

PLATO ON PAIN

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If man were a unity, he would never suffer pain.

(HIPPIAS MAJOR, 2.10-11)

INTRODUCTION

IN various passages of his *corpus* Plato's dramatic characters discuss pain. With respect to what pain is, including what kinds of pain there are, the most incisive discussions occur at *Republic* 583-587, *Philebus* 31-55, and *Timaeus* 64-65.¹ The *foci* of these passages differ from one another and do so in several ways. First the *Republic* and *Philebus* passages focus on pleasure. However Plato always treats pain in conjunction with pleasure. As Socrates says at *Philebus* 31b5-6, «We could not adequately examine pleasure separately from pain». That Plato treats pleasure and pain conjointly is itself worthy of explanation. The basic premise of the explanation is that Plato views pain and pleasure as opposites (ἐναντία). Indeed the discussion in *Republic* begins with this premise: «Tell me then ... do we not say that pain is the opposite of pleasure?».² Given the premise the account of pleasure can be transposed to the account of pain and *vice versa*.³ In contrast with the focus on pleasure in the *Republic* and *Philebus* passages, in the *Timaeus* passage pain and pleasure receive equal attention. The explanation for the disparity owes to the ethical contexts of the *Republic* and *Philebus* passages and precisely to the interests within those contexts in the relation between pleasure and goodness or eudaimonia. In the *Timaeus* passage ethical concerns are peripheral and figure in a different way altogether.

The *foci* of the passages differ in the following second respect. In *Republic* and *Philebus* Socrates is principally interested in the idea that pleasure and pain may be true and false. In fact Plato conceives of pleasure and pain as subject to truth and falsity in various ways. One way, which also accords with the standard contemporary view of truth-values, is that truth and falsity are properties of representations. In the cases of pain and pleasure these representations are psychic, that is, of the ψυχή.⁴ Hence these discussions attend to psychic and representational aspects of pleasure and pain and do so in ways and to degrees not exhibited in *Timaeus*.⁵ In *Timaeus* Timaeus is principally interested in the physiology of pain and pleasure. Hence there is limited discussion of the psychology of pain and pleasure, let alone the truth-aptness of algesic and hedonic representations.⁶

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¹ There are many other things to be said about Plato on pain, in particular with regard to the value or disvalue of pain and the relation of pain to motivational psychology. But I will not address these topics here.

² *R.*, 583c3.

³ I discuss this topic further below.

⁴ I use the adjective 'psychic' in this way throughout the paper.

⁵ I discuss this topic further below.

⁶ He is also centrally interested in the relation between pain and sense perception. But with respect to this relation, again the focus is on physiology rather than psychology.

A third respect in which the foci in the three discussions differ pertains to the fact that to a large extent they all examine types of pain rather than the kind pain itself. The types of pain they examine differ. The *Timaeus* focuses on sense perceptual pain. The *Philebus* begins with a primitive set of bodily pleasures and pains, which are not sense perceptual; shifts to a type of psychic pleasure and pain; then moves through a series of false bodily, psychic, and somato-psychic pleasures and pains. As stated the *Republic* is also concerned with true and false pleasures and pains, but in this case in terms of a tripartition of pleasures and pains correlative with the tripartition of the soul in book 4. In all cases the focus on types of pain as opposed the kind pain is remarkable in its own right. Contrast the way Socrates, especially in the early dialogues, pursues the «What is *F*?» question. Socrates rejects answers that describe species or types of *F*. Evidently Plato's aims in the various pain and pleasure passages are not definitional or at least not in the way that Socrates' characteristic question is.

While the foci of *Republic*, *Philebus*, and *Timaeus* passages differ in these several ways, to a large extent the accounts developed within them are consistent. Consequently it is possible to construct a Platonic theory of pain by synthesizing their elements. In speaking of 'a Platonic theory of pain' I do not mean merely a theory of the kind pain. Such a theory may be possible; it might require abstracting away from certain details of the various types of pain discussed among these passages to their common elements.¹ Given Plato's interests in types of pain a comprehensive Platonic theory of pain should also include an account of those types as well as their interrelations.

Such a comprehensive theory in fact accords with the methodology introduced in the *Philebus* itself. Socrates emphasizes that one should not rush from the many to the one, that is, from the innumerable particular instances of pain to the single kind pain, but recognize and understand the specific number of types of pain and their interrelations.² Socrates' methodology here evinces a sophistication that his early definitional pursuits lack.

My aim in this paper is to take a step toward such a comprehensive theory. In doing so I will primarily focus on the *Timaeus* passage, hence on Plato's account of sense perceptual pain. Since the *Timaeus* does, I will focus on the physiology of sense perceptual pain. But I will supplement the physiological account with some discussion of the psychology of sense perceptual pain by drawing on contents from the *Republic* and *Philebus* passages. The resulting synthesis will be a theory of a class of bodily pains.

As Plato views it, with respect to phylogenesis and ontogenesis bodily pains are more primitive than psychic pains. But the class of bodily pains that I will be explaining are arguably³ not the most primitive class of bodily pains. Hence the focus of my discussion is neither at the most phylogenetically or ontogenetically primitive level nor at the most conceptually general level of explanation. Some justification for starting somewhere in the middle is therefore in order.

Basically my justification is twofold. First the *Timaeus* passage provides the most detailed explanation of bodily pain of any kind within Plato's *corpus*. Hence it is an espe-

¹ This is not the only way an account of the kind pain might or should be achieved. For example types of pain may be related as Aristotle views the relation between homonymous terms. This suggestion might seem anachronistic for Plato, but some grounds in support of it may be derived from consideration of the structure of the division of types of pleasure (and pain) and types of knowledge in *Philebus*.

² *Phlb.*, 16c5-18d2, esp. 18a7-b3.

³ I explain this qualification below.

cially rich site for investigation. Despite this, scholars have largely neglected it¹ – perhaps because of its focus on physiology rather than psychology. But for this reason too the passage warrants scrutiny. Second contemporary philosophical treatments of pain largely focus on bodily pain. I aim to discuss aspects of Plato’s account in relation to contemporary treatments. Doing so is intrinsically rewarding, but it also helps to clarify features of Plato’s view.

THE EXPLANATION OF PAIN AT *TIMAEUS* 64A2-65B3

The account in *Timaeus* occurs precisely at 64a2-65b3. Hereafter I refer to this passage as ‘T.’² T falls within a larger movement of the dialogue (61c2-68d7). The larger movement immediately follows Timaeus’ explanation of the material elements and compounds that constitute the cosmos. At the beginning of the larger movement Timaeus makes explicit his aim within this movement: to explain, that is, provide an *αἰτία* of, the effects that these materials have on us.³ Material elements and compounds may affect us in various ways. Timaeus’ aim is more precisely to explain one important way that these materials affect us. This one important way is in terms of *αἴσθησις*.

Αἴσθησις is polysemous. The sense in which Timaeus uses the word here is, in Plato, the dominant one. I will render this sense as «bodily perception». Bodily perception is perception that occurs by means of the body. Consider Timaeus’ statement earlier in the dialogue: «Motions carried through the body strike against the soul; all these motions have been called ‘*αἰσθησεις*’».⁴ Compare Socrates’ statement in *Philebus*: «When the soul and body are jointly affected and moved by one and the same affection, if you should call this motion ‘*αἴσθησις*’, you would say nothing odd.»⁵

The larger movement in which T occurs is therefore Timaeus’ explanation of bodily perception. This larger movement is structured as follows:

- 61c2-d5: introductory remark
- 61d5-64a1: *αἰτία* of ‘pansomatic perception’⁶
- 64a2-65b3: *αἰτία* of pain and pleasure
- 65b4-66d1: *αἰτία* of taste
- 66d1-67a6: *αἰτία* of smell
- 67a7-c3: *αἰτία* of hearing
- 67c4-68d7: *αἰτία* of vision

In view of this structure one may wonder whether Timaeus is using *αἴσθησις* more precisely to refer to sense perception. Indeed one might think that ‘sense perception’ is the dominant sense of *αἴσθησις*. I submit that *αἴσθησις* does not mean ‘sense perception’ here or elsewhere in Plato’s *corpus*.⁷ Once again here and elsewhere in Plato the domi-

¹ Cp. DAVID WOLFSDFORF, *Timaeus’ Explanation of Sense-Perceptual Pleasure*, «Journal of Hellenic Studies», 134, 2014, pp. 120-35, at note 1.

² In 2014 I present a more detailed exegesis of T focused on pleasure.

³ *Ti.*, 61c4-5.

⁴ *Ti.*, 43c4-7.

⁵ *Phlb.*, 34a3-5. There is a semantically broader, but with respect to frequency minor use of *αἴσθησις* meaning «apprehension» or «perception (by whatever means)»; for example one may perceive the solution to an abstract problem. We can ignore this usage.

⁶ I will explain this phrase below.

⁷ The passage most likely to require qualification to this claim occurs at *Th.*, 184-186, on which cp. MICHAEL FREDE, *Observations on Perception in Plato’s Later Dialogues*, in *Essays in Ancient Philosophy*, Minneapolis, University of Minnesota Press, 1987, pp. 3-10.

nant sense is «bodily perception». Sense perception is a salient, perhaps the salient form of bodily perception. But there are forms of bodily perception that are not forms of sense perception. Bodily pain is a case in point.¹ Bodily perception encompasses forms of exteroception, interoception, and proprioception.² What distinguishes exteroceptive from interoceptive and proprioceptive bodily perception is whether the source of the bodily affection is external or internal to the body.

So Timaeus' explanation of pain occurs within his account of *αἴσθησις* understood as bodily perception. More precisely Timaeus explains pain in terms of sense perception. Whether sense perception is necessarily exteroceptive,³ it is generally exteroceptive; and Timaeus focuses on sense perception as involving the impact of ambient material elements and compounds on an animate body. An animate body is an ensouled (*ἔμψυχος*) body. It follows from this way of framing the topic that Timaeus focuses on sense perception as a condition of being materially affected by ambient matter. Indeed Timaeus repeatedly speaks of «affections» (*παθήματα*) and precisely «bodily perceptual» ones (*αἰσθητικὰ*). This suggests that Timaeus is considering bodily perception non-agentially and involuntarily, indeed passively. For instance psychological events such as attention and focus, which may be agential and voluntary, do not figure in his account.

The affection (*πάθημα*) that constitutes sense perception is then somato-psychic. More precisely it is a contiguous sequence of two events: one somatic, one psychic. The first event consists of ambient matter impacting a part of the animal's body and this impact being transmitted or conveyed within the body along a certain perhaps complex trajectory.⁴ The second event consists of the transmitted bodily affection impacting a part of the animal's psyche. Observe the asymmetric dependence of the psychic affection on the somatic affection. Given the asymmetry a somatic affection may terminate without impacting the psyche, and this may occur for two interrelated reasons. One is that the somatic affection may be too slight. The other is that the part of the body affected may consist of matter whose properties are not conducive to the transmission to the psyche of the somatic impact. Timaeus characterizes conductive or non-conductive bodily constituents accordingly as «eukineti» (*εὐκίνητον*) or «dyskineti» (*δυσκίνητον*) and precisely identifies fire and air as eukineti and earth as dyskineti.⁵

A presupposition of this account is that the psyche has spatial location.⁶ Precisely how this property is to be understood is unclear. One possibility is that the psyche itself is spatially extended. Another is that the spatial extension of the psyche is derivative of matter in which or through which the psyche is realized. Timaeus appears committed

¹ Cp. *Th.*, 156b4-5 where Socrates treats pleasures and pains among coordinate forms of *αἴσθησις*.

² Note that strictly «interoception» refers to perception by means of sensory nerves innervating the visceral (that is, thoracic, abdominal, pelvic, and cardio-vascular) tissue. «Proprioception» refers to perception by means of sensory nerves innervating the musculo-skeletal system.

³ I think the evidence for answering this question is not decisive. Timaeus certainly focuses on sense perceptions that are exteroceptive. But this does not exclude his admission of forms of sense perception whose objects are internal to the body. For example one may hear one's heart beat; taste blood or bile in one's mouth; or feel the roughness or smoothness of one's tongue.

⁴ On the trajectory and its complexity cp. D. WOLFSORF *Timaeus' Explanation of Sense-Perceptual Pleasure*, cit., pp. 127-128.

⁵ *Ti.*, 64c5-6.

⁶ Cp. *Ti.* 36b6-e5; THOMAS JOHANSEN, *Plato's Natural Philosophy. A Study of the Timaeus-Critias*, Cambridge??, Oxford University Press, 2004, pp. 138-142.

to the former position.¹ Given that the psyche is distinct from the body precisely insofar as the psyche is incorporeal, Timaeus is committed to the strange view that the psyche itself is a spatially extended, yet incorporeal entity. One question this raises is whether Plato admits spatial collocation of a psychic and a somatic extension. I don't have an answer to this question. Nonetheless Timaeus is a soul-body dualist, but quite unlike Descartes.

Granted that the psyche is incorporeal but spatially extended, Timaeus holds that the operations of the psyche are intimately related to what he calls the «*muelos*» (μυελός) in the body.² «*Muelos*» is standardly translated as 'marrow', however *muelos* is neither identical to nor coextensive with marrow. For instance Timaeus believes that the brain itself consists of *muelos*. Moreover he holds that strands extending from the spinal cord throughout the body consist of *muelos*. *Muelos* thus appears to include at least some of what we now recognize as the nervous system.³

More precisely Timaeus conceives of the relation between *muelos* and the psyche in generative and specifically agricultural terms. He speaks of the *muelos* as soil in which the psyche is rooted and from which it germinates.⁴ Moreover death involves the loosening and ultimate severing of the psyche's bonds from the muelic bed to which it is attached.⁵

Timaeus inherits the tripartition of the psyche that Plato introduces in *Republic*. Each of the three parts of the psyche is closely associated with a part of the body, and more precisely still with a portion of *muelos* constituting some such part. Bodily perception then essentially involves a particular part of the psyche. This psychic part is closely associated with the liver. Consequently I will refer to it as the 'hepatic' part of the psyche. In the case of those forms of bodily perception that involve sense organs located in the region of the head, the events constituting bodily perception are located between that part of the body and the hepatic part of the psyche. In particular the initial bodily impact – for example in the ears – must traverse, that is, be conveyed through the body to the hepatic part of the psyche.

At this point we may wish for an account of the psychic impact. But beyond the identification of the particular psychic part involved and the courses of transmission of affections through the body to that psychic part, the text offers little information. In particular Timaeus offers very little by way of either a phenomenological or functional account.⁶

Recall the structure of T. Timaeus' explanation of pain and pleasure immediately follows his explanation of «pansomatic perception» and immediately precedes his explanation of the other four modes of sense perception. Several points are noteworthy here. Timaeus speaks, as I have, of «pansomatic» affections (τὰ κοινὰ τοῦ σώματος παντὸς παθήματα).⁷ This is not because Plato lacks a word for «touch»; that word is ἀφή.

¹ Some have suggested that different parts of the psyche are to be explained in different ways, with respect to this problem. Cp. FILIP KARFIK, *What the mortal parts of the soul really are*, «Rhizai», 2, 2005, pp. 197-217.

² Ti., 73b1-e1.

³ On the discovery of the nervous system in the Hellenistic period, cp. FRIEDRICH SOLMSEN, *Greek Philosophy and the Discovery of the Nerves*, «Museum Helveticum», 18, 1961, pp. 150-67; HEINRICH VON STADEN, *Hierophilus: The Art of Medicine in Early Alexandria*, Cambridge et al., Cambridge University Press, 1989, pp. 155-160.

⁴ Ti., 73c7.

⁵ But cp. D. WOLFSORF *Timaeus' Explanation of Sense-Perceptual Pleasure*, cit., pp. 127-132.

⁶ Ti., 65b4.

⁷ Ti., 81c6-e5.

Indeed in *Republic* and *Phaedo* Socrates explicitly describes ἄφῆ as a form of αἴσθησις.¹ Timaeus' use of «pansomatic» as opposed to «touch» (ἄφῆ) may be explained on the following grounds. Touch is a form of pansomatic perception, usually associated with voluntary movement and saliently with the hands. But the entire the surface of the body, the δέρμα as Timaeus calls it,² is sensitive.³ Indeed pansomatic perception includes the principal bodily parts associated with the other forms of sense perception. For example one can feel roughness and smoothness as well as flavor with one's tongue. Likewise Timaeus treats bodily perception of heat and cold as pansomatic. In contrast to pansomatic perception then the principal bodily parts associated with each of the other forms of sense perception are localized in the body.

Granted this it is questionable why Timaeus' treatment of pain and pleasure is sandwiched between his explanation of pansomatic perception and the other forms of sense perception. One possibility is that Timaeus' explanations are ordered hierarchically, beginning with primitive sense perceptual capacities of animals. In that case Timaeus' view is that pain and bodily pleasure occur in the most primitively sense percipient living bodies, those merely capable of pansomatic sense perception. This claim seems borne out by the following two facts. First Timaeus attributes pain and pleasure to plants,⁴ which in his view are the most primitive living beings. Second Timaeus maintains that pain and pleasure «accompany» (ἔπομένως) or «occur within» (ἐν) sense perceptual affections.⁵ In other words Timaeus treats pain and pleasure not as distinct modes of sense perception coordinate with, say, vision and taste, but as modes of the distinct modes of sense perception.⁶ I will return to and develop this last point shortly.

Presently however it must be admitted that even if Timaeus holds that the sense perceptual faculties are phylogenetically and hierarchically ordered from pansomatic perception to sight and hearing, this cannot be the whole reason he situates the explanation of pleasure and pain where he does. In addition and perhaps more precisely the reason Timaeus locates his explanation of pain and pleasure immediately after his explanation of pansomatic perception is that he holds that pain and pleasure may accompany all forms of sense perception. As such, pain and pleasure are themselves pansomatic. Confirmation of this suggestion comes from Timaeus' following remark immediately after his explanation of pain and pleasure: «And now we have given a fairly complete statement of the affections common to all of the body».⁷ But observe that insofar as this is Timaeus' reason for situating the explanation of pain and pleasure where he does, his reasoning seems to depend on a loose and indeed faulty connection or even conflation of two senses of «pansomatic».

One further remark regarding pansomatic perception is in order. Evidently Timaeus' explanation of αἴσθησις focuses on exteroception. But does he take pansomatic perception to exclude interoception and proprioception? The question is significant insofar as elsewhere in the Platonic *corpus* hunger and thirst are treated as forms of bodily

¹ R., 532e6, *Phd.*, 75a5.

³ More precisely it is variously sensitive depending on how dense the skin is. Cp. *Ti.*, 74e1-75c7.

⁴ *Ti.*, 77b5-6.

⁶ Note that this does not entail that Timaeus views all pain and bodily pleasure as dependent on sense perception, for example if hunger is painful, but hunger is not a form of sense perception. Cp. D. WOLFSORF *Timaeus' Explanation of Sense-Perceptual Pleasure*, pp. 14-16. But see p. 17, note 1.

² *Ti.*, 76a2.

⁵ *Ti.*, 64a5.

⁷ *Ti.*, 65b4-6.

pain.¹ Given this, does Timaeus regard hunger and thirst as forms of pansomatic perception? The following consideration suggests that the answer must be no: hunger and thirst do not involve perceptions of qualities such as heat and cold, roughness and smoothness. Relatedly the internal bodily source upon which perception of hunger and thirst is based is either non-local or local. If it is non-local – for example one is thirsty in virtue or at least partly in virtue of depletion of water throughout the body – then such perception differs from the way a part of the body can detect qualities such as heat and cold, roughness and smoothness. If it is local – for example some internal bodily site that stores water is depleted – then such perception differs from the way any part of the body can detect qualities such as heat and cold, roughness and smoothness.²

I return now to the point that Timaeus treats pain and pleasures as modes of modes of sense perception, in a phrase, as second-order modes of sense perception. As a first step – and one crucial to his account of pain – Timaeus claims that painful bodily affections are those that are «contrary to nature [παρὰ φύσιν], forceful [βίαιον], and sudden[ἀθρόον]».³ In contrast pleasant affections are forceful, sudden, and restore us to our nature. Let's consider each of the algesic characteristics.

The phrase «contrary to nature» requires clarification of «nature». By «nature» or a «natural state» here I understand health, at least the health of the relevant bodily part. In *Philebus* Socrates characterizes health as a harmonious mixture of elements or constituents,⁴ and he describes bodily pain and pleasure accordingly:

when in us living beings harmony [ἀρμονία] is dissolved [λυομένας], a dissolution [λύσις] of our nature and a generation of pains then occur... But if [our nature]⁵ is again harmonized and returned to its nature... then pleasure occurs.⁶

Consequently an affection that is contrary to nature is conditioned by a departure from a state of bodily health. Hence bodily affections that are painful are disintegrative. To be clear – by 'disintegrative' I mean not that the affection itself disintegrates the body, but that it is caused by bodily disintegration.

But not every bodily disintegration is painful. In addition the disintegration must be forceful and sudden. It is questionable how clearly Timaeus distinguishes these two properties. But consider the following. A very gradual disintegration may not have any psychic impact, at least not initially. Again a sudden impact, but a very slight one may not be painful. In that case the «force» (βίαια) of an impact may be understood to mean the volume, that is, bodily scope of the impact.

Timaeus offers the following examples to support his reference to these properties. The first pertains to pleasure, but the point is easily transposed to pain. When a cut

¹ *Grg.*, 496c6-d3; *Phlb.*, 31e6, 10; cp. *R.*, 585a8-b1. But interpretation of both the *Gorgias* and *Philebus* passages is complicated. In *Gorgias* Socrates is explicitly non-committal about whether hunger and thirst are bodily or psychic (496e6-7). And later in *Philebus* (34e7-35d7) Socrates argues that the psyche rather than the body thirsts and hungers. On the other hand the painfulness of thirst and hunger would still seem to be a function of physiological depletion or disintegration. Hence even granting Socrates' argument, thirst and hunger would seem to be partly bodily pains. This topic warrants more scrutiny, which I hope to provide elsewhere.

² In light of this conclusion, we must now also add that the structure of Timaeus' discussion of αἴσθησις may be hierarchical, but that the dependence of pleasure and pain on bodily perception should include interoceptive and proprioceptive as well as exteroceptive bodily perception.

³ *Ti.*, 64c8-d1.

⁴ *Phlb.*, 25d11-26c1, esp. 25e7-8; cp. *Ti.*, 87c1-d3.

⁵ The participle ἀρμολομένης requires a feminine singular noun and τῆς φύσεως at 31d5 seems the only option, however this yields an awkward result with εἰς τὴν αὐτῆς φύσιν at 31d8.

⁶ *Phlb.*, 31d4-9.

heals, bodily integrity is restored. But such restoration is not pleasant because the healing occurs too gradually to be perceived.¹ Again when one moves from a lighted space into darkness sight is interrupted. Timaeus' understanding of sight is extramissive; he understands the interruption to consist in the severing of a stream of fire projecting from the visual sense organ into the environment. Such severing, which disrupts the natural operation of sight, is not painful, although it is sudden, because the disruption is too slight. That is, the effect upon the visual stream does not have further, significant impact on the body of the perceiver. So at any rate Timaeus conceives the situation.²

I come now to how these algesic and hedonic properties of affections – disintegration or restoration, forcefulness, and suddenness – are related to sense perceptual affections such that the former occur within or accompany the latter. As we have said sense perception involves the transmission or conveyance of affections, due to the initial impact of ambient matter, from the body to the psyche. But these affections may have properties of various dimensions. For example temporally the affections may be more or less sudden or gradual. With respect to scope or extent of impact on the body they may be more or less great or small, hence more or less forceful or subtle. With respect to their effect on the organization of the elements constitutive of the somatic compounds but within the parameters of natural conditions, they may variously alter these elements, both spatially and temporally. For example in the case of one sort of pansomatic affection, warmth is explained as deriving from separation of elements, coolness from condensation of elements. In the case of one sort of auditory affection low pitch is explained as deriving from slow motion of elements, high pitch from quick motion. Finally with respect to their effect on the natural condition of the body the affections may be restorative, disintegrative, or neutral. In short all sense perceptual affections must either occur within the parameters of the natural state and thus be neutral with respect to pain and pleasure or involve restorations to or disintegrations from the natural state and thus be pleasant or painful.

In short sense perception is generally, if not necessarily, a form of exteroception. In contrast pain is a form of interoception; and indeed Timaeus and Plato so conceive it. Hence sense perceptual pain is complex; it is a form of interoception that depends on a form of exteroception. In addition to the fact that bodily pain never involves the acquisition of information about ambient entities, it differs from sense perception in that it lacks a dedicated perceptual organ. These two distinctions of bodily pain from sense perception are related to one another insofar as the sense organs typically serve to acquire information about the ambient environment.

So much for an account of Timaeus' explanation of bodily, precisely sense perceptual pain in *T*. In the following subsections I consider several aspects of Timaeus' account in greater depth, supplement them with some of the contributions in *Republic* and *Philebus*, and relate the results to pertinent ideas in contemporary philosophical discussions of pain.

Note that I assume that Plato is committed to Timaeus' explanation. However Plato's theory of pain is more elaborate than Timaeus' since Plato, I hold, is also committed to explanations of aspects of pain that feature in *Republic* and *Philebus* where Socrates, not Timaeus, is the principal philosophical protagonist. Consequently hereafter I use

¹ *Ti.*, 65b2-3.

² *Ti.*, 64d5-e4.

'Plato's' theory of pain to refer to the more elaborate theory and 'Timaeus' to refer to the theory in T.

PAIN AS PASSIVE PROCESS

As we have seen *αἴσθησις* qua bodily perception is an event consisting of two sequential and contiguous sub-events, the first somatic, the second psychic. Moreover Timaeus and Socrates (in *Republic* and *Philebus*) characterize the event as a «motion» (*κίνησις*) as well as an «affection» (*πάθημα*).¹ Bodily perception is therefore a process, not a state.

Processes may be passive or active or a complex of passive and active constituents. For example qua passive process bodily perception may be a kind of reception or imprinting; qua active bodily perception may be a kind of gathering or apprehending. Timaeus' explanation of pain qua bodily perception is principally passive, but it contains at least one active component. As stated Timaeus characterizes bodily perception as a whole as a *πάθημα*. Likewise he characterizes the hepatic part of the psyche as «receiving impressions» (*δεχομένῳ τύπους*).² The active component relates to the eukineti- c bodily elements that are affected. The terms in which these elements are described as transmitting or conveying the affection to the psyche are active: *διαδίδοναι* and *παρέχειν*.³

Contrast Timaeus' largely passive processive conception of pain with the view that pain is a state, whether or not perceptual or representational. On such a view pain is a psychological state and more precisely a phenomenal state or state of consciousness.⁴ Why does Timaeus present a processive account? One idea is that his processive account of pain and sense perception is consistent with the physiological style of explanation that pervades the dialogue. By way of contrast, when in *Philebus* and *Republic* 9 Socrates is particularly concerned with false pleasures and pains, he focuses on the psychic and more precisely representational aspects of these conditions.

But merely to appeal to the physiological explanatory context and tradition is unsatisfactory. To see why, compare Diogenes of Apollonia's physiological account of pain, as reported by Theophrastus: «Pain occurs whenever the air is [in an unnatural condition] and does not mix with the blood. Then the blood settles [*συνιζάνοντος*] and becomes weaker [*ἀσθενεστέρου*] and denser [*πυκνοτέρου*].»⁵ In fact it is unclear whether this description is processive or stative.⁶ Is the pain a function of the blood's weak or dense state or the process of its weakening and condensing? Regardless, given his salient distinction between body and psyche Plato would find any such account inadequate

¹ Cp. *Ti.*, 43c4, 64e6. But the language of *εὐκίνητον* versus *δυσκίνητον* throughout is also indicative. Cp. *R.*, 583e10, *Phlb.*, 34a4.

² *Ti.*, 71b4. More precisely these impressions are said to be received as «in a mirror» (*ὄσον ἐν κατοπτρῷ*).

³ *Ti.*, 64b4, c1, 3. Note that the hepatic psyche is characterized (at 71b5) as furnishing or providing (*παρέχοντι*) images, which it has received. But such furnishing appears to be to the intellect for sense perceptual or bodily perceptual judgment. If so, then this act is not constitutive of bodily perception itself.

⁴ Cp. James Warren's suggestion regarding Anaxagoras' uses of *αἴσθησις* and *λύπη*: «Anaxagoras uses 'perception' and 'pain' to mean both some physiological process – the contact between and object and a sense-organ – and some psychological state or awareness» (*Anaxagoras on Perception, Pleasure, and Pain*, «OSAP», 33, 2007, pp. 19-54: at 46) Mere contact between entities does not constitute a process, but a stative relation. But perhaps Warren intends the event of an object contacting a sense organ.

⁵ *De sens.*, 43.
⁶ Elsewhere I have also suggested that it is unclear whether it is an account of pain or rather depression: DAVID WOLFSORF, *Pleasure in Ancient Greek Philosophy*, Cambridge et al., Cambridge University Press, 2013, pp. 33-34.

precisely because it fails to address the relation between the bodily condition and the psyche. Bodily pain is a psychic as well as a bodily condition. Thus the explanation must include the relation between the psyche and the body. Regarding the nature of this relation there are two options: causal and constitutive. The account Timaeus gives is causal. Why? Let's approach this question by raising another.

Why does Timaeus not instead give an account of pain as the perception of bodily disintegration or rather – since his account is characterized in predominantly passive terms – as, say, the psychic reception of bodily disintegration? The tradition of physiological explanation in which Timaeus is operating focuses on physical *aitiai*. Accordingly Timaeus focuses on the physical *aitia* of the psychic condition. But Plato views the body and psyche as spatially separate. Hence he needs an account of how they come into or are in contact. From a physical perspective, and unless one is to admit action at a distance, causation is the only reasonable explanation.

Finally in light of Timaeus' aetiological orientation we can also see why the kinds of concerns that tend to preoccupy contemporary philosophers of psychology and mind do not arise or engage Timaeus, namely those concerning naturalism, supervenience, and reductive explanation. Plato, exceptionally among early Greek philosophers, does not identify the psyche with matter or even associate it with a material realizing base.¹

THE OBJECT OF PERCEPTION

Since he conceives of pain as a kind of bodily perception, Timaeus conceives of pain as a form of perception. Contrast this with a view of pain as a mere quale, in other words, a view of pain as a mental particular that is simply a phenomenal quality. I doubt that anywhere in his *corpus* Plato even entertains such a possibility – although I acknowledge that support for this doubt requires an argument. Space constraints preclude my development of an adequate argument here. However I will advert to the introduction of the term *ποιότης* and the hypothesized theory of perception involving twin births at *Theaetetus* 181b8-183a1 as the most likely place that such a view might be found.²

Observe that in the hypothetical account of perception in this *Theaetetus* passage neither the quality (*ποιότης*) nor the qualified object (*τὸ ποίον*)³ that is construed as the object of perception is treated as a purely psychic entity. Rather the quality is of the mind-independent object; and the qualified condition is again of the mind-independent object, albeit ontologically dependent on a subject that is perceiving. In other words the object's being qualified is ontologically dependent on a subject's perceiving. In contrast once again the concept of a quale is of a purely mental entity and not of an entity that is a function of a relation between subject and object.

I assume then that Plato never even entertains a view of pain as a quale. In accordance with this conclusion and in view of the positive evidence from *Timaeus* (and *Philebus* and *Republic*) that Plato conceives of pain perceptually, I submit that Timaeus' and throughout his *corpus* Plato's account of pain is direct realist. Again Plato does not posit some mental entity, for example a quale or sense-datum or the like, that is the direct ob-

¹ This is so even though the psyche's spatial configuration is informed and constrained by the body, in particular the *muelos*.

² *ποιότης* first occurs at *Th.* 182a8.

³ *Th.*, 182a7; cp. 182b2.

ject of perception or experience or awareness and which may represent an extra-mental entity. I have just suggested that Plato never even entertains such a possibility, and the view he actually advances makes no appeal to any such mental intermediary between the algesic mode of perceiving and the bodily condition that is so perceived.

So, as Plato conceives it, what one perceives when one experiences bodily pain is a certain sort of bodily condition. Plato variously characterizes this bodily condition as emptying (κένωσις),¹ dissolution (λύσις, διάλυσις, διάκρισις), or destruction (φθόρα).² I suggest that the concept that best captures the bodily condition at issue is itself best captured by the term I have been using: «disintegration». I underscore two features of this term. One is lack of integration. As we saw earlier health is a state in which a set of elements or constituents are harmoniously interrelated. When pain occurs, these elements lose that integration.³ The other is that «disintegration» may be read as a processive term. In other words disintegration may be distinguished from a disintegrated state. Observe that a number of the terms Plato uses have the processive suffix -σις. It must be admitted however that there is a problem with this point. Some of the examples Timaeus himself uses are of disintegrated states rather than disintegrative processes. For example Timaeus speaks of being cut or wounded. It is highly counterintuitive to think that only the disintegrative process and not the resulting disintegrated state is painful. I will return to this point below.

Contrast the idea of bodily disintegration with the view often expressed by contemporary philosophers that the perceptual object of pain is damage, more precisely tissue damage. 'Tissue' is not an appropriate term to represent Timaeus' account since 'tissue' is part of a theory that required first the development of microscopy in the seventeenth century and then cell biology in the nineteenth.⁴ So in interpreting Timaeus and Plato we must speak of 'bodily' rather 'tissue' damage or disintegration as the direct perceptual object of pain.

Granted this let's consider the relation between «damage» and «disintegration». In *Philebus* Socrates explicitly characterizes hunger and thirst as painful;⁵ and in *Republic* he suggests the same.⁶ This itself is odd. On the one hand hunger and thirst are readily understood as involving depletion. As such they may be understood as disintegrative.⁷ But the idea that hunger and thirst involve damage is odd. The problem seems to be that if one thinks of increasing departures from a state of integrity or health, damage is a relatively extreme point along the spectrum. The same seems true with respect to pain. That is, hunger and thirst, in normal circumstances, may be uncomfortable or mildly unpleasant, but not painful. So on a spectrum of negative departure from an affectively neutral condition, pain is a relatively extreme point.⁸

¹ R., 585b1, cp. 585b3; cp. *Ti.* 65a2.

² *Phlb.*, 31d5, e6, 10, 32a1, 2, 32b2.

³ Cp. Timaeus' explanation of disease at 81e6 ff.

⁴ Within his account of the composition of the body Timaeus (at 74b-d, 76-77) distinguishes flesh (σάρξ) and sinews (νεῦρα) and then skin (δέρμα).

⁵ *Phlb.*, 31e6, 10.

⁶ R., 585a8-b1.

⁷ However this itself may be problematic. If hunger and thirst are states of depletion of a store of resources, then this may be distinguished from a state such as starvation or pathological dehydration that compromises the integrity of the body or some bodily part or system.

⁸ Plato does however recognize that pain is a gradable notion. In *Philebus* Socrates classifies pain (and pleasure) in the ontological category of the unlimited, which he loosely defines in terms of «the more and the less» (*Phlb.*, 24a6-25a5).

Hence it appears that in his use of «pain» (that is, *λύπη* or the like) Plato is inadequately discriminating. For example he fails to distinguish discomfort or unpleasantness from pain.¹

In sum despite his use of «pain» Plato's analysis is in fact of what might, at least provisionally, be called 'negative bodily affect'. For clarity's sake I underscore that my use of 'affect' here should not be confused with the use of 'affection' (*πάθημα*) above. My introduction of the term 'affect' is also worth underscoring for another reason. As I mentioned above and will discuss below, Plato conceives of pleasure and pain as opposites. But opposites of what? For convenience we provisionally may designate them as opposite 'affects'. Precisely what this amounts to we will consider. First I want to discuss another feature of pain as a form of perception.

REPRESENTATION AND PHENOMENAL CONTENT

Perception might essentially be representational. But this is not beyond debate.² Hence my suggestion now that Plato's account of pain is representational as well as perceptual does not state a simple tautology. Plato conceives of pain as a form of perception and that form of perception as representational.

Such representation is a characteristic of the psyche. In other words and more precisely pain experience is representational. Although Timaeus' account is less preoccupied with this aspect of pain and bodily perception generally than with the physiological process, evidence for the view may be derived from *Timaeus* as well as elsewhere in the *corpus*. But in pursuing the idea of pain as representational I will focus on *Philebus* and *Republic* 9.

The idea that pain is representational comes out most clearly when Socrates is articulating his view that pleasures and pains can be false. Typically if something can represent, it can also misrepresent. This is Socrates' interest in the relevant passages.

Since Socrates uses «false» (*ψευδής*) in several ways, specifically in the account in *Philebus*,³ it requires stating that the sense of 'falsity' at issue here is representational.⁴ Moreover, as Socrates argues, pains and pleasures can be representationally false in various ways. Note that the marquis example of representationally false pleasure in

¹ One might object to or at least wonder about this criticism in view of the condition of forcefulness (*βίαιον*) that Timaeus introduces as requisite for pain: forcefulness appears to be a relatively extreme property. I suggest that Timaeus' (and Plato's) commitment to this condition should be appreciated in view a usage found in the Hippocratic *On Regime* 2.61-62. There the author distinguishes «natural» (*κατὰ φύσιν*) and «forceful» (*διὰ βίης*) exertions (*πόνοι*). Among the former he includes regular forms of sense perception including sight and hearing. Among the later he includes walks (*περίπατοι*). W. H. S. Jones comments on this distinction: «The division of *πόνοι* into natural and violent corresponds to no modern division, as is proved by the enumeration of 'natural' exercises, while by 'violent' exercise we mean 'excessive' exercise, but *οἱ διὰ βίης πόνοι* means rather exercises that are artificial, the result of conscious and forced effort. Apparently all muscular exercises are 'violent'» (*Hippocrates*, vol. 4, Cambridge, MA, Harvard University Press, 1931, p. 349, note 1) In Timaeus' case the affections are of course not voluntary. Nonetheless they are impactful to a degree or extent that affectively neutral *παθήματα* are not. This is the key point.

² E.g., cp. BERNARDO AGUILERA, *Is Perception Representational? Tyler Burge on Perceptual Functions*, in *An Anthology of Philosophical Studies*, edited by Patricia Hanna, vol. 7, Athens, Greece, ATINER's Conference Paper Series, 2012, pp. 59-71.

³ Cp. DAVID WOLFSDORF, *Plato on Truth-Aptness and Truth-Value*, «Methexis», forthcoming.

⁴ I believe that in *Republic* 9 «*ψευδής*» is not used in a representational sense – even though the false pleasure there described is representationally false. Cp. DAVID WOLFSDORF, *Pleasure and Truth in Republic* 9, «Classical Quarterly», 63, 2013, pp. 1-29.

Philebus, namely false anticipatory pleasure (36c3-40e5), provides no support for the position I wish to discuss here since in that case the primary site of representation is not algesic or hedonic representation per se, but the image (εἰκῶν) that is in this specific case the object of the algesic or hedonic attitude. In other words, in this case pain or pleasure is representationally false (or true) only insofar as it is taken in an image that is representationally false (or true).¹

Instead evidence for pain itself as representational comes from the discussions of mixed affective conditions, that is, cases where pain and pleasure are compresent at 41a7-42c3.² For example one is pained (or discomfited) by hunger, but hopefully and so pleasantly anticipating a meal. Socrates argues that the compresence of affective conditions distorts the experience, yielding psychic states that are representationally false. He compares such conditions to visual illusions in which seeing large and small objects in relation to one another distorts their appearances. Compare the discussion of false pleasure in *Republic* 9 where Socrates argues that when a calm state follows a painful one, the sequential juxtaposition of pain and calm may distort the experience of calm, making it seem pleasant. Again he offers a visual analogy, in this case from the painting technique of σκιαγραφία: the juxtaposition of dark and light shades on a two dimensional surface can give the illusion of depth.³

In both the *Republic* and *Philebus* passages Socrates characterizes the falsity in terms of appearances. He says that the calm «appears» (φαίνεται)⁴ pleasant and that the compresence of opposed affects causes a false «appearance» (φαινομένον).⁵ To be clear, falsity here is a function of pain (or pleasure) perception. But the *Philebus* passage provides strong support for my claim in a way that the *Republic* passage does not. In *Republic* Plato does not draw a sharp distinction between perception and belief. For example in the case of the bent stick in water in book 10 the non-rational part of the soul that perceives the stick as bent is characterized as believing it is bent, while the rational part simultaneously believes the contrary.⁶ In contrast in *Philebus* Socrates explicitly argues that the condition of mixed affect owes to the perceptual appearances, not beliefs.⁷

Granted that Plato conceives of perception and pain perception specifically as representational, I suggest more strongly that he is a strong representationalist. According to strong representationalism the representational content of the experience of pain is exhausted by the phenomenal content of the experience. Support for this view derives from the absence of evidence for the alternative. In other words there is no evidence that Plato has a conception of the phenomenal content of pain experience that is non-representational.

The phenomenal and so representational experience of pain indicates the occurrence of disintegration. It does so by having a phenomenally painful, as opposed to, say, pleasant or affectively neutral character. More precisely the phenomenal aspect indicates

¹ Cp. IDEM, *Plato on Truth-Aptness and Truth-Value*, forthcoming.

² For a thorough defense of my interpretation of this passage cp. DAVID WOLFSORF, *Misappearing Pleasure: Philebus 41a7-42c3*, in *Plato and the Power of Images*, edited by Pierre Destrée, Radcliffe G. Edmonds, Brill, forthcoming.

³ Cp. D. WOLFSORF, *Pleasure and Truth in Republic 9*, cit., p. 8; EVA KEULS, *Skiagraphia once again*, «American Journal of Archaeology», 79, 1975, pp. 1-16.

⁵ *Phlb.*, 42c1; cp. 42b4-5.

⁶ Cp. D. WOLFSORF, *Pleasure and Truth in Republic 9*, cit., p. 26.

⁷ Cp. IDEM, *Misappearing Pleasure: Philebus 41a7-42c3*, forthcoming.

various properties of disintegration. For example disintegration may occur more or less rapidly; it may occur over a wider or narrower scope of the body.¹

PAIN AND PLEASURE AS OPPOSITES

Throughout his *corpus* Plato treats pain and pleasure as opposites. The thesis is intuitive, but what exactly does opposition here amount to? Perhaps the most natural interpretation is in terms of qualities of experience: the painfulness of pain is the opposite of the pleasantness of pleasure. But now how is the opposition of phenomenal qualities to be understood? Defense and explication of the intuitive thesis seems to require a phenomenological theory.

A second interpretation is in terms of action or motivation: normally pleasure is an object of pursuit or pro-motivation, while pain is an object of avoidance or con-motivation. On this interpretation the opposition of pursuit and avoidance or pro- and con-motivation is primary and that of pain and pleasure derivative. Resolving the interpretation also requires resolving the disjunction, that is, deciding between motivation and action. Motivation seems ontologically prior to, but explanatorily dependent on action.

A third interpretation is in terms of what may be called 'reversibility of process'. The disintegrative process that partly constitutes pain is the reverse of the restorative or reintegrative process that partly constitutes pleasure. So disintegration and reintegration or restoration are opposites because they are reversible processes, and pain and pleasure are opposites because they are partly constituted by these processes.

In certain respects the third interpretation seems to capture best the sense in which Plato conceives of pain and pleasure as opposites. Disintegration and restoration are the most salient features of Plato's explanation of pain and pleasure. Of the features Timaeus describes as conditions for sense perceptual pain and pleasure only these are opposed in any sense, for forcefulness and suddenness are properties that pain and pleasure share. Additionally there is no phenomenological analysis of painfulness or pleasantness in Plato's *corpus* that would facilitate an interpretation of pain and pleasure as qualitatively opposed.

An objection to this view however is that in *Republic* the analysis of pain and pleasure begins with the claim of opposition.² Moreover Glaucon assents to this claim immediately. Hence it is reasonable to think that however Plato ultimately understands the opposition of pain and pleasure his understanding tracks or conforms to some commonsensical or intuitive view. Consider the possibility that the intuitive view is that of the second interpretation: pain and pleasure are objects of con- and pro-motivation and correlative actions. But now if one assumes this, it is reasonable to ask why it is so. What is it about pleasure and pain that make them at least generally objects of pro- and con-motivation and correlative actions? The most natural answer seems to lead back to the first interpretation: the phenomenal character of pain and pleasure makes them generally objects of con- and pro-motivation respectively. Granted this,

¹ Cp. IDEM, *Plato on Truth-Aptness and Truth-Value*, forthcoming, n. xx. In contemporary philosophy perceptual experience is often considered to involve representation that is non-conceptual. Assuming a distinction between conceptual and non-conceptual content there are, I think, good grounds for understanding Plato's view of the representational content of bodily pain to be non-conceptual. At least, insofar as Plato conceives of the perceptual-representational content as non-doxastic, then what alternative is there? However the thesis deserves more careful consideration than I can here offer (cp. *ibidem*, xx).

² *R.*, 583c3.

but given his strong representationalism Plato may want to claim that the opposition of the psychic aspects of pain and pleasure is derivative of the somatic aspects; that is, the psychic aspects are phenomenally opposed because the processes of disintegration and restoration that they perceive and represent are opposed. The strength of this result is that it recognizes the centrality in Plato's analysis of disintegration and restoration as well as its strong representationalism, and it also indicates how Plato's view may track the commonsensical intuition.¹

Before turning to the topic of opposition in contemporary philosophy of pain, I want to draw attention to a difficulty in Plato's account. Recall the question raised earlier regarding whether a disintegrated state as well as a process of disintegration might reasonably be viewed as the object of pain perception. For example once again a flesh wound may be painful even if or while the bodily damage is not increasing. But observe that if Plato were to admit this point, he might be compelled, given his commitment to the opposition of pain and pleasure, to admit that a restored state was pleasant. Yet he clearly cannot admit this. Hence either Plato is compelled by his commitment to opposition to embrace the implausible view that only processes and not states of disintegration can be painful, or he must abandon his commitment to opposition based on the reversibility of process. Note further that he could opt for the latter while retaining the view that pain and pleasure are opposites; however opposition would then have to depend on motivational or actional properties and those in turn on phenomenal character. Finally Plato would have to answer the question why if pain and pleasure are perceptual and representational, their phenomenal characters do not represent the same kinds of conditions, but a process in one case and a disjunction of process or state in the other.

Finally let's briefly contrast Plato's conception of the opposition of pain and pleasure with a contemporary view according to which pain and pleasure are not opposites. While many philosophers understand pain as involving perception of bodily or tissue damage, they do not understand pleasure as involving perception of bodily health or restoration. The reason for this is that while the nervous system has dedicated nociceptors, it has no hedonoceptors. In other words there is no such thing as pleasure perception.² Note that this also calls into question the sense of the phrase 'bodily pleasure'. I return to this point momentarily.

As Murat Aydede has discussed, the concept of pain seems to conflate two distinct conditions subserved by distinct nervous systems. One is somato-sensory, the other Aydede calls «motivational-affective». The latter relates to the con-attitude, for example disliking, and the phenomenal quality of unpleasantness. But there is psychological evidence, from the disorder of reactive dissociation,³ that nociception can occur with-

¹ An argument at *Gorgias*, 496c6-497a5 problematizes the preceding account. There Socrates argues against evaluative hedonism using the premise that when one is thirsty and drinks or hungry and eats, one simultaneously experiences pain and pleasure in the same part of oneself. If so, then in this sort of case disintegration or depletion and restoration or filling cannot strictly be reversible processes. It seems however that in *Philebus*, if not *Republic*, Plato has abandoned this position. But the topic deserves more careful consideration, which must also involve the nature of hunger and thirst (on which once again cp. p. 17, note 1).

² This point is central to MURAT AYDEDE, *An Analysis of Pleasure vis-à-vis Pain*, «Philosophy and Phenomenological Research», 61, 2000, pp. 537-570.

³ Cp. DANIEL C. DENNETT, *Why You Can't Make a Computer that Feels Pain*, in IDEM, *Brainstorms*, Cambridge, The MIT Press, 1978, pp. 190-229; RONALD MELZACK, KENNETH LYMAN CASEY, *Sensory, Motivational, and Central Control Determinants of Pain: A New Conceptual Model*, in Dan R. Kenshalo (ed.), *The Skin Senses*, Springfield, Illinois, Thomas, 1968, pp. 223-243.

out the con-motivational or con-affective condition of dislike or unpleasantness. In contrast pleasure is not a somato-sensory condition at all, but purely a motivational-affective one.¹

Given this, pain and pleasure cannot be opposites in the sense that Plato conceives them. Indeed pain is not a proper candidate for a member of the pair of opposites. Rather the opposition must be between pleasure and displeasure, and this must be understood either motivationally or affectively. Moreover on this view 'bodily pleasure' must refer to a motivational or affective attitude toward a bodily sensation.

Now Aydede's phrase «motivational-affective» itself denotes a hybrid of distinguishable psychological categories. Pleasure and displeasure are, properly speaking, affective rather than motivational.² Hence if we are to offer an account of the opposition between pleasure and displeasure it will have to be affective. Consequently it looks like the opposite of pleasure is displeasure and that the opposition is phenomenal and more precisely affective. If so, then an explanation of the opposition may require a phenomenological theory, as I suggested above.

In light of these considerations it should also be noted that bodily pain is not, in any instance, a second-order mode of sense perception. Nociception is a distinct mode of interoception. In contrast a psychological event such as displeasure taken in a sound or taste is an event of con-affect which is intentional and whose object is a sense perceptual event or quality.

¹ Cp. D. WOLFSORF, *Pleasure in Ancient Greek Philosophy*, cit., pp. 246-248.

² Cp. KENT BERRIDGE, *Food Reward: Brain Substrates of Wanting and Liking*, «Neuroscientific and Biobehavioral Reviews», 20, 1, 1996, pp. 1-25.