristote*, Paris, Vrin,1996, pp. 441-463; G. Feola, *Orexis and phantasìa in Aristotle's account of animal movement*, in Dimka Gicheva-Gocheva, Ivan Kolev, (eds.), *Предизвикателството Аристотел*. (*The Challenge Aristotle*), Sofia, Sofia University Press "St. Kliment Ohridski", 2017, pp. 559-576 ; Jean-Louis Labarrière, "De la phronesis animale", in Daniel Devereux, Pierre Pellegrin (eds.), *Biologie, logique et métaphysique chez Aristote*, Paris, Editions du Centre National de la Recherche Scientifique, 1990, pp. 405-428; *La condition animale. Études sur Aristote et les stoïciens*, Louvain-la-neuve – Paris - Dudley MA, Peeters, 2005; Pierre-Marie Morel, "Volontaire, involontaire et non-volontaire dans le chapitre 11 du DMA d'Aristote", in André Laks, Marwan Rashed (eds.), *Aristote et le mouvement des animaux. Dix etudes sur le* De motu animalium, Villeneuve d'Ascq Cédex, Presses Universitaires de Septentrion, 2004, pp. 167-183; *De la matière à l'action. Aristote et le problème du vivant*, Paris, Vrin, 2007; "Du *De motu* à la *Génération des animaux*. Une connexion oubliée du corpus aristotélicien", *Anais de filosofia clássica*, vol. 12-24, https://revistas.ufrj.br/index.php/FilosofiaClassica/article/view/25974, accessed November 21, 2021; "La nature ne fait rien en vain. Sur la causalité finale dans la *Locomotion des animaux* d'Aristote", *Philosophie antique Problèmes, Renaissances, Usages*, vol. 16, 2016, pp. 9-30; Giles Pearson, *Aristotle on Desire*, Cambridge, Cambridge University Press, [2012] 2014; Henry S. Richardson, "Desire and the Good in De anima", in Martha C. Nussbaum, Amélie Oksenberg Rorty (eds.), *Essays on Aristotle's* De Anima, Oxford, Clarendon Press, 1992, pp. 381-399; John B. Skemp, "ὄρεξις in *De Anima* III 10", in Geoffrey E.R. Lloyd, Michael Owen (eds.), *Aristotle on the mind and the senses*, Cambridge University Press, Cambridge, [1978] 1979, pp. 181-190; Jennifer Whiting, "Locomotive Soul: the Parts of Soul in Aristotle's Scientific Works", *Oxford Studies in Ancient Philosophy*, vol. 23, 2002, pp. 141-200.

[23] Corcilius and Primavesi, *Aristoteles* cit., prefer here many variants that change the diction, but not the meaning, of the text (elided forms of words instead of the full forms), and transpose into our passage a shorter passage that Nussbaum puts after our passage. But this seems not to change the doctrine expressed by the text.

[24] I depart in this single line from Nussbaum's translation.

produce a chain of other bodily changes, and, at the end of this causal chain, the movement of the limbs occurs, and therefore locomotion: "That is why it is pretty much at the same time that the creature thinks it should move forward and moves, unless something less impedes it" ("διὰ τοῦτο δ' ἅμα ὡς εἰπεῖν νοεῖ ὅτι πορευτέον καὶ πορεύεται, ἂν μὴ τι ἐμποδίζῃ ἕτερον", 8, 702a15-17)[25].

## 4. IS THE COGNITIVE ACCESS OF NON-HUMAN ANIMALS TO THE END OF THEIR ACTIONS A COGNITION ABOUT FUTURE?

In neither of these two passages (702a4-5 and 15-17) tendency is mentioned. But, after some few lines, Aristotle resumes the theory in the already mentioned way:

> For the [bodily] affections suitably prepare [to movement] the organic part, desire [prepares] the affections, and *phantasìa* [prepares] the desire; and *phantasìa* comes about either through thought or through sense-perception. (8, 702a17-19, *loc. cit.*)

In *De anima* III 11 Aristotle notices that also animals that lack distal senses show sensibility to pleasure and pain, and adds that "if [there are] these, then of necessity [there will be] also appetite" ("εἰ δὲ ταῦτα, καὶ ἐπιθυμίαν ἄνάγκη", 434a3)[26].

Now, appetite is the most elementary form of tendency (cf. *MA* 6, 700b22). And speaking about pleasure and pain will automatically imply speaking about appetite, since appetite immediately follows from pleasure and pain. But 'following from' is not 'being identical to': tendency is future-oriented[27]: either to an experience which is not yet present, or else to the continuation of a present experience; pleasure and pain are in the present; the pleasure and pain which we feel in picturing to ourselves something past or something future, too, are pleasure and pain we are feeling *now* about a representation which is *now* present to us, and which refers to something in the past or in the future. The simplest way of construing Aristotle's meaning in 434a3 is then to presume that, if we feel pleasure about a representation of something absent, we feel the desire of the represented thing; if we feel pleasure about something which is present, we feel the desire to continue that experience.

Appetite must thus be construed as the action of representing something in the environment as a source of present or future pleasure. The two cognitive sources of appetite are here identified, accordingly, with sense-perception *vel* representation.

But why, as we saw, Aristotle sets aside this model, which seems at first sight so plausible, and prefers saying that tendency always needs a representation which interposes itself between sense-perception and tendency?

[25] Notwithstanding the great variety of the interpretations of the details of the theory, the literature seems to agree on the very general pertinence of this extremely abstract paradigm.

[26] Here I do not follow Hick's translation: translation of my own.

[27] This is a delicate point: as we will see, the fact that tendency is future-oriented does not automatically imply that it includes or entails a cognitive reference to future as future. Tendency is not yet a form of expectation.

I think that the answer lays in the already mentioned fact that tendency is future-oriented. Sense-perception is always in the present[28]: if the animal has to be able to prospect for something absent, it will need representation, which can construe virtual scenarios[29]. Also animals that lack the ability to represent past and future as distinct from the present through a chronological pattern will anyway have representations: when such an animal encounters something pleasant, gets promptly this resource; but, if there weren't any representation which could prospect for the continuation of the experience from one moment to another, the animal could not be able to articulate any effective action through time.

If this reconstruction is sound, also animals without perception of time, and unable to distinguish present from past and future, would be anyway able to prospect for possible actions, in virtue of the power of *phantasìa*. Now, since Aristotle clearly distinguishes *phantasìa* from memory, which is the conjunction to *phantasìa* of an explicit reference to the past (a reference which – we should infer – *phantasìa* by itself lacks)[30], and since Aristotle seems clearly prepared to treat expectation as correspondent to memory (cf. "μνῆμαι δὲ καὶ ἐλπίδες", 8, 702a5), the obvious conclusion is that if *phantasìa* about an object or experience is not accompanied by the cognition that the experience of that object is again possible in the future, it will not count as expectation. It is not cognition of the future *as* future.

## 5. *PHANTASÌA* ABOUT FUTURE AS FUTURE IN NON-HUMAN ANIMALS: EXPECTATION

Tendency is *per se* future-oriented, not in the sense that the animal, in order to be engaged in tendency, needs a structured perception of time and can prospect for a future experience as future; this is a power that Aristotle credits very few animal species with; more simply, the sensory system represents an already familiar experience, without reference to the past, but anyway registering its absence in the actual perceptual landscape, and pursuing (or avoiding) it *again and again*, by activating behaviours that are similar (since they are guided by the *phantasìai* that preserve the traces of past experiences) to the behaviours that already led to such an

[28] Sense-perception is always caused by an object which is 'out there' and acts *now* on our sense-organs: cfr. *APo.* II 31, 87b29-30.

[29] Cf. G. Pearson, *Aristotle on Desire*, Cambridge, Cambridge University Press, [2012] 2014: "to have a desire requires envisaging a prospect, or at least a counterfactual scenario, and […] perception either cannot do this itself […] or, if it can, can only do so in so far as it itself incorporates predicates supplied by phantasia" (p. 60).

[30] Cfr. *Mem.* 1, 449b22-23. On Aristotle's theory about perception of time, cfr. Daniela Patrizia Taormina, "Perception du temps et mémoire chez Aristote. De memoria et reminiscentia*, 1*, *Philosophie antique. Problèmes, Renaissances, Usages. Questions aristotéliciennes*, 2, 2002, pp. 33-61; Gerard Verbeke, "La perception du temps chez Aristote", in AA.VV., *Aristotelica. Mélanges offerts à Marcel de Corte*, Bruxelles-Liège, Ousia-Presses Universitaires, 1985, pp. 351-377.

experience. In the simplest case, in which only desire for the perpetuation of a present pleasant experience is at stake, such a pursuit can well be just the perpetuation of the present behaviour. As we saw, time is a *ratio* among different processes of change: Aristotle denies perception of time to most animals because he has such an articulated concept of time; but sheer perception of changes in the environment, that leads to the construal of expectations about environmental regularities, does not require a perception of time in this sense.

That Aristotle acknowledges perception of time *qua* time also to some of the non-human animals, is anyway clear in passages as this: dolphins

> συνακολουθοῦσιν εἰς βυθὸν διὰ τὸ πεινῆν, ὅταν δ' αὐτοῖς μακρὰ γίνηται ἡ ἀναστροφή, κατέχουσι τὸ πνεῦμα ὥσπερ ἀναλογισάμενοι, καὶ συστρέψαντες ἑαυτοὺς φέρονται ὥσπερ τόξευμα, τῇ ταχυτῆτι τὸ μῆκος διελθεῖν βουλόμενοι πρὸς τὴν ἀναπνοήν (*HA.* IX 48, 631a25-30[31]).
>
> [Dolphins], driven by hunger, follow [their preys] till the bottom of the sea; and, when their route upwards is long, take their breath as if having calculated, and, after having concentrated their energies, speed themselves as arrows wishing to make at great speed the trip that leads to the new breath. (trans. of my own)

Aristotle seems here prepared to credit to dolphins the ability to make a comparison between the route already done downwards and the equal route to be done upwards, and between the sum of these two routes and the rhythm by which they waste the air in their lungs. The passage would suffice alone, even without my paraphrase, to show that here a compared perception of time (and of times) is described[32].

It seems to me that the crediting to dolphins of the ability to calculate the temporality of the movement that brings them from the surface to the bottom of the sea and then to surface again – from the air-breath to the point in which the route must be inverted, and then to the new breath – is an unequivocal instance of the attribution to non-human animals of a representation (φαντασία) of a future event (the next air-breath) *as* future: i.e. not simply as a non-actual situation, toward which the habit drives the animal again, but as a situation that will become real in a structured and *foreseen* succession of phases of movement. The representation of the next air-breath is accompanied by a perceptual prospect about the time that will be necessary in order to make this situation real – a prospect that parallels what, in memory, is the perception of the time past.

[31] Pierre Louis, *Aristote. Histoire des animaux*, Paris, Les Belles Lettres, 1964-1969. To avoid long explanations on the problem of the order of the books of the *Historia animalium*, and of their authenticity, by "book IX" I will here simply mean the book that Louis prints as the ninth in his edition. Louis sees this book as an authentic work by Aristotle (pp. xxix-xxxi),.

[32] Let us notice that the comparison, done by the dolphin, between the length (μῆκος) of the downward route and that of the upward route, between these two and their sum, and between these three and the waste of air in the lungs, is a good example of perception of a *ratio* among many changes-movements – the *ratio* which (as we saw) is the temporality of the complete action.

## 6. THE ECCENTRICITY OF NON-HUMAN ANIMAL EXPECTATION IN ARISTOTLE'S PARADIGM OF NON-HUMAN COGNITIVE POWERS

The difference between expectation and sheer *phantasìa* or representation seems thus analogous to that between memory and sheer *phantasìa*: *phantasìa* presents an intentional object that, *per se*, lacks any temporal reference; such an intentional object presents itself as undiscernible from a real object which is here now[33]; in order to uncover its greater or lesser, full or totally lacking match with the environment, the animal will need upper levels of cognition, that Aristotle identifies, in different cases, with perception of time (*Mem.* 1, 449b22-23), propositional opinion (only in human beings: cfr. *De anima* III 3, 428b3-9) or in the so called "ruling and controlling power" ("τὸ κύριον καὶ τὸ ἐπικρῖνον", *Insomn.* 3, 461b25)[34]; specifically, the act of realizing that the *phàntasma*[35] that here presents itself to me does not correspond to anything real that, in the external environment, is now acting on my sensory system (and is rather the internal trace of a past experience), is the prerequisite in order that this *phàntasma* becomes the vector of an act of memory[36] – which will be thus composed by the *phantasìa* of that *phàntasma* and by the meta-perception of the past origin of the *phàntasma* itself. In the same way – it seems to understand – the crediting of expectations to some non-human animals is grounded on their power to perceive and even calculate time, and to refer the representation of absent items (which, as all representations of absent items, will be composed out of the relics of past sensory acts and actual sense-perceptions of the present[37]) not to present or to past, but to a future moment.

Nevertheless, in the case of expectation not everything can parallel the case of memory. In the case of memory, we can have a representation that is a persistence of

[33] All the instances of sensory delusion, both in wake and in sleep, treated in the *De insomniis* pertain to this rubric: cf. e.g. *Insomn.* 2, 460b11-16.

[34] Which I think should be identified with the synergy of all the sensory powers, out of which the overall sensory-perceptual presentation of the environment emerges: cfr. Giuseppe Feola, "The Unity of sense-power in the De Anima and Parva Naturalia", in Borje Bydén, Filipp Radovic (eds.), *The Parva Naturalia in Greek, Arabic, Latin and Hebrew Aristotelianism : Supplementing the Science of the Soul*, Springer, New York, 2018, pp. 51-63.

[35] I.e. the sensory trace of the past episode of sense-perception that remains into the animal body after the sensory episode – sensory trace whose eventual reactivation identifies with the act of *phantasìa* about a correspondent intentional object: cfr. *Insomn.* 3, 460b28-461b7.

[36] Cf. *Mem.*1, 449b22-23; 450a13, 23-25; 450b17-451a9.

[37] An example of how, according to Aristotle, hallucinations (the most radical case of sensory presentification of the absent) could be caused is outlined in *Insomn.* 3, 460b11-13: διὸ καὶ τοῖς πυρέττουσιν ἐνίοτε φαίνεται ζῷα ἐν τοῖς τοίχοις ἀπὸ μικρᾶς ὁμοιότητος τῶν γραμμῶν συντιθεμένων ("So to men in fever sometimes seems that they see animals on the walls from the slight resemblance of marks in a pattern", trans. mine). Feverish people can be subject to the illusion of seeing "animals" (or "painted pictures": the Greek term can mean both things) on the wall, just because on the wall there are some lines whose shape is similar to the shape of such animals. The lines on the wall are similar, in their geometrical pattern, to an animal; such a perception of geometrical shapes induces, due to similarity with the geometrical pattern of an animal seen in the past, the arousal of the *phantàsmata* that were stored when the animal was seen; and the animal is 'brought to life again' in front of the feverish man.

the originary presentation: a presentation that will be more or less faithful to the originary experience; or, vice versa, the animal can fail in the exercise of memory because the appropriate sensory representation got lost, destroyed in the course of the internal processes of change of the organism and of its sensory system[38]; or because the representation persists but has lost distinction and it does not contain anymore the level of detail that would be necessary in order to demarcate that experience from other experiences; or because the representation is available and fit, but perception of the time-laps is absent, and the representation is taken as the presentation of a present object[39], or vice versa as a presentation of something never really experienced[40]; or – finally – because we have perception that some time has passed, but we fail in setting the origin of the representation in the appropriate point of the past[41]. But, in any case, it will be possible to construe a description of the successful or unsuccessful exercise of memory which will be consistent with the paradigm that Aristotle thinks to be relevant in the description of every act of the sensory powers: the paradigm according to which there must be a causal chain that links the past or present object of perception to the cognitive act we are now exercising about it[42].

It is clear that this cannot happen in the case of expectation: here, the object of cognition has never been real – perhaps it will be real in the future. At most, I can have experienced situations that are similar to the situation I prospect for, and my senses can have been stimulated by perceptual items that are similar to the items I expect; but my object of expectation are not such *past* situations, but – rather – the future situation, which is similar to the past one, and which cannot have exerted any causal action on my sense-power.

[38] Cf. *Mem.* 2, 453b4-7.

[39] As when, in dream, we 'live again' a past experience.

[40] Cf. *Mem.* 1, 451a1.

[41] On the difficulty of appropriately calculate time-lapses, cf. *Mem.* 2, 452b9-22.

[42] About the paradigm of causation that Aristotle takes to be relevant for the account of the causal relation between the sense-object and the exercise of sense-perception, cf. John I. Beare, *Greek Theories of Elementary Cognition From Alcmaeon to Aristotle*, Oxford, Clarendon Press, 1906 (reprint: Thoemmes, Bristol, 1992); Myles F. Burnyeat, "Is an Aristotelian Philosophy of Mind Still Credible?", in Martha C. Nussbaum, Amélie Oksenberg Rorty (eds.), *Essays on Aristotle's* De Anima, Oxford, Clarendon Press, 1992, pp. 15-26; Stephen Everson, *Aristotle on Perception*, Oxford, Clarendon Press, 1997; Giuseppe Feola, "Aristotele sull'intenzionalità elementare : la sensazione dei 'proprî' e la teoria della 'medietà'", *Documenti e studi sulla tradizione filosofica medievale*, 25, 2014, pp. 1-28 ; Christoph Rapp, "Intentionalität und Phantasia bei Aristoteles"; in Dominick Perler (ed.), *Ancient and Medieval Theories of Intentionality*, Leiden-Boston-Köln, Brill, 2001, pp. 63-95; G. Romeyer Dherbey, "La construction de la théorie aristotélicienne du sentir", in Gilbert Romeyer Dherbey, Cristina Viano (eds.), *Corps et âme : sur le* De anima *d'Aristote*, Paris Vrin,1996, pp. 127-148; Allan Silverman, "Color and Color-Perception in Aristotle's *De Anima*", *Ancient Philosophy,*9, 1989, pp. 271-291; John E. Sisko, "Material Alteration and Cognitive Activity in Aristotle's *De Anima*", *Phronesis*, 41, 1996, pp. 138-157; Richard Sorabji, "Intentionality and Physiological Processes: Aristotle's Theory of Sense-Perception, in Martha C. Nussbaum, Amélie Oksenberg Rorty (eds.), *Essays on Aristotle's* De Anima, Oxford, Clarendon Press, 1992, pp. 195-226; Julie K. Ward, "Perception and λόγος in De Anima II 12", *Ancient Philosophy*, 8, 1988, pp. 217-233; Diego Zucca, *L'anima del vivente*, Morcelliana, Milano, 2015.

The same problem arises for the future time that divides my cognitive act which is here and now projected toward future, and the future toward which it is projected: I cannot have any sense-perception of the future time-lapse that divides me from my object of expectation.

Two of the pillars of Aristotle's definition of memory – (1) its afference to the sensory-perceptual part of the soul, on the basis of its *per se* reference to objects and situations to which we have perceptual access, or about which we still have the traces of such an access, and (2) its distinction form sheer *phantasìa* on the basis of the *perception* of the time passed – do not have any parallel in the case of expectation.

Therefore, we should not be surprised in seeing that Aristotle is so reticent about the attribution of expectation of future to non-human animals. Expectation is overtly mentioned in the *De motu animalium*, exactly where we would expect to find it: i.e. where Aristotle treats the topic of intentional animal actions that are projected toward a future which is prospected as future. But, although the *De motu animalium* treats the topic of intentional animal action (and therefore that of the projection of animal mind toward future), it is not the treatise on expectation that would parallel the treatise on memory – and which lacks in the *corpus*. At a very abstract level, the model of non-human mind devised by Aristotle does not allow to admit, among the usages of perceptual power, a *perception* about the future meant as a 'precise event that will become real at some precise point in the time' (which would parallel the usage of memory toward a real past event).

This model allows, instead, a theory about the usage of sensory *presentations* of future, where 'future' is meant as 'something that will happen' (and where 'something' stays for a generic instance of a class of events: e.g., in the case of the dolphin, 'the next breath'), and also a theory about sensory presentation of future time-lapses, which endows some non-human animals with a calculation of future time-lapses, construed as a projection, in the future, of a regularity of cycles of change already experienced in the past.

But the unification of these two theories in the attribution, to non-human animals, of expectation of a particular single event (as single as the remembered event is) in a given single moment of the future, in Aristotle lacks.

Singularity is accessible to sense-perception and representation of present and past; but in the future they can only prospect for types: either types of events (capturing a prey of this or that kind, in this or that way) or, if we come to single events (the next breath of the dolphin), it will be its temporal collocation that will be qualified in a 'serial', and therefore generic, manner.