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Aristotle's Theory of 'Sleep and Dreams' in the light of Modern and Contemporary Experimental Research

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Abstract

Aristotle's naturalistic and rationalistic interpretation of the nature and function of 'sleep' (ὕπνος) and 'dreams' (ἐνὸπνια) is developed out of his concepts of the various parts (μέρη) or faculties/powers (δυνάμεις) of the soul, and especially the functions of cognitive process: (a) sense/sensation (αἴσθησις), (b) imagination (φαντασία), (c) memory (μνήμη), and (d) mind/intellect (νοῦς). Sleep "is a sort of privation (στέρησις) of waking (ἐγρήγορις)", and dreams are not metaphysical phenomena.

The purpose of this paper is to provide a new reading of Aristotle's 'theory of sleep and dreams' through its connection to modern and contemporary research. To be more specific, through this analysis we shall try to present that many of the Stageirite philosopher's observations and ideas on the phenomenon of sleep and dreaming have been verified by current experimental research (e.g. Psychology, Psychophysiology, Neurobiology, Cognitive Science etc.).

Keywords: Aristotle, sleep, dreams, waking, biological and psychological phenomena, experimental research.

Introduction

What is sleep? Why do we sleep? Why do we dream? Who we are when we are asleep? What is the relation between sleep and dreams? Do dreams have meaning? From antiquity until today, humans wanted to know what happens during the process of sleep. They wanted to understand and explain the reason we spend one-third of our lives in this periodic state of rest or inactivity.

Greeks compared to other ancient populations¹ dealt systematically with sleep and dream function.² The Greeks, according to J. Donald Hughes, respected and paid attention to their dreams as they believed that: (a) they carried messages sent from the gods, (b) they predicted the future, (c) they had therapeutic powers, and (d) they were means of communication with the dead.³ But besides all these, they attempted to approach and interpret sleep and dreams in a rational way.

Multiple references and theories of sleep and dreams can be found in the writings of Ancient Greek epic and lyric poets (e.g. Homer,⁴ Hesiod,⁵ Pindar⁶), dramatists (e.g.

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¹ The oldest written analysis of dreams comes from ancient Mesopotamia (see Hall 1997, 47 and Oppenheim 1956, 179-373). The Sumerians (3500-1750 B.C.) were one of the earliest civilizations that arose in the southern area of Mesopotamia. They left behind the first dream-books dating back to 3100 B.C. *The Epic of Gilgamesh* is considered to be one of the oldest surviving epic poems in the world, containing numerous dreams and their interpretations (see Heidel 1963; Tigay 1987; Kovacs 1989).

Furthermore, to the ancient Egyptians dreams were very important. They believed that dreams were related to the supernatural world. They set up *Dream Temples* for incubating dreams. "Incubation is the practice of sleeping in a temple chamber in order to obtain oracular or healing dreams" (Hughes 2000, 10).

² Holowchak 2002, xv says that "the Greeks used several words for 'dream' — ὄναρ (n.), ὄνειρος (m.), ὄνειρον (n.), ὄραμα (n.), χρηματισμός (m.), ἐνύπνιον (n.), and φάντασμα (n.) — and a few terms for 'interpreter of dreams' — ὄνειροπόλος (m.), ὄνειρομάντις (f./m.), and ὄνειροκρίτης (m.). Of the words for 'dream', ὄνειρος, ὄραμα, χρηματισμός, ἐνύπνιον, and φάντασμα took on specific meanings in at least two ancient accounts, those of Artemidorus and Macrobius: the first three terms being indicative of types of prophetic dreams and the final two referring to types of non prophetic dreams...The Latin equivalent to ὄνειρος is *somnium* (n.)...Macrobius also gives *visio* (f.) (= ὄραμα) and *oraculum* (n.) (= χρηματισμός) as particular kinds of prophetic dreams, and *insomnium* (n.) (= ἐνύπνιον) and *visum* (n.) (= φάντασμα) as kinds of nonprophetic dreams".

³ Cf. Hughes 2000, 11.

⁴ The earliest surviving depiction of dream-interpretation in Greek antiquity is in Homer's epics (8th century B.C.). In the *Iliad* and the *Odyssey* dreams appear as divine or *eidolic* (εἰδωλον) figures that come to the sleepers at the head of their bed and convey to them important information about the future. Some indicative readings for the *Iliad* and the *Odyssey* dreams are the following: Messer 1918; Hundt 1935; Rankin 1962, 617-624; Reid 1973, 33-56; Kessels 1978; Lévy 1982, 23-41; Morris 1983, 39-54; Brillante 1990, 31-46; Μαρωνίτης 1993, 3-22; Πόλκας 1999.

⁵ In Greek mythology Hypnos, the son of Nyx (goddess of Night) and Erebus (god of Darkness and Shadow) and twin brother of Thanatos (god of Death), was the god or the personification of Sleep. Hypnos was often pictured as a young man with wings attached to his head or sprouting from his shoulders. Cf. Hesiod, *Theogonia* 211-212 and 761-764.

⁶ Cf. Pindar, *Olympia* 13.61-80; Idem., *Pythia* 4. 158-165, 8. 95-100; Idem., *Thren.* fr. 131b.

Aeschylus, Sophocles, Euripides),⁷ historians (e.g. Herodotus),⁸ physicians (e.g. Hippocrates)⁹ and philosophers.¹⁰

The Greek philosophers gave special attention to sleep and dreams. Dreams became part of philosophic and physiologic (biologic) investigation. Pre-Socratic philosophers,¹¹ such as Heraclitus,¹² Alcmaeon,¹³ Empedocles,¹⁴ Parmenides,¹⁵ Leucippus¹⁶ and Democritus,¹⁷ proposed naturalistic explanations of the cause of sleep and the formation of dreams, detaching them from the supernatural, while Pythagoras supported the divine origin of dreams.¹⁸

In the Platonic dialogues the subject of sleep and dreams occurs quite often.¹⁹ In the most part dreams are regarded by the philosopher as messages received from the gods. However, from *Politeia* (Πολιτεία) onwards both philosophical and scientific interest in the phenomenon of dreaming appears.²⁰ In the cosmological discourse *Timaeus*

⁷ For the nature, function and psycho-analysis of sleep and dreams in Greek tragedy see especially Messer 1918, 56-102 and Devereux 1976.

⁸ In Herodotus (484-425 B.C.), the 'father of history', dreams are divided into: (a) message dreams, and (b) symbolic dreams. Cf. Frisch 1968.

⁹ Hippocrates (460-375 B.C.) used dreams as a diagnostic and prognostic tool and treatment of psychological and somatic illness. In other words he regarded dreams as a 'medical' tool, and as well he accepted even the mantic or prophetic character of dreams. Cf. Hippocrates, *Regimen IV or Dreams* 4 86. 9-19, 4 87. 20-16, 4 88. 1-18. See also Byl 1998, 31-36.

¹⁰ For a bibliography on Ancient Greek views on sleep and dreams see: van Lieshout 1980; Marelli 1979-1980, 122-137; Guidorizzi 1988; Byl 1998; Holowchak 2002; Hughes 2000.

¹¹ We know most of their work through fragments and testimonia given by later philosophers, doxographers, physicians, biographers etc.

¹² Heraclitus of Ephesus (535/545-485 B.C.) was probably one of the first philosophers who proposed a naturalistic explanation of dreams, detaching them from the supernatural. Plutarch, *De Superstitione* 166c5-8 (DK B89): ὁ Ἡράκλειτός φησι, τοῖς ἐγρηγορόσιν ἓνα καὶ κοινὸν κόσμον εἶναι, τῶν δὲ κοιμωμένων ἕκαστον εἰς ἰδίον ἀποστρέφεσθαι. In this fragment it is described the sleep-world (κόσμος) that it is a private (ἴδιος) world, because the sleeping person is private in the one common (ἓνας καὶ κοινός) world.

¹³ See note 52.

¹⁴ Empedocles (495-435 B.C.), the Acragantine philosopher, believed that sleep is caused by a partial cooling of heat in the blood, and fire is separated from the other three elements, namely water, air and earth. Aëtius, *Placita* V 24.2 (D. 435): Ἐμπεδοκλῆς τὸν μὲν ὕπνον καταψύζει τοῦ ἐν τῷ αἵματι θερμοῦ συμμέτρῳ γίνεσθαι τῇ δὲ παντελεῖ θάνατον.

¹⁵ Parmenides of Elea (5th century B.C.), followed Empedocles' view on the sleeping phenomenon, and said that "sleep...is a cooling", or in other words the blood is chilled, when sleep comes upon the body. Tertullian, *De Anima* 45 (A46b): somnum...Empedocles et Parmenides refrigerationem.

¹⁶ Leucippus of Elea, Abdera or Miletus (5th century B.C.), the founder of the atomist theory of matter, asserted that "sleep occurs to the body when the output of thin [atoms] is more than the inflow of psychic heat". Ps-Plutarch, *Epitome* V 25.3 [= Aëtius, V 25.3]: Λεύκιππος οὐ μόνον σώματος γίνεσθαι, ἀλλὰ κρᾶσει τοῦ λεπτομεροῦς πλείονι τῆς ἐκκράσεως τοῦ ψυχικοῦ θερμοῦ, τὸν πλεονασμὸν αἴτιον θανάτου ταῦτα δ' εἶναι πάθη σώματος οὐ ψυχῆς.

¹⁷ Cf. notes 147 and 148.

¹⁸ Cf. note 81.

¹⁹ In the Platonic writings, according to van Lieshout 1980, 103-104, we can find 45 references in which the dream-phenomenon occurs. These references are divided "into 23 passages where the subject 'dream' is mentioned in passing (as simile, in a metaphorical sense or as proverbial expression) and 24...passages where the subject is dealt with as the author's primary or direct matter of interest".

²⁰ Cf. Plato, *Politeia* V 476c-d, IX 571c-572c; 574d-576b.

(Τίμαιος) Plato (427-347 B.C.) gives a physiological account of sleep, since he associates the phenomenon of dreaming to vision.²¹

But “the philosophical/scientific study of sleep in Ancient Greece reached its apex in the writings of Aristotle”.²² Aristotle's (384-322 B.C.) most important philosophical and psychophysical ideas on sleep and dreams are developed in three treatises of the Aristotelian corpus: (a) *De Somno et Vigilia* (Περὶ ὕπνου καὶ ἑγρηγόρσεως), (b) *De Insomniis* (Περὶ ἑνὸπνιων), and (c) *De Divinatione per Somnum* (Περὶ τῆς καθ' ὕπνον Μαντικῆς).²³ These works are very important, because they contain “the only systematic account of dreams and of prophecy in sleep that has been transmitted to us from antiquity”.²⁴

Taking into account the previous view, the current paper has two aims. The first and foremost aim is to explore Aristotle's naturalistic and rationalistic interpretation of the nature and function of 'sleep' (ὕπνος) and 'dreams' (ἐνὸπνια). The second aim is to show that the Stageirite philosopher “raised ideas that feature prominently”²⁵ in modern and contemporary sleep and dream research.

I. Aristotle's Theory of Sleep (Ὑπνος) and Dreams (Ἐνὸπνια)

a. A physiological interpretation of sleep (ὕπνος) and waking (ἐγρηγόρσις)

Aristotle examines the function of sleep and dreams in relation to the biological and psychological phenomena.²⁶ In Chapter 1 of the treatise *De Somno et Vigilia* the philosopher asserts that sleep “is a sort of privation (στέρησις) of waking (ἐγρηγόρσεως)”.²⁷ But what does this phrase mean? Sleep, according to Aristotle, is not

²¹ Plato, *Timaeus* XVI 45d3-46a4: ἀπελθόντος δὲ εἰς νύκτα τοῦ ξυγγενοῦς πυρὸς ἀποτέμνεται πρὸς γὰρ ἀνόμοιον ἔξιόν ἀλλοιοῦται τε αὐτὸ καὶ κατασβέννυται, ξυμφυῆς οὐκέτι τῷ πλησίον ἀέρι γιγνόμενον, ἅτε πῦρ οὐκ ἔχοντι. παύεται τε οὖν ὁρῶν, ἔτι τε ἐπαγωγὸν ὕπνου γίγνεται σωτηρίαν γὰρ ἦν οἱ θεοὶ τῆς ὄψεως ἐμηχανήσαντο, τὴν τῶν βλεφάρων φύσιν, ὅταν ταῦτα ξυμμύσῃ, καθείργνυσι τὴν τοῦ πυρὸς ἐντὸς δύναμιν, ἣ δὲ διαχεῖ τε καὶ ὁμαλύνει τὰς ἐντὸς κινήσεις, ὁμαλυνθεισῶν δὲ ἡσυχία γίγνεται, γενομένης δὲ πολλῆς μὲν ἡσυχίας βραχυρόνειρος ὕπνος ἐμπίπτει, καταλειφθεισῶν δὲ τινῶν κινήσεων μειζόνων, οἷαι καὶ ἐν οἷσις ἂν τόποις λείπωνται, τοιαῦτα καὶ τοσαῦτα παρέσχοντο ἀφομοιωθέντα ἐντὸς ἔξω τε ἐγεργεῖσιν ἀπομνημονεύματα φαντάσματα. Cf. Holowchak 2002, 28.

²² Cf. Mansfield, Goddard, Moldofsky 2003, 61.

²³ For a translation with introduction and commentary of these treatises see: Hammond 1902; Γρατσιάτος 1912; Tricot 1951; Mugnier 1953; Ross 1955; Hett 1975; van der Eijk 1994; Pigeaud 1995; Gallop 1996; Dönt 1997; Morel 2000; Repici 2003; Σωτηράκης, Ευσταθίου 2006.

²⁴ Cf. van der Eijk 2005, 170. Miller 1994, 40, notices that “unlike Aristotle, Plato did not write a sustained essay on dreams, but comments on them, often contradictory, are scattered throughout his works”.

²⁵ Cf. Mansfield, Goddard, Moldofsky 2003, 58.

²⁶ Indicative bibliography on Aristotle's treatment on sleep and dreams: Preus 1968, 175-182; Huby 1975, 151-152; Kent Sprague 1977, 230-241; Wijzenbeek-Wijler 1978; Lowe 1978, 279-291; Wiesner 1978, 241-280; Kent Sprague 1985, 323-325; Gallop 1988, 257-290; Cambiano, Repici 1988, 121-135; Woods 1992, 179-188; Holowchak 1996, 405-423; Pigeaud 1995; Hubert 1999, 75-111; van der Eijk 2005, 169-205; Everson 2007, 502-520.

²⁷ Aristotle, *De Somno* 1.453b26-27: φαίνεται στέρησις τις ὁ ὕπνος τῆς ἐγρηγόρσεως.

contrary to an animal's physical nature. Unlike deafness or blindness, sleep is a natural state of a living organism (human and animal). We could say here that sleep, as it is described in lines 453b25-26, is a natural state of an organism characterized by reduced or suspended physiological functions. David Gallop says that "to view sleep as 'a sort of privation of waking' (b26-27) is to regard it as an absence (in this case only temporary) of a positive condition".²⁸ The positive condition is waking (ἐγρήγοροις).²⁹

The Stageirite philosopher considers sleep (ὕπνος) and waking (ἐγρήγοροις) as affections (πάθη)³⁰ that require both body and soul,³¹ and belong to the 'primary sense-faculty' or 'primary sensitive/perceptive part' (πρῶτον αἰσθητικόν),³² known as 'common sense' (κοινὴ αἴσθησις or *sensus communis*).³³ Its role is to discriminate between the sense or sensible objects/objects of perception (αἰσθητὰ)³⁴ it is receiving from the various sense organs, which it then judges and interprets. Also, it is

²⁸ Gallop 1996, 120.

²⁹ Kent Sprague 1977, 234 asks and tries to answer the following question: "Sleep is a privation of waking, but is waking equally a privation of sleep?...Aristotle's difficulty appears to be the following: in terms of matter, form and privation, sleep, as a privation of waking, should not only be potential with respect to waking, but it should come *from* waking. On inspection, however, it turns out to come, instead, from a state even further from waking than sleep itself, the plant-like state 'analogous to sleep'". van der Eijk 2005, 185, argues that "sleep and waking are not absolute opposites: when one of them is present 'without qualification' (*haplōs*), the other may also be present 'in a certain way' (*pêi*)".

³⁰ Aristotle in *De Anima* i 1.403a3 speaks about "the affections of the soul" (τὰ πάθη τῆς ψυχῆς), that are caused by the functions of sense-perception (αἰσθάνεσθαι), *phantasia* (φαντασία), memory (μνήμη), mind/intellect (νοῦς) and sleep (ὕπνος).

³¹ According to Aristotle, the soul is the form (μορφή or εἶδος) of the body, while the body is the matter (ὕλη) of the soul (hylomorphism). The soul is inseparable from the body. The soul and body are not two separate entities but *one* composite substance. Based on this view sleep and waking are psychological states of one and the same subject. "That subject cannot, in the case of sleep and waking, be either the soul or the body alone" (Gallop 1996, 121).

³² Aristotle, *De Somno* 1.454a22-24: ἄμφορ γὰρ ἐστὶ τὰ πάθη ταῦτα περὶ αἰσθησιν τοῦ πρώτου αἰσθητικοῦ.

³³ Idem., *De Anima* iii 1.425a27-28; *De Memoria* 1.450a10; *De Partibus Animalium* iii 686a31-32. According to Modrak 1989, 68-69, Aristotle calls κοινὴ αἴσθησις "by a variety of names": "In the *De Anima* and the *De Memoria*, Aristotle speaks of a common sense (κοινὴ αἴσθησις); in the *De Somno*, he speaks of a common capacity (κοινὴ δύναμις); in the *De Sensu*, of a nonspecific sense faculty (αἰσθητικὸν πάντων); and in the *De Memoria*, of a primary sense faculty (πρῶτον αἰσθητικόν)".

³⁴ Cf. note 58.

responsible for the functions of imagination/*phantasia* (φαντασία),³⁵ memory (μνήμη),³⁶ sleep (ὕπνος) and dreams (ἐνύπνια).

The primary sense-faculty is located in the heart region, since the heart (καρδία) is connected with all the other senses.³⁷

Aristotle defines sleep (ὕπνος) and waking (ἐγρήγορις) as follows: Sleep is an affection (πάθος) of the sensitive part of the soul (αἰσθητικὸν μῦριον),³⁸ a sort of

³⁵ Imagination/*phantasia* (φαντασία) is described by the Stageirite philosopher as: (a) the type of motion (κίνησις), which is generated by actual perception (αἰσθήσεως τῆς κατ' ἐνέργειαν), (b) the faculty (δύναμις) by which a *phantasma* (φάντασμα) is presented to us, while *phantasma* is the product of imagination and the causal result of the action of 'αἴσθημα' (sensation or sense impression), (c) the necessary condition for thinking (νοεῖν), (d) the faculty which is not sense (αἴσθησις), or opinion (δόξα), or knowledge (ἐπιστήμη), or intellect (νοῦς), and (e) the power of the soul, which is associated with sense-perception (αἰσθάνεσθαι), memory (μνήμη), thinking (νοεῖν), and dreams (ἐνύπνια). Cf. Aristotle, *De Anima* iii 3.429a1-2: ἡ φαντασία ἂν εἴη κίνησις ὑπὸ τῆς αἰσθήσεως τῆς κατ' ἐνέργειαν γιγνομένης. *Op. cit.* iii 3.428a1-5: εἰ δὴ ἐστὶν ἡ φαντασία καθ' ἣν λέγομεν φάντασμα τι ἡμῖν γίγνεσθαι καὶ μὴ εἶ τι κατὰ μεταφορὰν λέγομεν, μία τίς ἐστὶ τούτων δύναμις ἢ ἕξις, καθ' ἣν κρίνομεν καὶ ἀληθεύομεν ἢ ψευδόμεθα. τοιαῦτα δ' εἰσὶν αἰσθησις, δόξα, ἐπιστήμη, νοῦς. *Op. cit.* iii 3.428a5-6: ὅτι μὲν οὖν οὐκ ἐστὶν αἰσθησις, δηλον ἐκ τῶνδε. *Op. cit.* iii 3.428a16-18: ἀλλὰ μὴν οὐδὲ τῶν αἰεὶ ἀληθευόντων οὐδεμία ἐστὶν, οἷον ἐπιστήμη ἢ νοῦς· ἐστὶ γὰρ φαντασία καὶ ψευδής. *Op. cit.* iii 3.428a24-28: φανερόν τοίνυν ὅτι οὐδὲ δόξα μετ' αἰσθήσεως, οὐδὲ δι' αἰσθήσεως, οὐδὲ συμπλοκὴ δόξης καὶ αἰσθήσεως φαντασία ἂν εἴη, διὰ τε ταῦτα καὶ δηλον ὅτι οὐκ ἄλλου τινός ἐστιν ἡ δόξα, ἀλλ' ἐκείνου ἐστὶν οὐ καὶ ἡ αἰσθησις.

³⁶ Memory (μνήμη), according to Aristotle, is a function of the soul that belongs not only to human beings and those animals that possess opinion (δόξα) or intelligence (φρόνησις), but also to some other animals that perceive time (χρόνος). Cf. Aristotle, *De Memoria* 1.449b28-30: διὸ μετὰ χρόνου πᾶσα μνήμη. ὥσθ' ὅσα χρόνου αἰσθάνεται, ταῦτα μόνον τῶν ζώων μνημονεύει, καὶ τούτῳ ᾧ αἰσθάνεται. *Ibid.* 1.450a16-19: διὸ καὶ ἑτέροις τισὶν ὑπάρχει τῶν ζώων, καὶ οὐ μόνον ἀνθρώποις καὶ τοῖς ἔχουσιν δόξαν ἢ φρόνησιν. εἰ δὲ τῶν νοητικῶν τι μορίων ἦν, οὐκ ἂν ὑπῆρχε πολλοῖς τῶν ἄλλων ζώων, ἴσως δ' οὐδενὶ τῶν θνητῶν, ἐπεὶ οὐδὲ νῦν πᾶσι διὰ τὸ μὴ πάντα χρόνου αἰσθησὶν ἔχειν. *Idem.*, *Ethica Nicomachea* vii 3.1147b3-5: ὥστε καὶ διὰ τοῦτο τὰ θηρία οὐκ ἀκρατῇ, ὅτι οὐκ ἔχει καθόλου ὑπόληψιν ἀλλὰ τῶν καθ' ἕκαστα φαντασίαν καὶ μνήμην.

Memory is closely connected with imagination/*phantasia*. It belongs to that part of the soul to which *phantasia* belongs. It belongs *per se* to the primary sensitive/perceptive part of the soul and *per accidens* to the thinking part of the soul (*De Memoria* 1.450a 11-14: ἡ δὲ μνήμη, καὶ ἡ τῶν νοητῶν, οὐκ ἄνευ φαντάσματος ἐστὶν ὥστε τοῦ νοῦ μὲν κατὰ συμβεβηκὸς ἂν εἴη, καθ' αὐτὸ δὲ τοῦ πρώτου αἰσθητικοῦ). Mnemonic images (μνημονεύματα), the objects of memory, arise from *phantasmata* (φαντάσματα), the products of *phantasia*.

³⁷ Aristotle, *De Somno* 2.456a5-7: πάντα γὰρ τὰ ἔναιμα καρδίαν ἔχει, καὶ ἡ ἀρχὴ...τῆς αἰσθήσεως τῆς κυρίας ἐντεῦθεν ἐστίν.

³⁸ Aristotle divides the soul into the following parts (μῦρια) or faculties (δυνάμεις):

(a) Nutritive (Θρεπτικόν) or Reproductive (Γεννητικόν). The nutritive faculty/power (θρεπτικὴ δύναμις) of the soul being the same as the reproductive (γεννητικὴ). It exists in all living beings, including plants and animals (blooded and bloodless). It does its own work better when the animal is asleep than when it is awake. Cf. Aristotle, *De Anima* ii 4.416a19-20: Ἐπεὶ δ' ἡ αὕτη δύναμις τῆς ψυχῆς θρεπτικὴ καὶ γεννητικὴ. *Idem.*, *Ethica Eudemia* ii 1.1219b22-23: ἐν τῷ ὕπνῳ γὰρ μᾶλλον ἐνεργεῖ τὸ θρεπτικόν.

(b) Appetitive (desire, spiritedness, wish) [Ὁρεκτικόν (ἐπιθυμία, θυμός, βούλησις)]. The appetitive power (ὀρεκτικόν) belongs to everything that has sensation (αἴσθησις), and under appetite (ὄρεξις) we include desire (ἐπιθυμία), spiritedness (θυμός) and wish (βούλησις). The appetitive faculty is both rational (ἡ βούλησις, namely wish) and irrational (ἡ ἐπιθυμία καὶ ὁ θυμός, namely desire and spiritedness). Cf. Aristotle, *De Anima* ii 3.414b1-2: εἰ δὲ τὸ αἰσθητικόν, καὶ τὸ ὀρεκτικόν· ὄρεξις μὲν γὰρ ἐπιθυμία καὶ θυμός καὶ βούλησις. *Ibid.* iii 9.432b3-6: πρὸς δὲ τούτοις τὸ ὀρεκτικόν, ὃ καὶ λόγῳ καὶ δυνάμει ἕτερον ἂν δόξειεν εἶναι πάντων. καὶ ἄτοπον δὲ τοῦτο διασπᾶν· ἐν τε τῷ λογιστικῷ γὰρ ἡ βούλησις γίνεται, καὶ ἐν τῷ ἀλόγῳ ἡ ἐπιθυμία καὶ ὁ θυμός.

tie/bond (δεσμός) or absence of motion (ἀκίνησις) imposed on it.³⁹ It is a state of powerlessness, due to excess of waking (ἐγρήγορις),⁴⁰ while waking is the contrary of sleeping and is defined as the 'release of sensation' (λελύσθαι τὴν αἴσθησιν) from a state of potency.⁴¹ Consequently, while sleep on the one hand is a kind of potential sensation (δυνάμει αἴσθησις), waking on the other hand is an actual sensation (ἐνεργείᾳ αἴσθησις).

Aristotle in lines 454a26-32 of the treatise *De Somno* stresses that all organs that have a natural function are incapable of exercising continuously. They become fatigued and no longer perform their function. For example, if the eyes continue seeing (actual sensation) beyond their natural time of their functioning period, they become unable to act. They need some time to calm down and rest (potential sensation).

So, if a living being has sensation (αἴσθησις),⁴² it is impossible to continue actualizing its powers continuously (ἐνεργείᾳ αἴσθησις) or, in other words, to be always awake (ἐγρήγορις). If time is exceeded during which continuous sensation is possible, the living being becomes fatigue and needs to sleep (ὕπνος). Sleep, which is

(c) Sensitive (Αἰσθητικόν). The sensitive faculty/power (αἰσθητική) of the soul exists in all animals. In plants there is no sensitive faculty/power apart from the nutritive. The sensitive part of the soul cannot exist without the nutritive. Cf. *Ibid.* ii 3.415a1-3: ἀνευ μὲν γὰρ τοῦ θρεπτικοῦ τὸ αἰσθητικὸν οὐκ ἔστιν· τοῦ δ' αἰσθητικοῦ χωρίζεται τὸ θρεπτικὸν ἐν τοῖς φυτοῖς.

(d) Locomotive/Motive according to place (Κινητικὸν κατὰ τόπον). The locomotive faculty/power (κίνησις ⇒ κινητικὸν κατὰ τόπον) is related to the local movement of animals and is also described as the 'progressive motion' (πορευτική κίνησις). Cf. *Ibid.* iii 9.432b8-14: τί τὸ κινεῖν κατὰ τόπον τὸ ζῶον ἔστιν;...ἀλλὰ περὶ τῆς κατὰ τόπον κινήσεως, τί τὸ κινεῖν τὸ ζῶον τὴν πορευτικὴν κίνησιν, σκεπτέον.

(e) Imaginative (Φανταστικόν). the imaginative (φανταστικόν) is distinct from the other parts (μόρια) or faculties (δυνάμεις), and it is difficult to say with which of the parts it is identical or not. Cf. *Ibid.* iii 9.432a28-432b4: περὶ ὧν καὶ νῦν εἴρηται, τὸ τε θρεπτικόν, ὃ καὶ τοῖς φυτοῖς ὑπάρχει καὶ πᾶσι τοῖς ζῴοις, καὶ τὸ αἰσθητικόν, ὃ οὔτε ὡς ἄλογον οὔτε ὡς λόγον ἔχον θείη ἂν τις ῥαδίως. ἔτι δὲ τὸ φανταστικόν, ὃ τῷ μὲν εἶναι πάντων ἕτερον, τίνι δὲ τούτων ταυτὸν ἢ ἕτερον, ἔχει πολλὴν ἀπορίαν, εἴ τις θήσῃ κεχωρισμένα μόρια τῆς ψυχῆς. πρὸς δὲ τούτοις τὸ ὁρεκτικόν, ὃ καὶ λόγῳ καὶ δυνάμει ἕτερον ἂν δόξειεν εἶναι πάντων.

(f) Rational (Νοητικόν) or Discursive (Διανοητικόν). Species like man have in addition the rational or discursive faculty/power of the soul. This faculty of the soul judges truth and falsehood and apprehends. Cf. *Ibid.* ii 3.414b16-19: ἐνίοις δὲ πρὸς τούτοις ὑπάρχει καὶ τὸ κατὰ τόπον κινητικόν, ἑτέροις δὲ καὶ τὸ διανοητικόν τε καὶ νοῦς, οἷον ἀνθρώποις καὶ εἴ τι τοιοῦτον ἕτερόν ἐστιν ἢ καὶ τιμιώτερον. Cf. Papachristou 2013, 20-28.

³⁹ Aristotle, *De Somno* 1.454b10-14: ὁ γὰρ ὕπνος πάθος τι τοῦ αἰσθητικοῦ μορίου ἔστιν, οἷον δεσμός καὶ ἀκίνησις τις, ὥστ' ἀνάγκη πᾶν τὸ καθεῦδον ἔχειν τὸ αἰσθητικὸν μόριον. αἰσθητικὸν δὲ τὸ δυνατόν αἰσθάνεσθαι κατ' ἐνέργειαν.

⁴⁰ *Ibid.* 1.454b4-6: εἰ οὖν τὸ τοιοῦτον πάθος ὕπνος, τοῦτο δ' ἔστιν ἀδυναμία δι' ὑπερβολὴν τοῦ ἐγρηγορέναι.

⁴¹ *Ibid.* 1.454a32-454b4: εἰ τοίνυν τὸ ἐγρηγορέναι τούτῳ ὥριται τῷ λελύσθαι τὴν αἴσθησιν, τῶν δ' ἐναντίων τὸ μὲν ἀνάγκη παρῆναι τὸ δ' οὐ, τὸ δ' ἐγρηγορέναι τῷ καθεύδειν ἐναντίον, καὶ ἀναγκαῖον παντὶ θάτερον ὑπάρχειν, ἀναγκαῖον ἂν εἴη καθεύδειν.

⁴² Sense/sensation (αἴσθησις) or sense-perception (αἰσθάνεσθαι): The act of perceiving by sense/sensation (αἴσθησις) is what distinguishes an animal (τὸ ζῶον) from non-animal (τὸ μὴ ζῶον). "Sense/sensation is that which is receptive of sensible forms without their matter, just as wax receives the imprint of a ring without its iron or gold of which it is made" (Aristotle, *De Anima* ii 12.424a17-19: ἡ μὲν αἴσθησις ἐστὶ τὸ δεκτικὸν τῶν αἰσθητῶν εἰδῶν ἀνευ τῆς ὕλης, οἷον ὁ κηρὸς τοῦ δακτυλίου ἀνευ τοῦ σιδήρου καὶ τοῦ χρυσοῦ δέχεται τὸ σημεῖον).

the opposite of waking, is essential for the preservation (ἔνεκα δὲ σωτηρίας) of the living beings: they have the opportunity to rest (ἀνάπαυσις)⁴³ (see **DIAGRAM 1**). Moreover, during sleep are promoted nutrition and growth.⁴⁴

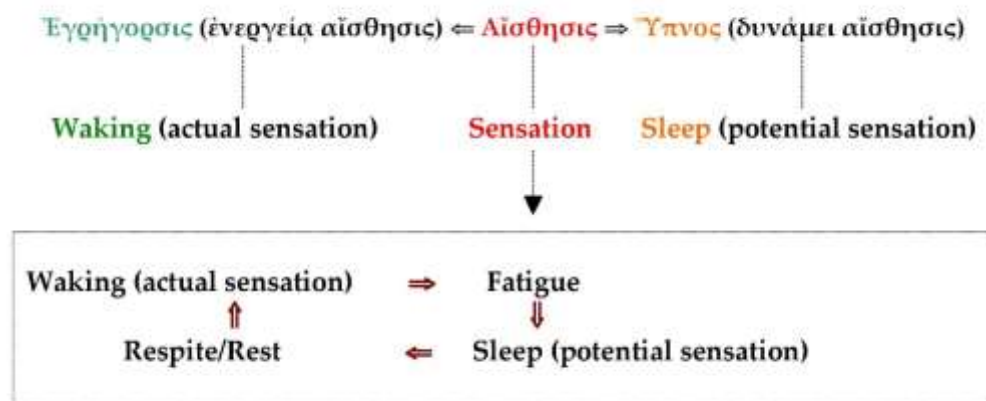


DIAGRAM 1

How does sleep come? What causes sleep? Aristotle describes the physiology of sleep based on the knowledge of his time. As soon as human beings and animals have sensation (αἴσθησις), then they must take food and grow. But, when do they acquire sensation? The embryos, according to the philosopher, possess only the nutritive (θρεπτική) soul; they absorb nutriment without sensation; they have in potentiality all the other parts of the soul, which are actualized later, namely, after birth.

Now, since an animal has sensation, it takes nourishment. Food (τροφή) in its final form is, in all blooded animals, blood (αἷμα), and in bloodless animals something analogous to blood.⁴⁵ When food enters the parts intended for its reception, the evaporation arising from it, enters into the veins, and there it is transformed into blood,

⁴³ Aristotle, *De Somno* 3.458a29-32: ἐξ ἀνάγκης μὲν γινόμενος (οὐ γὰρ ἐνδέχεται ζῶον εἶναι μὴ συμβαινόντων τῶν ἀπεργαζομένων αὐτό), ἔνεκα δὲ σωτηρίας· σώζει γὰρ ἢ ἀνάπαυσις.

⁴⁴ *Ibid.* 1.454b32-455a3: σημείον δ' ὅτι καὶ τὸ ἔργον τὸ αὐτοῦ ποιεῖ τὸ θρεπτικὸν μόριον ἐν τῷ καθεύδειν μᾶλλον ἢ ἐν τῷ ἐγρηγορῆναι· τρέφεται γὰρ καὶ αὐξάνεται τότε μᾶλλον, ὥς οὐδὲν προσδεόμενα πρὸς ταῦτα τῆς αἰσθήσεως.

⁴⁵ *Ibid.* 3.456a32-456b2: φανερόν δὲ ὅτι ἐπεὶ ἀναγκαῖον τῷ ζῳῷ, ὅταν αἴσθησιν ἔχη, τότε πρῶτον τροφήν τε λαμβάνειν καὶ αὐξήσιν, τροφή δ' ἐστὶ πᾶσιν ἢ ἐσχάτῃ τοῖς μὲν ἐναίμοις ἢ τοῦ αἵματος φύσις τοῖς δ' ἀναίμοις τὸ ἀνάλογον, τόπος δὲ τοῦ αἵματος αἱ φλέβες, τούτων δ' ἀρχὴ ἡ καρδία.

and is carried to the origin of veins and the center of sense-perception (αἰσθάνεσθαι),⁴⁶ namely, the heart.⁴⁷

In lines 456b17-19 of *De Somno* the philosopher stresses once again that sleep is not an 'impotence' (ἀδυναμία) of the sensitive part of the soul. He adds that "unconsciousness, choking, and swooning produce such an impotence" (καὶ γὰρ ἔκνοια καὶ πνιγμός τις καὶ λιποψυχία ποιεῖ τὴν τοιαύτην ἀδυναμίαν). Instead, sleep arises from the concentrated hot matter (moist and solid) exhaled (ἀναθυμίασις) from ingested food.⁴⁸ The exhaled hot matter rises through the circulatory system to the brain,⁴⁹ which is the coldest part of the body,⁵⁰ and the seat of sleep.⁵¹ Brain cools hot matter and makes it flow back in the heart (see **DIAGRAM 2**). These remarks on the cause of sleep, strongly suggest that Aristotle is drawing them from Alcmaeon's account on sleep.⁵²

⁴⁶ Sense-perception (αἰσθάνεσθαι) or the act of perceiving by sense is a form of being affected or moved (Aristotle, *De Anima* i 5.410a25-26: τὸ γὰρ αἰσθάνεσθαι πάσχειν τι καὶ κινεῖσθαι τιθέασιν). According to Aristotle, when an animal perceives an object (αἰσθητόν), sense-perception (αἰσθάνεσθαι) takes on the form of the object it perceives. Sense-perception is actualized by the sense quality of the object. The sense quality, which is a potentiality (δυνάμει) of the object, becomes an actuality (ἐνεργεία) through the action of the sense organs.

⁴⁷ Aristotle, *De Somno* 3.456b3-5: τῆς μὲν οὖν θύραθεν τροφῆς εἰσιούσης εἰς τοὺς δεκτικούς τόπους γίνεται ἡ ἀναθυμίασις εἰς τὰς φλέβας, ἐκεῖ δὲ μεταβάλλουσα ἐξαίματ' οὖται καὶ πορεύεται ἐπὶ τὴν ἀρχήν.

⁴⁸ *Ibid.* 3.456b17-19: οὐκ ἔστιν ὁ ὕπνος ἀδυναμία πᾶσα τοῦ αἰσθητικοῦ, ἀλλ' ἐκ τῆς περὶ τὴν τροφήν ἀναθυμιάσεως γίνεται τὸ πάθος τοῦτο.

⁴⁹ *Ibid.* 3.457b20-22: Γίνεται γὰρ ὁ ὕπνος, ὥσπερ εἴρηται, τοῦ σωματώδους ἀναφερομένου ὑπὸ τοῦ θερμοῦ διὰ τῶν φλεβῶν πρὸς τὴν κεφαλὴν.

⁵⁰ Aristotle, *De Partibus Animalium* ii 7.652a27-28: ὁ μὲν γὰρ ἐγκέφαλος ψυχρότατος τῶν ἐν τῷ σώματι μορίων.

⁵¹ *Idem.*, *De Somno* 3.457b27-29: οὐ μὴν ἀλλὰ κύριός γ' ἔστιν ὁ τόπος ὁ περὶ τὸν ἐγκέφαλον. Aristotle's theory of the role and function of the brain has not been accepted either by scientists or by philosophers (e.g. Galen, T. E. Lones, C. G. Gross etc.), all of whom have characterized it as "incorrect" and "anachronistic", since, as they point out, the Stageirite philosopher believed that the supreme organ of the body was the heart and not the brain. Contrary to this view, I believe that "it is to a great extent unfair to claim that: (a) Aristotle dismissed the role of the brain in the human organism quite as much as it is often claimed, and (b) the only functions of the brain in the Aristotelian theory of sense-perception are (i) to cool the heat of the blood generated by the heart, and (ii) to produce sleep". I have dealt with this issue in more detail in Papachristou 2008, 9-21.

⁵² Alcmaeon of Croton (5th century B.C.) was probably the first Pythagorean philosopher and physician, who proposed "the first rational theory for the cause of sleep" (cf. Thorphy 2005, 14). He said "sleep occurs from retreat of the blood to the blood vessels, and awakening from bloods flowing back" [Aëtius, *Placita*, V, 24, 1 (DK 24 A18): Ἀλκμαίων ἀναχωρήσει τοῦ αἵματος εἰς τὰς αἰμόρρους φλέβας ὕπνον γίνεσθαι φησι, τὴν δὲ ἐξέγερσιν διάχυσιν, τὴν δὲ παντελὴ ἀναχώρησιν θάνατον].

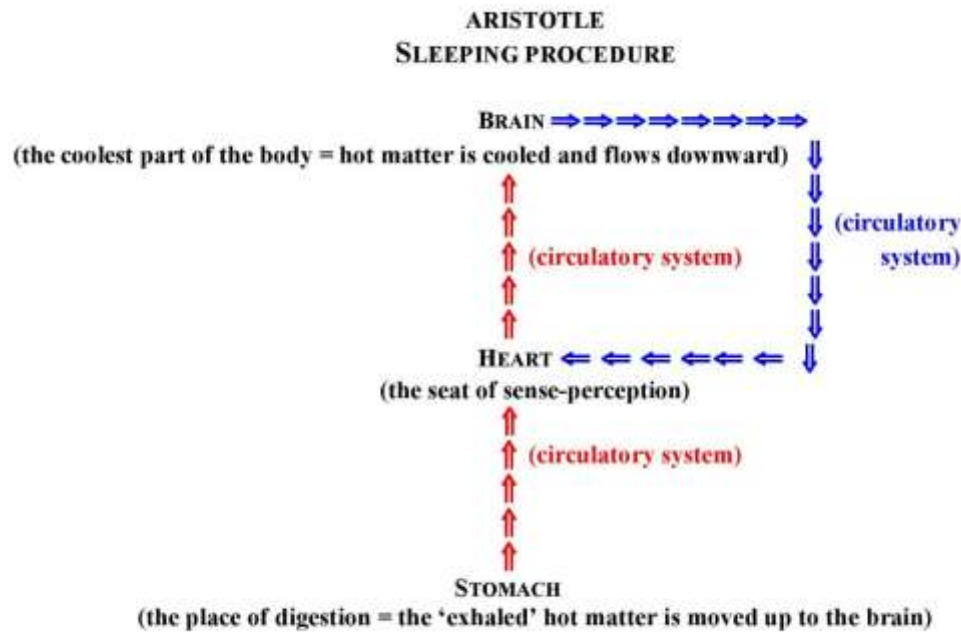


DIAGRAM 2

Aristotle adds and some other things that induce sleep:

- Narcotics (ύπνωτικά), whether liquid or solid, like opium poppy (*Papaver somniferum*), mandrake (*Mandragora officinarum*), wine (an alcoholic beverage), bearded-darnel (*Lolium temetulum*) make the head heavy:

σημείον δὲ τούτων καὶ τὰ ύπνωτικά· πάντα γὰρ καρηβαρίαν ποιεῖ, καὶ τὰ ποτὰ καὶ τὰ βρωτὰ, μήκων, μανδραγόρας, οἶνος, αἶραι (*De Somno* 3.456b29-31)

- Some states of fatigue (κόπος):

ὁ μὲν γὰρ κόπος συντηκτικόν, τὸ δὲ σύντηγμα γίνεται ὥσπερ τροφή ἄπειτος, ἂν μὴ ψυχρὸν ᾖ (*Op. cit.* 3.456b35-457a1)

- Certain diseases (νόσοι) "with an excessive amount of moist and hot, as happens with fever-patients and the cases of lethargy":

καὶ νόσοι δὲ τινες ταῦτὸ τοῦτο ποιοῦσιν, ὅσαι ἀπὸ περιπτώματος ὑγροῦ καὶ θερμοῦ, οἷον συμβαίνει τοῖς πυρέττουσι καὶ ἐν τοῖς ληθάργοις (*Op. cit.* 3.457a1-3)

Moreover, young children, people with small veins, dwarfs and people with large heads, sleep a lot:

- ἔτι δ' ἡ πρώτη ἡλικία· τὰ γὰρ παιδία καθεύδει σφόδρα διὰ τὸ τὴν τροφήν ἄνω φέρεσθαι πᾶσαν. σημείον δὲ τὸ υπερβάλλειν τὸ μέγεθος τῶν ἄνω πρὸς τὰ κάτω κατὰ τὴν πρώτην ἡλικίαν, διὰ τὸ ἐπὶ ταῦτα γίνεσθαι τὴν αὔξησιν. (*Op. cit.* 3.457a3-7)

Further, early childhood has this effect; for children sleep very much, because all their food rises upwards. A proof of this whereof seems in the excessive size of the upper parts compared with the lower during early childhood, because growth takes place in these parts.

- καὶ τὸ ὅλον δὲ φίλυπνοι οἱ ἀδηλόφλεβοι καὶ οἱ νανώδεις καὶ οἱ μεγαλοκέφαλοι· τῶν μὲν γὰρ αἱ φλέβες στεναί, ὥστ' οὐ ῥάδιον διαρρεῖν κατιὸν τὸ ὑγρὸν, τοῖς δὲ νανώδεσι καὶ μεγαλοκεφάλοις ἡ ἄνω ὁρμὴ πολλή καὶ ἀναθυμίασις. (*Op. cit.* 3.457a21-25)

Also, in general, people with small veins, dwarfs and those with large heads are fond of sleeping; for in the former the veins are narrow, so that the moisture cannot easily flow through them, while for dwarfs and those with large heads the upward surge of exhalation is great.

Then, we have the question: When does awakening occur? Aristotle says that awakening occurs when digestion is completed. When the great amount of heat, which is concentrated from the surrounding parts of the body has taken control, and the thickest blood has been separated from the purest blood. The thinnest and purest blood is in the head, the thickest and most troubled in the lower parts:

Ἐγείρεται δ', ὅταν πεφθῇ καὶ κρατήσῃ ἡ συνεωσμένη θερμότης ἐν ὀλίγῳ πολλὴ ἐκ τοῦ περιεστώτος, καὶ διακριθῇ τὸ τε σωματωδέστερον αἷμα καὶ τὸ καθαρώτατον, ἔστι δὲ λειπτότατον μὲν αἷμα καὶ καθαρώτατον τὸ ἐν τῇ κεφαλῇ, παχύτατον δὲ καὶ θολερώτατον τὸ ἐν τοῖς κάτω μέρεσιν. (*Op. cit.* 3.458a10-15)

Let us finish this section with a brief "explanation of sleep in terms of Aristotle's doctrine of 'four causes' [αἰτία]".⁵³

(a) The material cause or material substratum of sleep (*De Somno* 3.457a33-b3) = *causa materialis* ⇒ is, according to Ross, the hot matter exhaled from ingested food.⁵⁴

⁵³ Gallop 1996, 126. Aristotelian commentators are puzzled about whether Aristotle applied the doctrine of 'four causes' to his explanation of sleep. Woods 1992, 180-181, asserts that "it seems mistaken to suppose that at 455b13-15, we have an undertaking by Aristotle to consider all four causes in relation to sleep; so the failure to deal with the formal and material (explicitly at least) in the subsequent text does not call for explanation. The four causes are mentioned, in typical Aristotelian fashion, so as to relate the discussion to Aristotle's general methodological frameworks". See also Gallop 1996, 127-128, who notices that "the 'formal' and 'material' causes are nowhere to be found" and it is doubtful whether Aristotle explains "sleep in terms of his 'four cause' schema".

⁵⁴ Aristotle, *De Somno* 3.457a33-b3: Ὅστε φανερόν ἐκ τῶν εἰρημένων ὅτι ὁ ὕπνος ἐστὶ σύννοδος τις τοῦ θερμοῦ εἶσω καὶ ἀντιπερίστασις φυσικὴ διὰ τὴν εἰρημένην αἰτίαν. Ross 1955, 260, believes that Aristotle considers all 'four causes' in relation to sleep. The philosopher deals with: (a) the material cause in 457a33-b1, (b) the final cause in 455b16-28 and 458a29-30, (c) the efficient cause in 455b28 ff. and 456a30-458a25, and (d) the formal cause in 458a30-32. Cf. van der Eijk 2005, 177. Also, Mansfield, Goddard and Moldofsky 2003, 60, regard that the Stageirite applies the four fundamental causes to his study of sleep, and they locate the 'material causes' of sleep to "the matter that is digested, the heart, the veins, and possibly the brain".

(b) The cause of sleeping (τι μὲν οὖν τὸ αἴτιον τοῦ καθεῦδεν, *De Somno* 3.458a25-26) = τὸ τι ἦν εἶναι or *causa efficiens* ⇒ "is the reverse flow of the solid matter, carried upwards by the naturally inherent heat, *en masse* towards the primary sense-organ".⁵⁵

(c) What is sleep (καὶ τί ἐστὶν ὁ ὕπνος, *op. cit.* 3.458a28)? = μορφή or *causa formalis* ⇒ sleep is the inhibition of the primary sense-organ, rendering it incapable for functioning.⁵⁶

(d) The final cause of sleeping (ἐξ ἀνάγκης μὲν γινόμενος, *op. cit.* 3.458a29-30) = τέλος or *causa finalis* ⇒ sleep is for the sake of animal preservation, since rest preserves.⁵⁷

b. The formation of dreams (ἐνὸπνια)

In the treatise *De Insomniis* (Περὶ Ἐνὸπνιῶν) Aristotle examines dreams (ἐνὸπνια) and inquires to which part (μόριον) or faculty (δύναμις) of the soul they occur.

Μετὰ δὲ ταῦτα περὶ ἐνὸπνίου ζητητέον, καὶ πρῶτον τίνι τῶν τῆς ψυχῆς φαίνεται, καὶ πότερον τοῦ νοητικοῦ τὸ πάθος ἐστὶ τοῦτο ἢ τοῦ αἰσθητικοῦ. (*De Insomniis* 1.458a33-458b2)

The Macedonian philosopher argues that sense/sensible objects (αἰσθητά),⁵⁸ namely the objects of perception, produce sensation (αἴσθησις) in the sense organs. The affection (πάθος) produced by them, specifically αἴσθημα ["the causal result of the action of 'αἰσθητόν' (object of perception)"],⁵⁹ persists in the sense organs not only while the senses are in actuality, but also after αἰσθητά have gone.⁶⁰ It occurs not only during the waking state, but also when sleep takes place.

The affection (πάθος) that persists when the sense organs are no longer active seems, for Aristotle, to be similar to that observed in the case of objects moving in space (ἐπὶ τῶν φερομένων ἔοικεν εἶναι). Because in the case of these objects movement continues, both in the air and in the water, even when the moving agent is no longer in contact with them. In addition, the philosopher points out that something like this takes place also in the case of alteration or qualitative change (ἀλλοίωσις). What is warmed by a hot object, warms what it is adjacent to it, and the transmission is continuous, until the

⁵⁵ Gallop 1996, 83.

⁵⁶ Aristotle, *De Somno* 3.458a28-30: καὶ τί ἐστὶν ὁ ὕπνος, ὅτι τοῦ πρώτου αἰσθητηρίου κατάληψις πρὸς τὸ μὴ δύνασθαι ἐνεργεῖν.

⁵⁷ *Ibid.* 3.458a30-32.

⁵⁸ Aristotle, *De Anima* ii 6.418a8-11: λέγεται δὲ τὸ αἰσθητόν τριχῶς. ὧν δύο μὲν καθ' αὐτά φαμεν αἰσθάνεσθαι, τὸ δὲ ἓν κατὰ συμβεβηκός. τῶν δὲ δύο τὸ μὲν ἰδίον ἐστὶν ἐκάστης αἰσθήσεως, τὸ δὲ κοινὸν πασῶν. The Stageirite distinguishes three kinds of sensible objects (αἰσθητά): (a) *per se* (καθ' αὐτά), (b) *per accidens* (κατὰ συμβεβηκός) and (c) common (κοινά).

⁵⁹ Wedin 1988, 37. Wedin 1988, 37, translates 'αἴσθημα' as 'perceptual state' and Sorabji 2004, 82, as 'sense-image'.

⁶⁰ *De Insomniis* 2.459a25-28: τὰ γὰρ αἰσθητά καθ' ἑκάστον αἰσθητήριον ἡμῖν ἐμποιοῦσιν αἴσθησιν, καὶ τὸ γινόμενον ὑπ' αὐτῶν πάθος οὐ μόνον ἐνυπάρχει ἐν τοῖς αἰσθητηρίοις ἐνεργουσῶν τῶν αἰσθήσεων, ἀλλὰ καὶ ἀπελθουσῶν.

starting-point is reached.⁶¹ The previous examples that are classic cases of the 'domino effect' "provide a model for understanding what occurs in perception more generally".⁶²

The sensory impulses/sensory movements (κινήσεις) arising from αἰσθήματα are present during the waking and sleeping state. These sensory impulses are compared with those of flowing rivers.⁶³ For in the daytime, while the senses (αἰσθήσεις) and the mind/thought (διάνοια) are in actuality (ἐνεργοῦσαι), sensory impulses are pushed away. At night, while the special senses are inactive, because of the reverse flow of heat from the outer parts to the interior, these sensory impulses are carried through blood to the seat of sense-perception, the heart, and become evident, as the disturbance subsides.⁶⁴ Thus, dreams (ἐνύπνια) originate from the preserved (σωζόμενη) movement of sensory impulses in the sense organs "from the moment of their arrival (in the waking state) to the moment of their transport to the heart".⁶⁵

The phenomenon that is called dreaming (ἐνυπνιάζειν) does not belong to:⁶⁶

(a) What judges (δοξάζον): opinion/judgement (δόξα) is defined as "one of the faculties or habits, by which we judge, and put us in truth or falsity".⁶⁷ It follows sensation (αἴσθησις) and should be impossible in dreaming. During sleep, says the Aristotelian commentator Michael Ephesius, opinion, just as sensation, is disabled from exercising its function:

ἡ δόξα ἄνευ αἰσθήσεως οὐχ ὑπολαμβάνει, ἡ δὲ αἴσθησις ἐν τοῖς ὕπνοις οὐκ ἐνεργεῖ, οὐκ ἂν εἴη οὐδὲ τῆς δόξης τὸ ἐνύπνιον πάθος). (Michael Ephesius, *Parva Naturalia Commentaria* 22.1.61.23-25)

(b) What thinks (διανοοῦμενον): thought (διάνοια) is the cognitive process that results in belief and knowledge.

It is clear, from (a) and (b), that dreaming does not belong to the rational (νοητικόν) or the discursive (διανοητικόν) part (μόριον) or faculty (δύναμις) of the soul. In other

⁶¹ *Op. cit.* 2.459a25-459b4: τὰ γὰρ αἰσθητὰ καθ' ἕκαστον αἰσθητήριον ἡμῖν ἐμποιοῦσιν αἴσθησιν, καὶ τὸ γινόμενον ὑπ' αὐτῶν πάθος οὐ μόνον ἐνυπάρχει ἐν τοῖς αἰσθητηρίοις ἐνεργουσῶν τῶν αἰσθήσεων, ἀλλὰ καὶ ἀπελθουσῶν. Παραπλήσιον γὰρ τὸ πάθος ἐπὶ τε τούτων καὶ ἐπὶ τῶν φερομένων ἔοικεν εἶναι. καὶ γὰρ ἐπὶ τῶν φερομένων τοῦ κινήσαντος οὐκέτι θιγγάνοντος κινεῖται· τὸ γὰρ κινήσαν ἐκίνησεν ἄερα τινά, καὶ πάλιν οὗτος κινούμενος ἕτερον. καὶ τοῦτον δὴ τὸν τρόπον, ἕως ἂν στή, ποιεῖται τὴν κίνησιν καὶ ἐν ἄερι καὶ ἐν τοῖς ὕγροις. Ὅμοίως δ' ὑπολαβεῖν τοῦτο δεῖ καὶ ἐπ' ἀλλοιώσεως· τὸ γὰρ θερμανθὲν ὑπὸ τοῦ θερμοῦ τὸ πλησίον θερμαίνει, καὶ τοῦτο διαδίδωσιν ἕως τῆς ἀρχῆς.

⁶² Gallop 1996, 145.

⁶³ *De Insomniis* 3.461a8-25.

⁶⁴ *Op. cit.* 3.460b28-461b8.

⁶⁵ van der Eijk 2005, 183.

⁶⁶ *De Insomniis* 1.459a8-11: Ὅτι μὲν οὖν οὐκ ἔστι τοῦ δοξάζοντος οὐδὲ τοῦ διανοομένου τὸ πάθος τοῦτο ὁ καλοῦμεν ἐνυπνιάζειν, φανερόν. ἀλλ' οὐδὲ τοῦ αισθανομένου ἀπλῶς· ὅρᾳν γὰρ ἂν ἦν καὶ ἀκούειν ἀπλῶς.

⁶⁷ *De Anima* iii 3.428a3-4: μία τις ἐστὶ τούτων δύναμις ἡ ἕξις, καθ' ἣν κρίνομεν καὶ ἀληθεύομεν ἢ ψευδόμεθα.

words it means that we should not be able to think during the sleeping state. Whereas, in lines 459a6-8 and 462a29-30, Aristotle, as van der Eijk remarks, “speak[s] of an activity of ‘judgement’ (*doxa*) and of the presence of ‘true thoughts’ (*alêtheis ennoiai*) in sleep, but it remains vague”:⁶⁸

καὶ ὅτε μὲν ἡ δόξα λέγει ὅτι ψεῦδος τὸ ὁρώμενον, ὥσπερ ἐγρηγορόσιν, ὅτε δὲ κατέχεται καὶ ἀκολουθεῖ τῷ φαντάσματι. (*De Insomniis* 1.459a6-8)

and sometimes opinion/judgement says that what is seen is as falsehood, just as in the waking state, and at other times [opinion] is held in check and follows the *phantasm*.

οὐδ, ὅσαι δὴ ἐν τῷ ὕπνῳ γίνονται ἀληθεῖς ἔννοιαι παρὰ τὰ φαντάσματα. (*Op. cit.* 3.462a29-30)

neither can those true thoughts which occur in sleep, over and above the *phantasmata* (*Op. cit.* 3.462a29-30)⁶⁹

(c) What perceives (αἰσθανόμενον) in an unqualified sense (ἀπλῶς): For then it would be possible in a dream to see and hear in an unqualified sense (ἀπλῶς). But in sleep both the particular senses and their primary sense-faculty/common sense are inactivated, and for this reason dreams are illusory⁷⁰ and “do not give us faithful images of reality”.⁷¹

Aristotle believes that a dream (ἐνὸπνιον) is a kind of *phantasma* (φάντασμα) – *phantasma* is the product of *phantasia* –, i.e., a kind of (mental) representation/image⁷² that occurs in sleep.⁷³ Also, he notices that the imaginative (φανταστικόν) is the same as the sensitive (αἰσθητικόν) part (μόριον) of the soul, although they are different in their being (εἶναι).⁷⁴ Therefore, ἐνυπνιάζειν “is an activity of the sensitive part, but belongs to it *qua* imaginative” (see **DIAGRAM 3**).⁷⁵

⁶⁸ van der Eijk 2005, 176.

⁶⁹ *De Insomniis* 3.462a29-30: οὐδ, ὅσαι δὴ ἐν τῷ ὕπνῳ γίνονται ἀληθεῖς ἔννοιαι παρὰ τὰ φαντάσματα.

⁷⁰ *Op. cit.* 1.458b26-28: Δῆλον δὲ περὶ τούτων ἀπάντων τό γε τοσοῦτον, ὅτι τῷ αὐτῷ ᾧ καὶ ἐγρηγορότερος ἐν ταῖς νόσοις ἀπατῶμεθα, ὅτι τοῦτ' αὐτὸ καὶ ἐν τῷ ὕπνῳ ποιεῖ τὸ πάθος.

⁷¹ See Hughes 2000, 16.

⁷² For the interpretation of the word *phantasma* (φάντασμα), see Papachristou 2013, 32: “My suggestion is that the word ‘φάντασμα’, which is mentioned twelve times in *De Anima* (also thirteen times in *De Memoria*, thirteen in *De Insomniis*, four in *De Divinatione*, two in *De Somno*, two in *Metaphysica*, one in *Ethica Nicomachea*, one in *Protrepticus*) may conveniently and aptly be translated as: (a) ‘representation’ or ‘image’ in contexts where ‘φάντασμα’ is related only with the faculty of *phantasia* (e.g. εἰ δὴ ἐστὶν ἡ φαντασία καθ’ ἣν λέγομεν φάντασμα τι ἡμῖν γίνεσθαι, *De Anima* iii 3.428a1-2), and (b) as ‘mental representation’ or ‘mental image’, when ‘φάντασμα’ is described by the philosopher as the substratum upon which the mind works [e.g. (διὸ οὐδέποτε νοεῖ ἄνευ φαντάσματος ἡ ψυχή), *De Anima* iii 7.431a16-17].”

⁷³ *De Insomniis* 3.462a15-16: Ἐκ δὴ τούτων ἀπάντων δεῖ συλλογίσασθαι ὅτι ἐστὶ τὸ ἐνὸπνιον φάντασμα μὲν τι καὶ ἐν ὕπνῳ.

⁷⁴ *Op. cit.* 1.459a15-17: ἐπεὶ δὲ περὶ φαντασίας ἐν τοῖς περὶ ψυχῆς εἴρηται, καὶ ἔστι μὲν τὸ αὐτὸ τῷ αἰσθητικῷ τὸ φανταστικόν, τὸ δ' εἶναι φανταστικῷ καὶ αἰσθητικῷ ἕτερον.

⁷⁵ *Op. cit.* 1.459a21-22: φανερόν ὅτι τοῦ αἰσθητικοῦ μὲν ἐστὶ τὸ ἐνυπνιάζειν, τούτου δ' ἡ τὸ φανταστικόν.

At this point we can pose the question: What is the difference between a dream (ἐνύπνιον) and a *phantasma* (φάντασμα)? Themistius (Sophonias),⁷⁶ the Aristotelian commentator, gives an answer to the previous question. Ἐνύπνιον is that kind of dream in which you don't know at that time that you are dreaming. Whereas φάντασμα is a kind of dream in which you become aware at that time that you are dreaming:

οὐκ αἰεὶ δὲ, ἐπὶ μέντοι τῆς δόξης αἰεὶ ὁ δοξάζομεν συναισθανόμεθα ὅτι δοξάζομεν. οὐκ ἄρα οὐδὲ οὕτω δόξης τὰ ἐνύπνια. ἅμα δὲ δῆλον ὡς οὐ πᾶν τὸ ἐν ὕπνῳ φάντασμα ἐνύπνιον ἐστίν, ἀλλ' ὅταν μὲν τι ὁρῶν τις μὴ ἐννοῇ, ὅτι ὅπερ ὁρᾷ ὄναρ ἐστίν, ἐνύπνιον τοῦτο γε· ὅταν δὲ ὁρῶν δύνηται ἐννοεῖν ὅτι τὸ ὁρώμενον ἐνύπνιον ἐστίν, ἤδη τοῦτο φάντασμα, ἐνύπνιον δὲ οὐδαμῶς. [Themistius (Sophonias), *Parva Naturalia Commentarium* 5.6.30.3-8]

At the end of the treatise *De Insomniis* the philosopher notices that dreams (ἐνύπνια) do not occur to very young children (οὐδὲ τοῖς παιδίοις γίνεται ἐνύπνιον) and immediately after the intake of food (οὐδὲ μετὰ τὴν τροφήν καθυπνώσασιν). He also mentions that there are people who have never dreamt in their whole lives (τισι συμβέβηκεν ὥστε μηδὲν ἐνύπνιον ἑωρακέναι κατὰ τὸν βίον),⁷⁷ and others who were late dreamers, namely, they have observed them late in life (ἐνίοις δὲ καὶ προελθοῦσι πόρρω τῆς ἡλικίας ἐγένετο).⁷⁸

⁷⁶ The *Paraphrase* of parts of Aristotle's *Parva Naturalia* should not be attributed to Themistius but to Sophonias (see Wendland 1903, v-x).

⁷⁷ Sorabji 2004, 36, stresses that "we could assume that Aristotle's supposed non-dreamers had simply not remembered their dreams. Indeed, Aristotle himself once mentions this possibility (453b18-20), though it is not explicitly pursued further".

⁷⁸ *De Insomniis* 3.462a31-b11. See also *Historia Animalium*, iv 10.537b16-20.

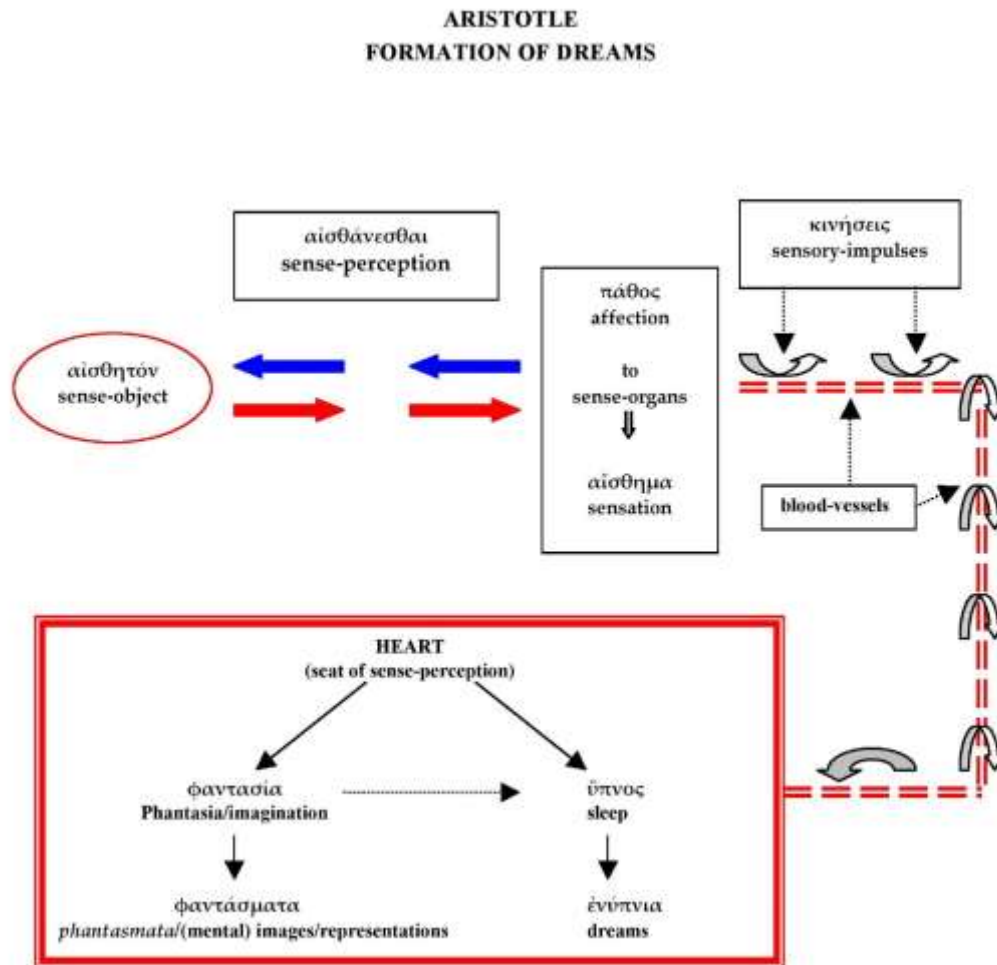


DIAGRAM 3

c. Dreams (ἐνύπνια) are not divine. Dreams may be signs (αἷτια), causes (σημεῖα) or coincidences (συμπτώματα).

Aristotle in his treatise *De Divinatione per Somnum* (Περὶ τῆς καθ' ὕπνον Μαντικῆς) acknowledges that dreams sometimes foretell the future, and rejects the popular belief of the divinatory power of dreams. He argues that some other animals than man dream (καὶ τῶν ἄλλων ζῴων ὀνειρώττει), and ordinary people (εὐτελεῖς ἄνθρωποι) experience prophetic dreams:

Ὅλως δ' ἐπεὶ καὶ τῶν ἄλλων ζῴων ὀνειρώττει τινά, θεόπεμπα μὲν οὐκ ἂν εἴη τὰ ἐνύπνια, οὐδὲ γέγονε τοῦτου χάριν, δαιμόνια μέντοι· ἢ γὰρ φύσις δαιμονία, ἀλλ' οὐ θεία. σημεῖον δέ· πάνυ γὰρ εὐτελεῖς ἄνθρωποι προορατικοὶ εἰσι καὶ εὐθρόνειροι, ὥς οὐ θεοῦ πέμποντος, ἀλλ' ὅσων ὥσπερ ἂν εἰ λάλος ἢ φύσις ἐστὶ καὶ μελαγχολική, παντοδαπὰς ὄψεις ὁρῶσιν. (*De Divinatione* 2.463b12-18)

In general, since some other animals dream, dreams could not be sent by God and do not occur for this purpose; however, they are daemonic (δαιμόνια). For nature is daemonic (δαιμονία), but not divine (οὐ θεία). A sign of this is that ordinary people have foresight/prevision (προορατικοί) and vivid dreams (εὐθυδόνειροι), showing that it is not God who sends them, but such men as have a garrulous (λάλος) and melancholic (μελαγχολική) nature, see all sorts of sights.

So, God cannot be the sender of dreams, because:

- (a) Animals, who do not have intellect/mind (νοῦς), have dreams too.
- (b) Quite ordinary people "with low moral and intellectual capacities",⁷⁹ and especially those whose nature is garrulous and melancholic have vivid dreams about the future.

Hence, if dreams were sent by God, would be experienced only by those with "moral and intellectual virtues to the highest degree, and thus approach the divine level".⁸⁰

The Stageirite also remarks that although dreams are not divine, they are nevertheless daemonic (δαιμόνια). Dreams are like nature herself "daemonic, but not divine". The word "daemonic" does not mean that dreams are "sent by daemons" (cf. Pythagoras of Samos),⁸¹ but rather "beyond human control".⁸²

Dreams must be regarded either as causes (αἰτία), signs (σημεῖα) or coincidences (συμπτώματα):

Ἀνάγκη δ' οὖν τὰ ἐνύπνια ἢ αἰτία εἶναι ἢ σημεῖα τῶν γιγνομένων ἢ συμπτώματα, ἢ πάντα ἢ ἓν τούτων ἢ ἓν μόνον. λέγω δ' αἰτίον μὲν οἷον τὴν σελήνην τοῦ ἐκλείπειν τὸν ἥλιον καὶ τὸν κόπον τοῦ πυρετοῦ, σημεῖον δὲ τῆς ἐκλείψεως τὸ τὸν ἀστέρα εἰσελθεῖν, τῇ δὲ τραχύτητι τῆς γλώττης τοῦ πυρέττειν, σύμπτωμα δὲ τὸ βαδίζοντος ἐκλείπειν τὸν ἥλιον· οὐτε γὰρ σημεῖον τοῦ ἐκλείπειν τοῦτ' ἐστὶν οὔτ' αἰτίον, οὔθ' ἡ ἐκλειψις τοῦ βαδίζειν. διὸ τῶν συμπτωμάτων οὐδὲν οὔτ' αἰεὶ γίνεται οὔθ' ὥς ἐπὶ τὸ πολὺ. (*De Divinatione* 1.426b26-463a3)

Now dreams must be either causes (αἰτία) or signs (σημεῖα) of events which occur or else coincidences (συμπτώματα); either all or some of these, or one only. I use the word "cause" in the sense in which the moon is the cause of an eclipse of the sun, or

⁷⁹ Cf. van der Eijk 2005, 190.

⁸⁰ *Op. cit.*, 190.

⁸¹ Diogenes Laertius, *Vitae Philosophorum* VIII, 32: εἶναι τε πάντα τὸν ἀέρα ψυχῶν ἔμπλεων· καὶ ταύτας δαίμονας τε καὶ ἥρωας ὀνομάζεσθαι· καὶ ὑπὸ τούτων πέμπεσθαι ἀνθρώποις τοὺς τ' ὄνειρους καὶ τὰ σημεῖα νόσους τε, καὶ οὐ μόνον ἀνθρώποις ἀλλὰ καὶ προβάτοις καὶ τοῖς ἄλλοις κτήνεσιν. Pythagoras of Samos (582-496 B.C.), the founder of Pythagoreanism, believed in the divinity of dreams. *Daemones* (δαίμονες) and heroes (ἥρωες) are responsible for dreams (ὄνειροι) and signs (σημεῖα). Dreams occur when the soul is liberated from the sleeping body.

⁸² van der Eijk 2005, 191.

fatigue is the cause of fever; the fact that a star comes into view I call a "sign" of the eclipse, and the roughness of the tongue a "sign" of fever; but the fact that someone is walking when the sun is eclipsed is a coincidence. For this is neither a sign nor a cause of the eclipse, any more than the eclipse is a cause of sign of a man's walking. So no coincidence occurs invariably or even commonly. (trans. W. S. Hett)

Thus, some dreams, as Aristotle notes, may be signs (σημεῖα) of events happening in the body of the dreamer. Physicians say that we should pay close attention to dreams (σφόδρα προσέχειν τοῖς ἐνυπνίοις), because they can help in medical diagnosis.⁸³

Also, dreams may become the cause (αἴτιον) of our waking actions. The action (κίνησις) in dream encourages action during the daytime. So, some of the dreams may be both signs and causes.⁸⁴

But, most dreams [prophetic/divinatory dreams], according to the philosopher, are coincidences (συμπτώματα), "especially all those which are transcendental, and those in which the origination does not lie in the dreamers themselves, such as in the case of a naval battle and things taking place far away".⁸⁵ He suggests that, when someone sees a dream "which is extraordinary either in time, place or magnitude" (ἄλλ' ὑπερορίας ἢ τοῖς χρόνοις ἢ τοῖς τόποις ἢ τοῖς μεγέθεσις)⁸⁶ this is due to an effect like a ripple in the water or air, where the original movement/impulse (κίνησις) and sensation (αἴσθησις) after traveling over a great distance reach the soul of the dreamer. These movements, says Aristotle, that proceed "from the objects from which Democritus says, images (εἰδωλα) and emanations (ἀπόρροιαί) are thrown off",⁸⁷ reach the soul more easily at night than by the day, because there is less air at night and because people perceive small movements more clearly in sleep than in the waking state.⁸⁸

⁸³ *De Divinatione* 1.463a3-6: ἄρ' οὖν ἐστὶ τῶν ἐνυπνίων τὰ μὲν αἰτία, τὰ δὲ σημεῖα, οἷον τῶν περὶ τὸ σῶμα συμβαινόντων; λέγουσι γοῦν καὶ τῶν ἰατρῶν οἱ χαριέντες ὅτι δεῖ σφόδρα προσέχειν τοῖς ἐνυπνίοις.

⁸⁴ *Op. cit.* 1.463a21-31: Ἀλλὰ μὴν καὶ ἐνία γε τῶν καθ' ὕπνον φαντασμάτων αἰτία εἶναι τῶν οἰκείων ἐκάστω πρᾶξεων οὐκ ἄλογον· ὥσπερ γὰρ μέλλοντες πράττειν καὶ ἐν ταῖς πράξεσιν ὄντες ἢ πεπραχότες πολλάκις εὐθυνοειρία τούτοις σύνεσμεν καὶ πράττομεν (αἴτιον δ' ὅτι προωδοποιημένη τυγχάνει ἡ κίνησις ἀπὸ τῶν μεθ' ἡμέραν ἀρχῶν), οὕτω πάλιν ἀναγκαῖον καὶ τὰς καθ' ὕπνον κινήσεις πολλάκις ἀρχὴν εἶναι τῶν μεθ' ἡμέραν πρᾶξεων διὰ τὸ προωδοποιηθῆαι πάλιν καὶ τούτων τὴν διάνοιαν ἐν τοῖς φαντάσμασι τοῖς νυκτερινοῖς. οὕτω μὲν οὖν ἐνδέχεται τῶν ἐνυπνίων ἐνια καὶ σημεῖα καὶ αἰτία εἶναι.

⁸⁵ *Op. cit.* 1.463b1-3: Τὰ δὲ πολλὰ συμπτώμασιν ἔοικε, μάλιστα δὲ τὰ τε ὑπερβατὰ πάντα καὶ ὧν μὴ ἐν αὐτοῖς ἡ ἀρχὴ οἷον περὶ ναυμαχίας καὶ τῶν πόρρω συμβαινόντων.

⁸⁶ *Op. cit.* 2.464a2-3.

⁸⁷ *Op. cit.* 2.464a11-12: ἀφ' ὧν ἐκεῖνος τὰ εἰδωλα ποιεῖ καὶ τὰς ἀπορροίας.

⁸⁸ *Op. cit.* 2.463b31-464a19: Περὶ δὲ τῶν μὴ τοιαύτας ἐχόντων ἀρχὰς ἐνυπνίων οἷας εἵπομεν, ἀλλ' ὑπερορίας ἢ τοῖς χρόνοις ἢ τοῖς τόποις ἢ τοῖς μεγέθεσιν, ἢ τούτων μὲν μηδέν, μὴ μέντοι γε ἐν αὐτοῖς ἐχόντων τὰς ἀρχὰς τῶν ἰδόντων τὸ ἐνυπνιον, εἰ μὴ γίνεται τὸ προορᾶν ἀπὸ συμπτώματος, τοιόνδ' ἂν εἴη μᾶλλον ἢ ὥσπερ λέγει Δημόκριτος εἰδωλα καὶ ἀπορροίας αἰτιώμενος. ὥσπερα γὰρ ὅταν κινήσῃ τι τὸ ὕδωρ ἢ τὸν ἀέρα, τοῦθ' ἕτερον ἐκίνησε, καὶ παυσαμένον ἐκεῖνον συμβαίνει τὴν τοιαύτην κίνησιν προϊέναι μέχρι τινός, τοῦ κινήσαντος οὐ παρόντος, οὕτως οὐδὲν κωλύει κίνησιν τινα καὶ αἴσθησιν ἀφικνεῖσθαι πρὸς τὰς ψυχὰς τὰ

II. Aristotelian and Contemporary Views on Sleep and Dreams

In the second part of this paper we shall try to present that when we take an in-depth study of the function of dreaming, as it is described in the psychological and biological Aristotelian treatises, we can find great analogies or similarities between the Aristotelian and the contemporary views on sleep and dreams. R. Mansfield, S. Goddard and H. Moldofsky assert that "these similarities of content may indicate that even two millennia of scientific and technological advance have not changed the basic human observations from which theory and research spring".⁸⁹

- ❖ Let us start with Aristotle's empirical observations⁹⁰ on the phenomenon of sleep in animals at 454b15-27 of *De Somno et Vigilia* (Περὶ ὕπνου καὶ Ἑγρηγόρεως). The ancient philosopher argues that almost all animals, whether they are aquatic, winged or terrestrial, have the power of sleep. Every kind of fish, mollusks, insects, hard-eyed animals and every other creature that has eyes have been seen sleeping. However, all such animals sleep for a short period of time, and consequently someone may not observe whether they sleep or not. At the same time, Aristotle notices that it is not easy to determine whether testaceans, such as mussels and oysters, sleep or not. It is difficult to recognize sleep in such living beings. But he believes that creatures that are endowed with sensation (αἴσθησις), must be capable of sleeping and waking.

Τὰ μὲν οὖν ἄλλα σχεδὸν πάντα δῆλα κοινωνοῦνθ' ὕπνου, καὶ πλωτὰ καὶ πτηνὰ καὶ πεζὰ (καὶ γὰρ τὰ τῶν ἰχθύων γένη πάντα καὶ τὰ τῶν μαλακίων ὄπται καθεύδοντα, καὶ τᾶλλα πάνθ' ὅσα περ ἔχει ὀφθαλμούς· καὶ γὰρ τὰ σκληρόφθαλμα φανερὰ καὶ τὰ ἔντομα κοιμώμενα· βραχύπνα δὲ τὰ τοιαῦτα πάντα, διὸ καὶ λάθοι ἂν τινα πολλάκις πότερον μετέχουσι τοῦ καθεύδειν ἢ οὐ), τῶν δ' ὀστρακοδέρμων κατὰ μὲν τὴν αἴσθησιν οὐδέ πω γέγονε φανερόν· εἰ καθεύδουσιν· εἰ δὲ τῷ πιθανὸς ὁ λεχθεὶς λόγος, τοῦτ' πεπιθήσεται.

Ὅτι μὲν οὖν ὕπνου κοινωνεῖ τὰ ζῷα πάντα, φανερόν ἐκ τούτων· τῷ γὰρ αἴσθησιν ἔχειν ὥριται τὸ ζῶον, τῆς δ' αἰσθήσεως τρόπον τινὰ τὴν μὲν ἀκίνησίαν καὶ οἶον δεσμὸν τὸν ὕπνον εἶναι φαμεν, τὴν δὲ λύσιν καὶ τὴν ἄνεσιν ἐγρήγορσιν. (*De Somno* 1.454b15-27)

ἐνυπνιαζούσας, ἀφ' ὧν ἐκεῖνος τὰ εἰδῶλα ποιεῖ καὶ τὰς ἀπορροίας, καὶ ὅπῃ δὴ ἔτυχεν ἀφικνουμένης μᾶλλον αἰσθητὰς εἶναι νύκτωρ διὰ τὸ μεθ' ἡμέραν φερομένης διαλύεσθαι μᾶλλον (ἀταραχωδέστερος γὰρ ὁ ἀήρ τῆς νυκτὸς διὰ τὸ νηγεμωτέρας εἶναι τὰς νύκτας), καὶ ἐν τῷ σώματι ποιεῖν αἰσθησιν διὰ τὸν ὕπνον, διὰ τὸ καὶ τῶν μικρῶν κινήσεων τῶν ἐντὸς αἰσθάνεσθαι καθεύδοντας μᾶλλον ἢ ἐγρηγορούσας. αὗται δ' αἱ κινήσεις φαντάσματα ποιοῦσιν, ἐξ ὧν προορῶσι τὰ μέλλοντα περὶ τῶν τοιούτων.

⁸⁹ Mansfield, Goddard, Moldofsky 2003, 60.

⁹⁰ Preus 1957, 21: "Aristotle's sources of biological information were of three general sorts: 1) written sources, literary, philosophical, and otherwise; 2) the oral tradition and interviews with fishermen, farmers and others; 3) his own dissections and observations". Although he relied upon written sources and oral tradition, he observed many phenomena ἰδίῳ ὁμμασι (with his own eyes).

Practically all other animals, aquatic, winged and terrestrial, partake in sleep (for all kinds of fish and mollusks have been observed asleep, and all other animals which have eyes; for clearly even hard-eyed animals and insects repose, but these creatures only sleep for a short time, so that one might often doubt whether they partake in sleep or not), but in the case of the testacea direct observation has not yet proved whether they sleep or not. But if the foregoing argument appeals to anyone, he will be satisfied that they do.

Therefore that all animals partake in sleep is obvious from the following considerations. The animal is defined by the possession of sensation, and we hold that sleep is in some way the immobilization or fettering of sensation, and that the release or relaxation of this is waking. (trans. W. S. Hett)

Furthermore, Aristotle at *Historia Animalium* (Περὶ τὰ Ζῷα Ἱστορίαι), iv 10.536b25-537b22 offers a more detailed description of the phenomenon of sleep in animals that are blooded (ἐναιμα) and have legs (πεζά), fish (ἰχθύες), mollusks (μαλάκια), crustaceans (μαλακόστρακα), insects (ἔντομα), hard-eyed animals (σκληρόφθαλμα) and every other creature that has eyes. Also, he notices that:

ἔτι δ' ἐνυπνιάζειν φαίνονται οὐ μόνον ἄνθρωποι, ἀλλὰ καὶ ἵπποι καὶ κύνες καὶ βόες, ἔτι δὲ πρόβατα καὶ αἴγες καὶ πᾶν τὸ τῶν ζωοτόκων καὶ τετραπόδων γένος· δηλοῦσι δ' οἱ κύνες τῷ ὕλαγμῳ. περὶ δὲ τῶν φωτοκούντων τοῦτο μὲν ἄδηλον, ὅτι δὲ καθεύδουσι, φανερόν. ὁμοίως δὲ καὶ τὰ ἐνυδρα, οἷον οἱ τ' ἰχθύες καὶ τὰ μαλάκια καὶ τὰ μαλακόστρακα, κάραβοι τε καὶ τὰ τοιαῦτα. Βραχύθυνα μὲν οὖν ἔστι πάντα ταῦτα, φαίνεται δὲ καθεύδοντα. (*Historia Animalium* iv 10.536b27-537a2)

It appears, that it is not only human beings who dream (ἐνυπνιάζειν), but also horses, and dogs, and cattle, and further sheep, and goats, and all viviparous quadrupeds; and dogs show it by barking in their sleep. As far as it concerns oviparous animals, it is not sure that they dream, but it is obvious they sleep. And the same holds for water animals, such as fish and molluscs, and crustaceans, crayfish and the like. All these animals sleep, undoubtedly, but their sleep is for a short period of time.

Decades of research have shown and therefore have confirmed the Aristotelian view that “practically all other animals...partake in sleep”. We now know with reasonable certainty that all mammals and birds sleep.

Many studies have shown that all mammals and birds experience REM ('Rapid Eye Movement Sleep')⁹¹ and non-REM sleep, but with some differences. REM and non-REM sleep episodes are quite shorter in birds than in mammals. “Their NREM sleep

⁹¹ Two sleep researchers at the University of Chicago, Nathaniel Kleitman and his student Eugene Aserinsky, discovered the rapid-eye movement (REM) sleep and its association with dreaming in 1953.

episodes average only 2 ½ minutes, and REM sleep episodes only 9 seconds",⁹² whereas in humans, for example, the average length of non-REM and REM sleep is about 90 to 120 minutes.

The following table lists the average sleep time for various mammals in over a 24-hour period:⁹³

Mammals	Average Daily Sleep Time (in hours)
Giraffe	1.9
Elephant	3.6
Whale	5.3
Human	8.0
Baboon	9.4
Domestic Cat	12.5
Laboratory rat	13.0
Lion	13.5
Squirrel	15.9
Big Brown Bat	20
Koala	The longest sleeping animal 22

Researchers have now been able to show that fish, hard-shelled animals, mollusks and insects 'sleep', but not in the same way as mammals and birds do. Since most fish do not have eyelids⁹⁴ (except from sharks),⁹⁵ they 'sleep' or 'rest' with their eyes open during the day or at night. They go into a state of inactivity. Hard-shelled animals, mollusks and insects experience some kind of repose, too.⁹⁶

⁹² See Sleep Research Society 1997, <<http://www.sleepsources.org/uploads/sleepsyllabus/m.html>>.

⁹³ This table was adapted from the following sources: (a) Kryger, Avidan and Berry (eds) 2014, 68-69, (b) Allada and Siegel 2008, R671, (c) Sleep Research Society 1997, <<http://www.sleepsources.org/uploads/sleepsyllabus/m.html>>.

⁹⁴ Eyelid's function is to keep the eye moist, because the eye's outermost layer, the cornea, must be kept moist. Most fish do not have lachrymal glands and eyelids, because they live in water that keeps their eyes moist.

⁹⁵ Sharks have a nictitating membrane, which can be pulled down over the eye.

⁹⁶ Cf. McNamara, Barton and Nunn (eds) 2010.

- ❖ Aristotle, as we have already said, asserts that sleep provides rest (ἀνάπαυσις) to the sense organs, since all bodily parts, which have a natural function, are unable to act continuously without interruption.

ὅτι ὅσων ἐστὶ τι ἔργον κατὰ φύσιν, ὅταν ὑπερβάλλῃ τὸν χρόνον ᾧ δύνатаι χρόνῳ τι ποιεῖν, ἀνάγκη ἀδυνατεῖν, οἷον τὰ ὄμματα ὁρῶντα καὶ παύεσθαι τοῦτο ποιοῦντα, ὁμοίως δὲ καὶ χεῖρα καὶ ἄλλο πᾶν οὗ ἐστὶ τι ἔργον. εἰ δὲ τινὸς ἐστὶν ἔργον τὸ αἰσθάνεσθαι, καὶ τοῦτο ἂν ὑπερβάλλῃ ὅσον ἦν χρόνον δυνάμενον αἰσθάνεσθαι συνεχῶς, ἀδυνατήσῃ καὶ οὐκέτι τοῦτο ποιήσῃ. (*De Somno* 1.454a26-32)

for all things that have a natural function, as soon as they exceed the time for which they are able to do a certain thing, must become impotent, e.g. the eyes by exercising vision [must become impotent], and must cease from doing it, and similarly the hand, and everything else that has a function. So if sense perception is the function of some part, this too, if it exceeds the due time for which it is capable of perceiving continuously, will become powerless, and will do so no longer.

πρῶτον μὲν οὖν ἐπειδὴ λέγομεν τὴν φύσιν ἕνεκά του ποιεῖν, τοῦτο δ' ἀγαθόν τι, τὴν δ' ἀνάπαυσιν παντὶ τῷ πεφυκότι κινεῖσθαι, μὴ δυναμένῳ δ' αἰεὶ καὶ συνεχῶς κινεῖσθαι μεθ' ἡδονῆς ἀναγκαῖον εἶναι καὶ ὠφέλιμον, τῷ δ' ὕπνῳ αὐτῇ τῇ ἀληθείᾳ προσάπτουσι τὴν μεταφορὰν ταύτην ὡς ἀναπαύσει ὄντι. (*De Somno* 2.455b17-21)

First of all then, since we assert that nature acts for the sake of an end, and that this end is a good, and that to everything that moves by nature, but cannot move constantly and continuously with pleasure, rest is necessary and beneficial; and the metaphorical term of sleep as 'rest' "reflects the literal truth"⁹⁷.

Consequently, sleep for Aristotle is a good thing and serves a restorative function. It helps the body to rest and rejuvenate. This view has been frequently explored in modern and contemporary era.⁹⁸ Modern sleep research started in the 1930s with the invention of the electroencephalography (EEG). The advent of new technology has allowed scientists to study sleep in a systematic and objective way, and to develop a number of different theories in order to explain the function/purpose of sleep.

"Among the major theories that have been formulated to explain the function/purpose of sleep is the *repair/restorative theory* (e.g., Webb 1981; cf: Cohen 1979; Shapiro 1982), which suggests that sleep serves an important recuperative function, allowing one to recover not only from physical fatigue, but also from emotional and intellectual demands".⁹⁹

Two of the most important *repair/restorative theories* are those of Oswald (1969, 1980) and Horne (1988). The British sleep researcher, I. Oswald, asserted that non-REM sleep

⁹⁷ Gallop 1996, note 6, 70 and 71.

⁹⁸ Cf. Mansfield, Goddard, Moldofsky 2003, 61.

⁹⁹ Roeckelein 1998, 437.

restores bodily functions that have deteriorated at the end of the day, while REM sleep replenishes mental functions, through the stimulation of protein synthesis that is increased during sleep and is needed for the restoration of bodily tissue and cell growth. Oswald pointed out that there is a substantial release of growth hormone from the pituitary gland during deep non-REM sleep. This hormone stimulates protein synthesis.

J. Horne's (1988) restorative theory resembles that of Oswald's (1980). Horne believed that sleep is divided into *core sleep* (REM and non-REM) and *optional sleep* (lighter stages of non-REM). *Core sleep* is essential for the restoration and the maintenance of the brain, while "optional sleep, as its name implies, is not essential for normal functioning of either the brain or the body".¹⁰⁰

The basic difference between the two theories is that Oswald suggested that non-REM sleep restores bodily processes that have been active during the day, whereas Horne does not.

- ❖ Aristotle says that sleep takes place especially after the ingestion of food (ἐκ τῆς περὶ τὴν τροφήν ἀναθυμιάσεως),¹⁰¹ while awakening occurs, when the process of digestion is finished (ὅταν πεφθῇ καὶ κρατήσῃ ἡ συνεωσμένη θερμότης).¹⁰² Therefore, the philosopher connects food ingestion and digestion with the sleep-wake cycle. For Mansfield, Goddard and Moldofsky "this notion is evident in recent studies which describe how different feeding programs can alter the sleep-wake cycle of rats via input from the vagus nerve¹⁰³ or entrainment of the circadian clock in the liver¹⁰⁴".¹⁰⁵

Hansen *et al.* (1998) examined the effects of a "cafeteria diet" on sleep-wake activity and brain temperature (T_{br}) in control and vagotomized rats for 7 consecutive days. The researchers found that in control rats, the "cafeteria diet" consisting of palatable high fat foods, "resulted in an increase in non-REM sleep, which was due to a significant lengthening of the non-REM sleep episodes, and in a decrease in REM sleep".¹⁰⁶ In contrast, "in vagotomized rats, cafeteria feeding resulted in a decrease in both non-REM sleep and REM sleep".¹⁰⁷ Furthermore, cafeteria diet increased brain temperature (T_{br}) in both control and vagotomized rats.

¹⁰⁰ Green 2011, 66.

¹⁰¹ *De Somno* 3.456b18-19.

¹⁰² *Op. cit.* 3.458a10-11.

¹⁰³ Hansen *et al.* 1998, R172: "The vagus nerve is an important communication pathway between the gastrointestinal tract and the central nervous system".

¹⁰⁴ Cf. Stokkan *et al.* 2001, 490-493, demonstrated that there is a link between feeding and the liver clock, that functions independently of the master clock in the Suprachiasmatic Nucleus (SCN) and the light cycle.

¹⁰⁵ Mansfield, Goddard, Moldofsky 2003, 61.

¹⁰⁶ Hansen *et al.* 1998, R172.

¹⁰⁷ *Op. cit.*, R172.

Roky *et al.* (1999) in their study showed that food and water restriction to the light period for 29 days changed the sleep-wake cycle of Sprague-Dawley rats. During this period, the daily rhythm of REM sleep and temperature of the brain (T_{br}) were reversed, while the distribution of non-REM sleep between the sleep and wake cycles was attenuated.¹⁰⁸

- ❖ Aristotle describes sleep as the cooling of the 'primary sense-faculty' or 'primary sensitive/perceptive part' (πρῶτον αἰσθητικόν), which is located in the heart. The region around the brain acts as a coolant during sleep, while the things that cause sleeping are hot. Accordingly, during sleep the body temperature goes up and down.

τῆς μὲν οὖν κινήσεως φανερόν ὅτι καὶ ἡ τοῦ πνεύματος ἀρχὴ καὶ ὅλως ἡ τῆς καταψύξεως ἐστὶν ἐνταῦθα [τὸ περὶ τὴν καρδίαν μέρος]. (*De Somno* 2.456a6-8)

Now, as for movement, it is obvious that the origin of breathing and the cooling process in general, is found there [the region about the heart].

τὸν μὲν ὕπνον εἶναι κατάψυξιν, τὰ δ' αἷτια τοῦ καθεύδειν θερμά. (*De Somno* 3.457b9-10)

sleep should be a cooling process, while the causes of sleep are hot.

οὐ μὴν ἀλλὰ κύριός γ' ἐστὶν ὁ τόπος ὁ περὶ τὸν ἐγκέφαλον, ὥσπερ ἐν ἄλλοις εἴρηται. πάντων δ' ἐστὶ τῶν ἐν τῷ σώματι ψυχρότατον ὁ ἐγκέφαλος, τοῖς δὲ μὴ ἔχουσι τὸ ἀνάλογον τοῦτω μόριον. (*De Somno* 3.457b27-31)

the region about the brain, however, is the dominant factor, as has been said elsewhere. The brain, or the analogous part in animals that have no brain, is the coldest of all parts of the body.

Several types of evidence in recent times support the view that sleep onset is associated with body cooling in several species. "Sleep onset in humans is associated with a reduction of body temperature of 1° to 2° C accompanied by heat loss due to vasodilation [widening of blood vessels] and increased sweating".¹⁰⁹ Body temperature is controlled by the *preoptic area/anterior hypothalamus* (also called PO/AH), where there are neurons sensitive in skin and blood temperatures (temperature-sensitive neurons).

During periods of non-REM (NREM) sleep or slow-wave sleep (SWS), the temperature of both the brain and body decrease. The longer the non-REM sleep episode, the more the temperature falls. In contrast, the temperature of the brain increases during REM sleep.

¹⁰⁸ Roky *et al.* 1999, 697.

¹⁰⁹ Chokroverty 1994, 68.

"Many mammals lose significant thermal regulatory capacity during sleep. Some animals like squirrels go into a torpor state during sleep, in which their body temperature dips well below the normal level for hours at a time".¹¹⁰ McGinty and Szymusiak hypothesize that:¹¹¹

slow-wave sleep (SWS) in mammals and birds is controlled by thermoregulatory mechanisms, and provides brain and body cooling as a primary homeostatic feedback process...Studies have shown that SWS, like other heat loss processes, is facilitated when brain temperature exceeds a threshold level. This threshold is hypothesized to be determined by responses of PO-AH thermosensitive neurons and to be regulated by both circadian and homeostatic processes...At a functional level, SWS-induced brain and body cooling would provide several adaptations including lower energy utilization, reduced cerebral metabolism, protection of the brain against the sustained high temperatures of wakefulness, facilitation of immune defense processes and regulation of the timing to behavioral activity relative to the circadian light-dark cycle.¹¹²

- ❖ According to Mansfield, Goddard and Moldofsky, "Aristotle's theory of the final cause of sleep being animal preservation [ἔνεκα σωτηρίας] is also revisited in contemporary thinking".¹¹³

ὥστε σωτηρίας ἔνεκα τῶν ζώων ὑπάρχει. (*De Somno* 2.455b22)

it follows that sleep exists for the preservation/conservation of animals.

ἐξ ἀνάγκης μὲν γινόμενος (οὐ γὰρ ἐνδέχεται ζῶον εἶναι μὴ συμβαινόντων τῶν ἀπεργαζομένων αὐτό), ἔνεκα δὲ σωτηρίας· σώζει γὰρ ἢ ἀνάπαισις. (*De Somno* 3.458a29-32)

sleep occurs of necessity (for it is not possible for an animal to exist, if the conditions that produce it not obtain), and sleep exists for its preservation/conservation; for rest preserves/conserves.

One of the major and earliest theories that have been formulated to explain the function/purpose of sleep is the *adaptive non-responding theory* (Webb 1974),¹¹⁴ also known as *evolutionary/circadian theory* (Kleitman 1963). This theory suggests that sleep has evolved as a means of conserving energy and promoting survival by keeping organisms out of harm's way at times when they would be most vulnerable. Sleep

¹¹⁰ See Sleepdex 2013, <<http://www.sleepdex.org/thermoregulation.htm>>.

¹¹¹ See Mansfield, Goddard, Moldofsky 2003, 60-61.

¹¹² McGinty, Szymusiak 1990, 480.

¹¹³ Mansfield, Goddard, Moldofsky 2003, 61.

¹¹⁴ Webb 1974, 1023: "We have chosen to use the term non-responding to mean qualitatively minimal behavioral engagement with the surround".

protects animals from predators, and permits them to better adapt to their environment (Meddis 1975).

The *adaptive non-responding theory* is supported by comparative research of different animal species. Animals that have less predation risks (e.g., lions), sleep longer than prey species (e.g., giraffes). Sleep time is reduced in prey species, as they have to remain alert and aware of nearby predators.

- ❖ It is interesting to note that Aristotle associates epilepsy (ἐπιληψία)¹¹⁵ with sleep. He regards sleep as a kind of an epileptic fit, but not a pathological one. He remarks:

τὰ γὰρ παιδιά καθεύδει σφόδρα διὰ τὴν τροφὴν ἄνω φέρεσθαι πᾶσαν. σημεῖον δὲ τὸ ὑπερβάλλειν τὸ μέγεθος τῶν ἄνω πρὸς τὰ κάτω κατὰ τὴν πρώτην ἡλικίαν, διὰ τὸ ἐπὶ ταῦτα γίνεσθαι τὴν αὔξησιν. διὰ ταύτην δὲ τὴν αἰτίαν καὶ ἐπιληπτικὰ γίνεται ὅμοιον γὰρ ὁ ὕπνος ἐπιλήψει, καὶ ἔστι τρόπον τινὰ ὁ ὕπνος ἐπιληψις. διὸ καὶ συμβαίνει πολλοῖς ἡ ἀρχὴ τοῦτου τοῦ πάθους καθεύδουσιν, καὶ καθεύδοντες μὲν ἀλίσκονται, ἐγρηγορότες δ' οὐ ὅταν γὰρ πολὺ φέρεται τὸ πνεῦμα ἄνω, καταβαῖνον πάλιν τὰς φλέβας ὀγκοῖ, καὶ συνθλίβει τὸν πόρον δι' οὗ ἡ ἀναπνοὴ γίνεται. (*De Somno* 3.457a12-14)

for children sleep very much, because all their food rises upwards. A proof of this whereof seems in the excessive size of the upper parts compared with the lower during early childhood, because growth takes place in these parts. Hence too they are liable to epilepsy, for sleep is like epilepsy; in fact, sleep is, in a way, epilepsy. That is why for some people the beginning of this affection happens during sleep, and they become seized with it while asleep, but not while awake. For when a great mass of *pneuma* moves upwards, it swells the blood-vessels as it descends again, and compresses/constricts the passage through which respiration passes.

The philosopher thinks of sleep, like epilepsy, as a temporary failure of consciousness. He observes the occurrence of epileptic seizures during sleep¹¹⁶ and says that children are “particularly prone to the disease (a widely known fact in antiquity)”.¹¹⁷ These observations somehow prefigure the contemporary type of

¹¹⁵ For the history of epilepsy see Temkin 1971. Epilepsy was generally believed to be of divine origin. It was regarded as a 'sacred disease'. The earliest mention of epileptic seizures can be traced back to 2,000 B.C. in ancient Mesopotamia. In 400 B.C. Hippocrates of Kos (460-370 B.C.), the father of medicine, in his treatise *De Morbo Sacro* (Περὶ Ἱερῆς Νοῦσου), disputes the divine origin of epilepsy and describes it as a natural disease. Cf. Hippocrates, *De Morbo Sacro* 1.1-6: Περὶ τῆς ἱερῆς νοῦσου καλεομένης ὧδ' ἔχει. οὐδέν τι μοι δοκεῖ τῶν ἄλλων θειοτέρη εἶναι νοῦσων οὐδὲ ἱερωτέρη, ἀλλὰ φύσιν μὲν ἔχει καὶ πρόφασιν, οἱ δ' ἄνθρωποι ἐνόμισαν θεῖον τι πρῆγμα εἶναι ὑπὸ ἀπειρίας καὶ θαυμασιότητος, ὅτι οὐδὲν ἔοικεν ἑτέροις. The two Hippocratic treatises *De Morbo Sacro* (Περὶ Ἱερῆς Νοῦσου) and Chapter 14 of *De Flatibus* (Περὶ Φυσῶν) provide an in-depth etiological account of epilepsy. Also, many other medical treatises of the Hippocratic Corpus contain references to epilepsy. Hippocrates was the first physician to attribute the etiology of epilepsy to brain disorder.

¹¹⁶ Both Hippocrates and Aristotle observed the relationship between sleep and epileptic seizures.

¹¹⁷ Cf. van der Eijk 2005, 134.

'absence seizures' (formerly called 'petit mal' seizures),¹¹⁸ that usually occur in school-aged children and young people.¹¹⁹

According to Lo Presti "Aristotle's association of epilepsy with sleep is anything but a unique example in the history of the medical representation of epilepsy".¹²⁰ However, the relationship of epilepsy and sleep was not studied until the second half of the nineteenth century. In 1885, the British neurologist William Richard Gowers examined the effect of the sleep/wake cycle on 'grand mal' seizures.¹²¹ In 1890, the French neurologist Charles Féré described specific sleep disorders associated with epilepsy. But in the electroencephalography (EEG) period¹²² Professor Pierre Passouant and colleagues,¹²³ were the first to report an association between epileptiform discharges (EDs) and sleep phasic phenomena.

- ❖ Aristotle in lines 462a6-8 of *De Insomniis* mentions that "(for often, while someone is asleep, there is something in the soul which says that this phenomenon [what is appearing] is a dream); but if he is not aware that he is asleep, then there is nothing which will contradict the imagination" [(πολλάκις γὰρ καθεύδοντος λέγει τι ἐν τῇ ψυχῇ ὅτι ἐνύπνιον τὸ φαινόμενον)· ἐὰν δὲ λανθάνῃ ὅτι καθεύδει, οὐδὲν ἀντιφῆσι τῇ φαντασίᾳ]. This view is one of the first written historical descriptions of *lucid dreaming* in the Western civilization. *Lucid dreaming* is the *conscious dreaming*, is a phenomenon, according to which a person who is asleep and dreaming he becomes consciously aware in his dream that he is dreaming.

Frederik Willem van Eeden (1860-1932), a Dutch psychiatrist, used for the first time the term 'lucid dreaming':¹²⁴

The seventh type of dreams, which I call lucid dreams, seems to me the most interesting and worthy of the most careful observation and study. Of this type I

¹¹⁸ 'Absence seizures' (they are also called 'petit mal' seizures) are seizures that usually last a few seconds and involve a brief impairment of consciousness. Chokroverty 1994, 433: "Absence seizures occurring during sleep are difficult to diagnose and clinical absence seizures are observed in the waking state. According to Niedermeyer there may be fluttering of the eyelids during the spike and wave discharges in sleep. Gastaut and colleagues and Patry et al described occasional cases of petit mal status in REM sleep".

¹¹⁹ Lo Presti 2013, 208.

¹²⁰ *Op. cit.*, 206.

¹²¹ 'Grand mal' seizures, or generalized tonic-clonic seizures, are seizures that occur almost exclusively in non-REM sleep and affect the entire body. They involve loss of consciousness and violent muscle contractions. Chokroverty 1994, 433: "Primary generalized 'grand mal' seizure occurs almost exclusively in non-REM sleep and is most frequently seen 1-2 hours after sleep onset and at 5-6 a.m. as noted originally in 1985 by Gowers and later by others. Grand mal seizure may occur only during sleep, only during daytime or randomly distributed".

¹²² The electroencephalography was invented in 1929 by the German physiologist and psychiatrist Hans Berger (1873-1941).

¹²³ Passouant, Cadilhac, Philippot 1951, 659-663.

¹²⁴ See van Eeden 1913, 431-461.

experienced and wrote down 352 cases in the period between January 20, 1898, and December 26, 1912.

In these lucid dreams the reintegration of the psychic functions is so complete that the sleeper remembers day-life and his own condition, reaches a state of perfect awareness, and is able to direct his attention, and to attempt different acts of free volition. Yet the sleep, as I am able confidently to state, is undisturbed, deep and refreshing.¹²⁵

Surprisingly, the father of psychoanalysis, Sigmund Freud (1856-1939), mentioned lucid dreams very briefly. He added a paragraph in the 1909-second edition of his classic work *The Interpretation of Dreams* (*Die Traumdeutung* 1899), and another one to the book's fourth edition in 1914. "Even there, he doesn't mention lucid dreaming by name, despite having met and corresponded with Frederic van Eeden...who coined the term 'lucid dream' in his seminal 1913 article, 'A Study of Dreams'"¹²⁶:

On the other hand, there are some people who are quite clearly aware during the night that they are asleep and dreaming and who thus seem to possess the faculty of consciously directing their dream. If, for instance, the dreamer of this kind is dissatisfied with the turn taken by a dream, he can break it off without waking up and start it again in another direction – just as a popular dramatist may under pressure give his play a happier ending. Or another time, if his dream has led him into a sexually exciting situation, he can think to himself: 'I won't go on with this dream any further and exhaust myself with an emission; I'll hold it back for a real situation.'

The Marquis d' Hervey de Saint-Deny... claimed to have acquired the power of accelerating the course of his dreams just as he pleased, and of giving them any direction he chose. It seems as though in his case the wish to sleep had given place to another preconscious wish, namely to observe his dreams and enjoy them. Sleep is just as compatible with a wish of this sort as it is with a mental reservation to wake up if some particular condition is fulfilled.¹²⁷

Lucid dreams have been proven scientifically to exist. The first scientific research on lucid dreaming was Celia Green's 1968 study *Lucid Dreams*.¹²⁸ Furthermore, Keith Hearne produced the first laboratory evidence of lucid dreaming in the late 1970's.¹²⁹ In the early 1980s the psychophysiologicalist Stephen LaBerge made the study of lucid dreaming into a science by demonstrating its existence.¹³⁰ He "validated the psycho-

¹²⁵ van Eeden 1913, <<http://www.lucidity.com/vanEeden.html>>.

¹²⁶ Thomson 2015, 143.

¹²⁷ Freud 2010, 571.

¹²⁸ Cf. Celia Green 1968.

¹²⁹ Cf. Hearn 1978.

¹³⁰ Cf. LaBerge 1985.

physical markers of lucidity with an EEG machine".¹³¹ In 2009 the psychiatrist Allan Hobson¹³² linked lucid dreaming to consciousness. Researchers continue to conduct scientific experiments in order to learn more about this fascinating and complex phenomenon.

- ❖ The Macedonian philosopher refers briefly to the phenomenon of 'somnambulism or noctambulism' (sleep-walking). In lines 456a25-26 of *De Somno* he says that "some people move in their sleep and do many waking acts but not without any (mental) image/representation and sensation" (Κινούνται δ' ἔνιοι καθεύδοντες καὶ ποιοῦσι πολλὰ ἐγρηγορικά, οὐ μέντοι ἄνευ φαντάσματος καὶ αἰσθησέως τινος).

Somnambulism (from the Latin *somnus* = sleep and *ambulare* = to walk around) has been described since before the time of Hippocrates and it has puzzled people for centuries. It is a mysterious behaviour, a sleep disorder (parasomnia). The advances in technology and the development of Neuroscience from the second half of the twentieth century have led to an increasingly understanding of this intriguing phenomenon. Recent researches have discovered that *somnambulism* most often occurs during the non-REM sleep stage early in the night—within the first third or first half of the sleep period. It "involves a series of complex motor behaviors and results in walking during altered consciousness".¹³³

- ❖ Aristotle in lines 458b16-20 of *De Insomniis* mentions that when we are asleep, we sometimes think (ἐννοοῦμεν) –it functions the rational (νοητικόν) or discursive (διανοητικόν) part or faculty of the soul– something else besides the *phantasmata*. And he adds that "this would become obvious to anyone if he concentrates and tries to remember [it functions memory] his dream immediately upon rising" (trans. W. S. Hett):

ἔτι παρὰ τὸ ἐνύπνιον ἐννοοῦμεν ἄλλο τι, καθάπερ ἐν τῷ ἐγρηγορέναι αἰσθανόμενοι τι· περὶ οὗ γὰρ αἰσθανόμεθα, πολλάκις καὶ διανοοῦμεθα τι. οὕτω καὶ ἐν τοῖς ὕπνοις παρὰ τὰ φαντάσματα ἐνίστε ἄλλα ἐννοοῦμεν, φανεῖν δ' ἂν τῷ τοῦτο, εἴ τις προσέχοι τὸν νοῦν καὶ πειρῶτο μνημονεύειν ἀναστὰς.

So, according to Aristotle's remarks on the previous paragraph, we realize that there is a mental activity in dreams similar to the activity we have in waking life while we are perceiving something. This view is supported by modern and contemporary studies on sleep creativity. Dreams can be used for decision-making and creative problem solving. In 1892, Charles M. Child did the first study on sleep creativity. Child asked 186 students if they had ever solved a problem during sleep. One third said they

¹³¹ Hurd 2009, <<http://www.dreaminglucid.com/articles/The%20Science%20of%20Lucid%20Dreaming.pdf>>.

¹³² Cf. Hobson 2002. *Idem.* 2009, 41-44.

¹³³ Harris-Thorpy 2012, 189.

had. In 1993, Deirdre Barrett, a clinical psychologist at Harvard Medical School, conducted an experiment asking 76 college students to choose a real-life homework problem and incubate answers. She found that at the end of a week, half of the students had dreamed about the problem, and about a quarter had a dream that contained a solution.¹³⁴ Barrett came to the conclusion that “dreams are thinking or problem solving¹³⁵ in a different biochemical state from that of waking”.¹³⁶

- ❖ The philosopher believed that dreaming is not the work of actual perception, since external sense objects/stimuli are absent during sleep. But the affection (πάθος) produced by them (external sense objects/stimuli correspond to each sensory organ and produce sense-perception in us) persists in the sense organs, not only when the sense organs are actualized, but even when the external stimuli have gone:

Τὶ δ' ἐστὶ τὸ ἐνύπνιον καὶ πῶς γίνεται, ἐκ τῶν περὶ τὸν ὕπνον συμβαινόντων μάλιστα ἂν θεωρήσαιμεν. τὰ γὰρ αἰσθητὰ καθ' ἕκαστον αἰσθητήριον ἡμῖν ἐμποιοῦσιν αἴσθησιν, καὶ τὸ γινόμενον ὑπ' αὐτῶν πάθος οὐ μόνον ἐνυπάρχει ἐν τοῖς αἰσθητηρίοις ἐνεργουσὼν τῶν αἰσθήσεων, ἀλλὰ καὶ ἀπελθουσῶν. (*De Insomniis* 2.459a24-28)

This means that dreams, according to Aristotle, are manifestations of internal sensations (καὶ ἀπελθόντος τοῦ θύραθεν αἰσθητοῦ ἐμμένει τὰ αἰσθήματα αἰσθητὰ ὄντα, *op. cit.* ii 460b 2-3), which are expressed as ‘dream imagery’.

The above view is analogous to contemporary clinico-anatomical studies on dreaming or ‘dream imagery’. In the dream state the external sensory perception is limited/suspended, while ‘dream imagery’ is generated by “projecting information backward in the [visual] system” (Kosslyn), so that “internally generated images which are fed backwards into the [visual] cortex as if they were coming from outside” (Zeki).¹³⁷

- ❖ Aristotle was probably one of the first who made remarks on ‘hypnagogic’ (state of consciousness that marks the onset of sleep/the period of transition

¹³⁴ Barrett 1993, 115-123. Barrett in her book entitled *The Committee of Sleep* (2001), describes how some of the most creative personalities in the fields of science (Einstein), music (Beethoven, Beatles), politics (Ghandi) etc. used their dreams for creative problem solving.

¹³⁵ G. William Domhoff is against any problem-solving theory of dream function. He argues that “creative thinking during sleep does not mean that dreams have a problem-solving function” Cf. Domhoff 2003, http://www2.ucsc.edu/dreams/Library/domhoff_2004b.html.

¹³⁶ Barrett, McNamara 2007, xiv.

¹³⁷ Cf. Kosslyn 1994, 74; Zeki 1993, 326.

into sleep)¹³⁸ and 'hypnopompic' (the transition from sleep to wakefulness)¹³⁹ phenomena/hallucinations:

Ὅτι δ' ἄληθῃ λέγομεν καὶ εἰσὶ κινήσεις φανταστικαὶ ἐν τοῖς αἰσθητηρίοις, δῆλον, ἐάν τις προσέχων πειρᾶται μνημονεύειν ἃ πάσχομεν καταφερόμενοί τε καὶ ἐγειρόμενοι· ἐνίοτε γὰρ τὰ φαινόμενα εἶδωλα καθεύδοντι φωράσει ἐγειρόμενος κινήσεις οὔσας ἐν τοῖς αἰσθητηρίοις· ἐνίοις γὰρ τῶν νεωτέρων καὶ πάνπαν διαβλέπουσιν, ἐάν ἢ σκοτός, φαίνεται εἶδωλα πολλὰ κινούμενα, ὥστ' ἐγκαταλύπτεσθαι πολλάκις φοβουμένους. (*De Insomniis* 3.462a8-15)

It becomes clear that our statement is true, and that there are movements of imagination in the sense organs, if one attentively tries to remember how we are affected when falling asleep or waking up; For sometimes one will detect, when waking up, that the images which appear in sleep are movements in the sense organs; Indeed some very young people, even when their eyes are wide open, if it is dark, many moving images appear, so that they often conceal themselves in terror.

The Stageirite carefully observes that some people experience images (εἶδωλα) between sleeping and waking. When waking up, occasionally it is possible to detect these images as movements of imagination (κινήσεις φανταστικαὶ) in the sense organs. David Gallop correctly says that Aristotle "does not explain how [these images] are detected. But he takes them as evidence for movements subsisting within the eyes, like the frightening objects seen in the dark by children, which they vainly try to shut out by covering their heads".¹⁴⁰

The investigation of these perceptual phenomena began in the 19th century through the research works of Johannes Peter Müller (1826), Jules Gabriel François Baillanger (1846), Louis-Ferdinand-Alfred Maury (1848),¹⁴¹ and it continues until today. Hypnagogic or hypnopompic hallucinations are usually visual, auditory, tactile, olfactory or more complex sensory phenomena taking place between sleeping and waking. "Taken together, hypnagogic and hypnopompic hallucinations are referred to as 'hypnagogia [cf. Mavromatis 1987]".¹⁴² During hypnagogia the affected person may see visions (e.g. coloured circles, faces), hear sounds (e.g. bangs, vocal or instrumental music), smell unpleasant odors etc. that aren't there. These phenomena are quite vivid, last from a few seconds to more than fifteen minutes, and are usually associated with narcolepsy (a chronic neurological disorder).

¹³⁸ The term 'hypnagogic' [from the Ancient Greek words 'ὕπνος' (sleep) and 'ἄγωγός' (leader)] was introduced by the French psychologist Louis-Ferdinand-Alfred Maury (1817-1892).

¹³⁹ The term 'hypnopompic' [from the Ancient Greek words 'ὕπνος' (sleep) and 'ἄγωγός' (leader)] was coined by the British physical researcher Frederic W. H. Myers (1834-1901).

¹⁴⁰ Gallop 1996, 152-153.

¹⁴¹ Blom 2010, 251.

¹⁴² Blom 2010, 251.

- ❖ Aristotle tells us that external or somatic stimuli become a part of a dream. For example faint noises in our ears sound like a thunder or a lightening; a very slight heat in any part of the body is felt like walking through fire:

δῆλον δ' ἐπὶ τῶν συμβαινόντων κατὰ τοὺς ὕπνους πολλάκις οἴονται γὰρ κεραυνοῦσθαι καὶ βροντᾶσθαι μικρῶν ἤχων ἐν τοῖς ὡσὶ γινομένων, καὶ μέλιτος καὶ γλυκέων χυμῶν ἀπολαύειν ἀκαριαίου φλέγματος καταρρέοντος, καὶ βαδίζειν διὰ πυρὸς καὶ θερμαίνεσθαι σφόδρα μικρᾶς θερμασίας περὶ τινα μέρη γιγνομένης. ἐπεγειρομένοις δὲ ταῦτα φανερά τοῦτον ἔχοντα τὸν τρόπον. (*De Divinatione* 1.463a11-17)

This is clear from what often happens in sleep; dreamers think it is lightning and thundering, when faint noises fall upon their ears, and they are enjoying honey and sweet flavours, when a tiny drop of phlegm is flowing down [the oesophagus], and they are walking through fire and feeling extremely hot, when a very slight heat is affecting certain parts of the body. But when they wake up, it becomes obvious that these things have a true character.

It has been showed by numerous scientific researches that external sensory stimuli (e.g. sounds, smells and physical sensations) are sometimes incorporated into the dream scene, while the dreamer is still asleep. This phenomenon is called 'dream incorporation'. "A range of stimuli of varying modalities, such as water droplets on the skin (Dement & Wolpert, 1958), positive and negative odours (Schredl, Atanasova, Hörmann, Maurer, Hummel & Stuck, 2009), and sounds (Berger, 1963) have all been incorporated into dream content, either directly or in disguised form".¹⁴³

A famous painting by Salvador Dali, titled 'Dream Caused by The Flight of a Bee around a Pomegranate a Second Before Awakening' (1944), depicts this phenomenon. In this oil painting Dali depicts his wife, Gala, in the midst of a dream. Two droplets of water and a small pomegranate float below Gala's naked body. Above the pomegranate flies a bee. Gala's dream, caused by the noise of the bee, appears in the upper part of the painting. From a large pomegranate bursts out a fish, from whose mouth two tigers spews out together with a bayonet (a symbol of the stinging bee) which, one second later, will sting Gala in the arm and wake her up.¹⁴⁴

- ❖ Aristotle's natural theory of how prophetic/divinatory dreams "which are extraordinary either in time, place or magnitude" and consequently are not mere coincident, might come about, "is in fact, better suited to telepathy than

¹⁴³ Bloxham, Durrant 2014, 129.

¹⁴⁴ Alarcó, http://www.museothyssen.org/en/thyssen/ficha_obra/352 : "Dali explained in 1962 that in this dream, which takes place in broad daylight, he had the idea of 'putting into an image for the first time Freud's discovery of the typical dream involving a long story argument, resulting from the instantaneity of an accident causing awakening. Just as the dropping of a rod on the neck of a sleeper gives rise simultaneously to his awakening and to a very long dream ending with the descent of the guillotine blade, here the sound of the bee provokes the sensation of the sting which wakes Gala'".

to precognition [foresight], as is the hypothesis of special rapport between distant friends":¹⁴⁵

τὸ δὲ τινὰς εὐθυονείρους εἶναι καὶ τὸ τοὺς γνωρίμους περὶ τῶν γνωρίμων μάλιστα προορᾶν συμβαίνει διὰ τὸ μάλιστα τοὺς γνωρίμους ὑπὲρ ἀλλήλων φροντίζειν· ὥπερ γὰρ πόρρω ὄντων μάλιστα γνωρίζουσι καὶ αἰσθάνονται, οὕτω καὶ τῶν κινήσεων· αἱ γὰρ τῶν γνωρίμων γνωριμώτεροι κινήσεις. (*De Divinatione* 1.464a27-32)

That some persons have vivid dreams, and that familiar friends have foresight/prevision especially about each other is due to the fact that familiar friends care most for each other; for as [familiar friends] in particular recognize and perceive each other at a distance, so too in the case of movements; for the movements/impulses of familiar friends are themselves more familiar.

The above excerpt explains why friends have dreams about each other: their sensory movements/impulses (κινήσεις) are more easily recognized. They are attuned to each other. Therefore, dream communication between people who are connected to each other and isolated from one another is a phenomenon that is called 'dream telepathy'.¹⁴⁶

It should be added here that Democritus (430-370 B.C.) was probably one of the first Greek philosophers who advanced a physical theory of dream telepathy. He believed that the external *eidōla* (εἰδῶλα) that result from inanimate things or living beings, travel through the air, penetrate the body-soul complex through its pores and cause the phenomenon of dreaming, when they come up again.¹⁴⁷ His view of telepathy is derived from the thesis that the *eidōla* projected by a living being are loaded with information, and they carry with them not only the external physical likeness of their source, but also the appearances (ἐμφάσεις) of its psychic movements, wishes, morals and emotions.¹⁴⁸

¹⁴⁵ Gallop 1996, 167.

¹⁴⁶ Frederic W. H. Myer (1843-1901), the founder of the Society for Psychical Research (1882), used first the term 'telepathy' [from the Greek words 'τῆλε' (far off/distance) + 'πάθος' (feeling)].

¹⁴⁷ Plutarch, *Questiones Convivales*, VIII, 10.2.735a1-735b5: φησι Δημόκριτος ἐγκαταβυσσοῦσθαι τὰ εἰδῶλα διὰ τῶν πόρων εἰς τὰ σώματα καὶ ποιεῖν τὰς κατὰ ὕπνον ὁψεις ἐπαναφερόμενα· φοιτᾶν δὲ ταῦτα πανταχόθεν ἀπιόντα καὶ σκευῶν καὶ ἱματίων καὶ φυτῶν, μάλιστα δὲ ζώων ὑπὸ σάλου πολλοῦ καὶ θερμότητος οὐ μόνον ἔχοντα μορφοειδεῖς τοῦ σώματος ἐκμεμαγμένους ὁμοιότητος (ὡς Ἐπίκουρος οἶται μέχρι τούτου Δημοκρίτῳ συνεπόμενος, ἐνταῦθα δὲ προλιπὼν τὸν λόγον), ἀλλὰ καὶ τῶν κατὰ ψυχὴν κινήματων καὶ βουλευμάτων ἐκάστῳ καὶ ἡθῶν καὶ παθῶν ἐμφάσεις ἀναλαμβάνοντα συνεφέλκεσθαι καὶ προσπίπτοντα μετὰ τούτων ὥπερ ἔμψυχα φράζειν καὶ διαγγέλλειν τοῖς ὑποδεχομένοις τὰς τῶν μεθιέντων αὐτὰ δόξας καὶ διαλογισμοὺς καὶ ὁρμάς, ὅταν ἐνάρθουσι καὶ ἀσυγχύτους φυλάττοντα προσμίξῃ τὰς εἰκόνας.

¹⁴⁸ Cf. Dodds 1973, 118: "And Democritus Atomist theory of dreams as *eidōla* which continually emanate from persons and objects, and affect the dreamer's consciousness by penetrating the pores of his body, is plainly an attempt to provide a mechanistic basis for the objective dream; it even preserves Homer's word for the objective dream-image. This theory makes explicit provision for telepathic dreams by declaring that *eidōla* carry representations (ἐμφάσεις) of the mental activities of the beings from whom they originate".

According to Tolaas and Ullman "Aristotle and Democritus made the paranormal dream [dream telepathy] an object of scientific inquiry and postulated a physical carrier for the information".¹⁴⁹ But is dream telepathy a real phenomenon?

Scientific interest in dream telepathy began with the practice of psychoanalysis since the late nineteenth century. Sigmund Freud was intrigued by telepathic dreams. In 1922 he published a paper on dreams and telepathy (*Traum und Telepathie: Vortrag in der Wiener Psychoanalytischen Vereinigung*), which was written shortly after the publication of an entire monograph about telepathic dreams by Wilhelm Stekel (*Der Telepathische Traum*). Freud believed that the telepathic occurrences during sleep must be subject to psychoanalysis like any other psychological phenomenon. He also referred to "the incontestable fact that sleep creates favorable conditions for telepathy".¹⁵⁰

The most famous clinical research on the possibility of dream telepathy was conducted in the mid-'60s by researchers Montague Ullman, MD, and Stanley Krippner, Professor of Psychology at Saybrook University, at the Dream Laboratory of Maimonides Medical Center in Brooklyn, New York. Their researches¹⁵¹ lasted more than ten years, and "yielded statistically significant results".¹⁵² However, these results have been treated with considerable skepticism by several researchers (Hansel 1989; Marks 2000; Alcock 2003).

Experiments of dream telepathy using varying systems or mechanisms have continued through the last decades, and some of them (Smith 2013, 17-25) were "well designed and so need to be taken seriously".¹⁵³

Concluding Remarks

In light of the preceding analysis, it became obvious that Aristotle explained sleep and dreams in a rational way. As E. R. Dodds remarks, the Stageirite approaches dreams from a scientific rather than a religious point of view, "and one may in fact doubt whether in this matter modern science has advanced very far beyond him".¹⁵⁴ He presents sleep and waking as psychophysical conditions, and recognizes, as the final cause of sleep, the preservation of the organism. He denies the divine or supernatural origin of dreams, and gives a physiological explanation, since he relates the formation of dreams with the function of sensation (αἴσθησις), imagination (φαντασία) and mind (νοῦς).

¹⁴⁹ Wolman 1979, 170.

¹⁵⁰ Freud 1922, 219.

¹⁵¹ From 1964 to 1972 Ullman and Krippner conducted fifteen experiments of dream telepathy.

¹⁵² Krippner 1999, 12.

¹⁵³ McNamara 2014, <<http://www.psychologytoday.com/blog/dream-catcher/201404/can-our-dreams-solve-problems-while-we-sleep>>.

¹⁵⁴ Dodds 1973, 120.

Finally, as I hope I have shown, the Stageirite was probably the first psychologist who produced a detailed and profound analysis of sleep (ϕνός) and dreams (ἐνὸπνια), and many of his observations on these phenomena have been verified by modern and contemporary experimental research (e.g. Psychology, Psychophysiology, Neurobiology, Cognitive Science etc.).

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