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THE NEW FRONTIER: PHILOSOPHY OF NATURE IN PLATONIC STUDIES AT THE BEGINNING OF THE XXITH CENTURY

Philosophy of nature is one of the thriving fields in Platonic studies today, and it is still bound to expand even more in the near future¹. However exciting and prolific the recent years may have been in this domain, there is still a lot to discover, and current limits in international Plato studies need to be overcome for substantial progress to be made in some of these uncharted territories where a new image of Plato awaits. We need to broaden our historical angle before our Plato may take his full place in the wider context of the history of scientific ideas of the Greeks and of the development of their ideas about nature. We need to get rid of the idea that Plato is not a « natural » philosopher, not a *phusikós* – more of a metaphysician, merely able to hint at some of the intuitions Aristotle would properly develop soon after him. It seems paradoxical that such a view has sometimes been adopted by the very scholars who would attach themselves to the study of Plato's natural philosophy in some academic cultures of Platonic studies². However interesting Aristotle's view on his predecessors might be, we cannot take it for granted in a historical investigation. Nor can we accept at face value Aristotle's definition of *phúsis* : the very distinction he makes between the natural and the artificial – what kind of beings belong to the former and what kind of beings belong to the latter – cannot be taken, however familiar it sounds to the Western or Westernised ear, as a self-evident frame for all Greek thought of the previous centuries, as if this very distinction was not also the product of a specific history. Plato challenges the boundaries of the natural and the artificial, of the natural and the cultural, of the natural and the political ; to follow him on this path entails challenging the very framework in which we are accustomed to think. Plato's "physics" might encompass more stuff than we would actually find in a

¹ I want to warmly thank Gretchen Reydam-Schils for her discussion of my presentation : many points have been improved thanks to her comments, both in the content and in the phrasing of my english. The remaining shortcomings are my own fault.

² See for instance Gregory (2000) and Johansen (2004), who share such a view. In the English speaking world, this trend is probably due to the influence of G. E. R Lloyd (see Lloyd 1968 and 1991). It stands in contrast to previous presentations of Plato's natural philosophy in English, such as Cornford (1935) and Cherniss (1945).

contemporary handbook of physics, or a different set of objects at least. So there are two directions in which we need to move and take a few risks:

(1) We need to see Plato in the wider context of the history of cosmology, of the theory of bodily interactions, etc., and in order to do this, we have to get rid of the idea that he does not really belong together with the Greek thinkers who examine what nature is, what kind of motions there are, how material and mechanical causes interact, what is the speed, weight, size, structure of all things that move randomly and still create such patterns and order that we can actually start recognizing in them something that could be an object of knowledge.

(2) There will be no correct assessment of Plato's philosophy of nature if we do not accept to treat the concepts of "nature" and its correlates (society, art, convention, etc.) in their historical context, and accept to construct them according to the manner in which Plato himself actually presents them in his own words. This approach might take us to unfamiliar landscapes, where nature, society, and the soul are all aspects of the same kind of powerful reality. The originality of Plato will then appear in the context of the history of the many ways men of all times and societies (not only Western) have tried and gathered all beings into sets that they could then relate or oppose to each other. Recent anthropology has shown how grouping things in sets called "nature" and "society" is an idea that belongs to the specific history of the West³. Plato goes beyond such borders. This is very good news as Platonic studies of the XXIst century are already, and will be more and more written outside the West – especially on the shores of Asia. Plato, who was for a long time the father of Western culture, is ready for more.

What is nature? Challenging the boundaries of the natural

Are we sure where to find *the* Plato *physicus* ? The *Timaeus* seems the obvious choice – and many studies on the *Timaeus* carry the label of Plato's "natural philosophy". This assumption might be right, but then again, we do not want to presuppose conceptual frameworks before we assess their own historicity.

³ Descola (2004)

As I just mentioned, recent anthropology suggests that the nature / culture divide is a very special product of a very special Western history, and that the Greeks constituted an early but swiftly moving stage of that history⁴ - perhaps even a time during which the ground shifted back and forth before it stabilized. Historians have noticed peculiarities about the way the Greeks, at times, were still thinking of society and politics as reflecting the cosmic order, at a subsequent stage and in some instances left this perspective behind, and then again tried to re-establish this link⁵. Plato appears to present us with a very notable moment in that history, as he himself describes it in book ten of the *Laws*, where the Stranger suggest that atheism in Athens stems from the *phúsis* / *nómos* divide, put forth by the sophists. The soul that moves the sky, a soul that thinks and brings harmony to all the kinds of motions, the soul that also has *tékhne*⁶ is "nature", that is, the first principle of motion⁷. The question of nature therefore challenges the boundaries that we tend to assume in our reading of the Platonic dialogues: we study "moral", "political" or "natural" philosophy, or philosophy "of mind" in Plato, and we take it for granted that these distinctions have a kind of absolute validity, or, at least, that Aristotle's divisions of the sciences can be more or less thought of as equivalent to Plato's framework. How can we be so sure that Plato matured in a environment in which these distinctions were quite so obvious? All the evidence we have points to the contrary: drawing these boundaries was a new and exciting exercise. We know entitling books and speeches after their subject matter was a new trend of the late Vth century and branding a "*peri phúseos*" investigation also was⁸. In 2005, Gerard Naddaf's 1992 book on the Greek concept of Nature was translated into English-- which might broaden the discussion on the boundaries of what the Ancients, including Plato, might have understood under the term « *phúsis* ». Naddaf's thesis is very good news – maybe even too good – for Plato scholars: the

⁴ Descola (2004).

⁵ Lévêque et Vidal-Naquet (1964), see also « Espace et organisation politique en Grèce ancienne », in Vernant (1965-1985), p. 238-260, Capizzi (1982).

⁶ On the idea that *tékhne* belongs to the soul and therefore comes first in the natural order, see *Laws* X 892b3-5.

⁷ On the definition of *phúsis* as first principle of the generation and motion, see *Laws* X 892c5. On both this passages see my development in Macé (2006), p. 147 and p. 154.

⁸ See Schmalzriedt (1970).

program of sciences presented at the beginning of the *Timaeus*, with its three levels, a cosmogony, an anthropogony and a politogony, would actually be the inner structure of the kind of knowledge that the Greeks, as Plato puts it, called the « inquiry on nature (*peri phúseos historia*) »⁹. This structure can certainly be found in cosmogonic poetry such as Hesiod, but it becomes more problematic to assign it to Pre-Platonic philosophers as a whole. Maybe Plato was drawing a new synthesis, and the fresh scope he was giving to the concept of nature was the sign of his renewed ambition. So far we still do not have definitive answers to these historical and epistemological questions. They merit our further attention. Such an examination will have to start over from a deep inquiry into the very genre of *peri phúseos historia*, in the context of the VIth and Vth century literary production, on the tracks of Schmalzriedt's stimulating study.

The manner in which Plato challenges the divide between nature and psychology, and between nature and the artificial, forbids us to impose on him boundaries that make no sense from his perspective. The unity between Plato's cosmology and psychology has been well established. For a recent comprehensive study on the subject, see Lisi (2007). It is one of the benefits of Karfik's approach in his 2004 book dedicated to the *Timaeus* and the *Phaedo* that he shows the continuity between Plato's cosmology, theology and psychology¹⁰, through underscoring the psychological aspects of physical interactions as represented by Plato. Furthermore, once this continuity is established, the question of where exactly politics stands in relation to nature can be raised, if one acknowledges that Platonic politics are about souls and city as a soul¹¹. Carlo Natali, in his own contribution to the volume he edited in 2003, finds in the anthropology of the *Timaeus* the foundation for the unity between Plato *physicus* and Plato *politicus*.

The relative ignorance – or disbelief – of such continuities from the heavens to the city has made some essential Platonic topics difficult to understand in our times, and in particular the relation between ethics and cosmology. It is very interesting, then, that the 2003 symposium *Plato Ethicus* (the collected

⁹ *Phaedo* 96a6-7.

¹⁰ See my review of this book in « Bulletin Platonicien VI », *Les Études Platoniciennes* IV, 2007, Paris, Les Belles Lettres, p. 391-395, and online : <http://www.etudesplatoniciennes.eu/bulletins.html>.

¹¹ See for instance Vegetti (2007).

papers of which were published in 2004 by M. Migliori, L.M. Napolitano Valditara and Del Forno) has manifested a broadened interest in understanding the connection between Platonic ethics and politics and cosmology. As Annie Larivée points out in a review of the volume¹², the whole enterprise does not seem to presuppose the existence of a homogeneous and distinct domain of ethics, and the title of the book (*Plato Ethicus*), she suggested, might as well have been followed by a question mark. Larivée therefore, and quite rightly to my opinion, focuses her review on the papers that most strongly deny the autonomy of ethics or set out to find out what it exactly means to think of moral behaviour outside of the boundaries of moral philosophy *per se*. What are the consequences of such a « naturalisation of ethics », to use Luc Brisson's phrase in the same volume¹³? One very important point is made by Christopher Gill in his paper «*Plato, ethics and mathematics*»¹⁴, in which he devotes special attention to Burnyeat's «*Plato on why mathematics is good for the soul?*»¹⁵, insisting on the « why », and the how: it is not easy to see how this connection works, maybe because it needs a mediation – the mediation of cosmology. The latter point makes Gill direct our attention to the Stoics for a model of how ethics and cosmology might be connected. If mathematics is important for Platonic ethics, it is probably because this discipline is the key to the order of the world and to the motions of the sky, which themselves express the order of a divine soul (the world soul) that is the model for all souls and cities to be educated.

The mediation of the world order and soul's order is key to a connection between ethics, cosmology and mathematics, as Franco Ferrari rightly sees in his «*World order and soul's order: the Timaeus and the de-socratisation of Socrates' ethics*»¹⁶. L. Gerson also denounces the exclusively « Socratic » approach to Platonic ethics in Anglo-American scholarship, and the ensuing indifference to its

¹² « Bulletin Platonicien V », *Les Études Platonicienne* V, 2006, Paris, Les Belles Lettres, p. 350-357. On line : <http://www.etudesplatoniciennes.eu/bulletins.html>.

¹³ See « *Myths in Plato's Ethics* » (p. 63-76), p. 75. Luc Brisson also denies the autonomy of ethics in his introduction (p. 63) and conclusion (p.76).

¹⁴ *Op. cit.*, p. 165-176.

¹⁵ In T. Smiley (ed.), (2000), p.1-81.

¹⁶ *Op. cit.*, p. 121-132.

metaphysical and epistemological foundations¹⁷. This claim does not necessarily imply that we need to read more late dialogues rather than so-called « Socratic » ones: all it might mean is that the views of Plato's Socrates, as a character, are always compatible with a metaphysical and epistemological foundation of ethics, which would underscore a natural connection with cosmology¹⁸. It does not necessarily mean either that Platonic ethics are part of a wider perspective than the individual life and the city only in the sense that the soul has a destiny beyond ordinary human life : these are the Neoplatonic directions both Brisson and Gerson explore. However interesting the Neoplatonists might be in order to cast away contemporary anachronistic readings of Plato, as Gerson uses them, the Neoplatonic reading of Plato might also come with its own anachronisms. Referring politics and ethics to the cosmos may have a more immediate meaning for Plato : it might simply mean that men and cities are precisely natural things that develop and die, feel pain and joy – and that this feature turns them into possible objects knowledge¹⁹. We need to be careful that the restitution of Plato's inscription of ethics and politics within the frame of the cosmos does not lead to an a-political interpretation of his work. The comparison with the Stoics might lead to the idea, expressed for instance in Carone (2005), that with a cosmic god – such as the world soul – as an ethical model, there is no more need for a political production of virtue. Such a notion makes the project of the *Laws* lose all consistency: why would anyone introduce the world soul as key to legislation in book ten of a work that devotes so much time and detail to the social and political fabric of virtue, if such a principle was to discard the civic production of virtue altogether? Before we can safely try to assess the connection between ethics and cosmology, we need to make sure that we do not lose the connection between ethics and politics that no Ancient classical thinker would dream of severing.

Carone (2005) has made this connection between ethics and cosmology a central issue in the contemporary debate on Platonic ethics. In my review of the

¹⁷ *Op. cit.*, « *The Neoplatonic Interpretation of Platonic Ethics* », p.151-164.

¹⁸ On this continuity on the epistemic foundation of ethics, see Carone (2001) ; see also my own contribution to this debate, « La surpuissance morale des âmes savantes à l'aune de la procédure athénienne d'examen public des compétences techniques », in Macé (ed) (2007).

¹⁹ I have defended this view in « Les Affections sociales : l'édification platonicienne de la philosophie politique comme partie de la science de la nature », in Brahami (2008) p. 11-53.

work²⁰, I claim that the full analysis of such a connection would require a double task: (1) a comprehensive study of Plato's cosmology in the context of the history of Greek cosmology, in order to understand how and why his cosmology came to display an ethical dimension; (2) an assessment of all the reasons why Platonic ethics, throughout the dialogues, have to be read into a cosmic framework. Carone pursues a more restricted – but nevertheless crucial – approach, by focusing on the former task (the ethical dimension of cosmology), and restricting her scope both to Plato himself (without historical contextualisation) and, within Plato, to four late dialogues (*Timaeus*, *Philebus*, *Statesman* and *Laws*). Her study has two chapters on each dialogue, one on the analysis of the cosmological passages in each book, the other drawing out the ethical implications. The book reaches some important conclusions (on the universe as a model for human action – I return to other points below), and maybe ventures into some controversial territory (on the possibility of the universe suffering the consequences of human deeds – with the contra-factual hypothesis of the bad world soul representing such consequences)²¹. My main concern here is that we need to extend this inquiry to all the dialogues, and open it to a full-scale historical reassessment of Plato's position in the history of cosmology. And we need to do the same with ethics and its cosmological dimension. One of the main points of the whole debate is the question of the « psychological » reading of cosmology, to use Karfik's phrase, not only in the late dialogues, but in the entire range of extant dialogues.

Let us now turn to these cosmological matters *per se*, bearing in mind that our current research will need to highlight details of cosmology that have a potential for bridging the gap with human affairs.

Cosmological issues: Into the network of causes within a psycho-physical cosmology – from transcendent to immanent causality

²⁰ « Bulletin Platonicien V », *Les Études Platoniciennes* III, 2006, Paris, Les Belles Lettres, p. 357-364, and online : <http://www.etudesplatoniciennes.eu/bulletins.html>.

²¹ See my above mentioned review for a full discussion.

The new century proved quickly that it was not going to renounce a two millennium long tradition of reading the *Timaeus*: three volumes on its historical legacy²² ; another running commentary²³ ; at least three collective volumes of analyses, including one to celebrate the forty years anniversary of Luc Brisson's *magnum opus* of 1974²⁴. The volume edited by Ada Neschke-Hentschke (ANH) in 2000 and both volumes edited in 2003 by Gretchen J. Reydams-Schils (GRS), on the one hand, and Robert Sharples and Ann Sheppard (S&S), on the other, provide a renewed coverage of the reception of the *Timaeus*, with a strong emphasis on this phenomenon in Ancient times, from the Ancient Academy (J. Dillon in GRS) to Cicero (C. Levy in GRS), from Philo of Alexandria (D. Runia in both S&S and GRS) to Chaldaean Oracles (L. Brisson in GRS), from Galen (R. Sorabji in GRS and M. Vegetti in ANH) to Proclus (C. Steel and B. van den Berg in S&S, A. Lernoud in ANH), from Boethius (W. Mesch in ANH) to the Arabic tradition (D'Ancona in GRS). The role of the *Timaeus* as a matrix for the history of ideas has never been so strongly highlighted, from Ancient times into the Renaissance and modern times. The increase of our knowledge about the long history of the interpretations of the *Timaeus* should serve as a filter to check the viability and the necessity for new interpretations – since, paradoxically, this rich history of reception does not seem to have exhausted the desire for more interpretation of the *Timaeus*. L. Brisson's book of 1974 still provides a guidance as we see more new readings of the *Timaeus* emerge : the history of wide-ranging interpretations provides a set of variations that cover many possibilities of reading the text. If we believe that these possibilities are not completely exhausted, we should compare every new interpretation to the existing ones to challenge its novelty and necessity.

Carlo Natali dedicated his 2000-2001 seminar at the University of Venice Ca'Foscari to the cosmology and anthropology of the *Timaeus*, with a closing

²² Neschke-Hentschke (2000), Sharples, R., and A. Sheppard. (2003) and Reydams-Schils (2003), (see the review of the latter by F. Fronterotta in the « Bulletin Platonicien III », *Les Études Philosophiques*, n° 72 2005/1, p. 117 à 142, see online : <http://www.etudesplatoniciennes.eu/bulletins.html>.

²³ Johansen (2004).

²⁴ Wright (2001), Natali and Maso (2003) and Pradeau (2006). See my review of Natali and Maso (2003) in the « Bulletin Platonicien III », *Les Études Philosophiques*, n° 72 2005/1, see online : <http://www.etudesplatoniciennes.eu/bulletins.html>.

symposium « Plato Physicus. The image of cosmos in the *Timaeus* », (November 29 – December 1, 2001) which gave the 2003 book its title²⁵. The book is a good indicator of the main problems faced by contemporary readings of the *Timaeus*. As Nattali and Maso point out in their preface, the question of causality was the key issue underlying all discussions: what type of causality is at work in the explanation of world's constitution in the *Timaeus*? We can actually see that readers of Plato in Middle- and Neoplatonic circles might have seen the same problem, and they often put much effort into emphasizing such or such element as the key causality in the universe. They also seemed to have some trouble accepting the multiple causes provided by Plato's account and its astonishing mixture of causes, crossing the boundaries of the technical and the natural, mixing craft, forms, psychology and mechanical causes. Aristotle already seemed to look for a simplification : his reduction of Plato's doctrine of causality to matter and form (see *Metaphysics* A9) is very restrictive and does away with the difficulties raised by the multiplication of modes of causality in Plato's description of the structure of the universe and of its components and their interactions. The forms, the demiurge and his aides, the world soul, the receptacle, necessity in its different guises, either « before » or « after » the intervention of the demiurge, can all claim to exert a causality of some sort.

Sorting out these various modes of causality is the complex task commentators have always faced, and we still do. It is at this very point that we are also faced with an important projection of complex models of technical agency into the understanding of « physical » interactions, in a manner that becomes hard to grasp from a retrospective Aristotelian point of view: the problem of sorting out the natural and the technical, and of discovering the subtle ways in which Plato might have gone beyond this divide lays ahead. This might be one road for us to pursue in interpreting the *Timaeus* without repeating our predecessors : informed by the trouble they had with coming to terms with Plato's doctrine of causality, often reducing its complexity to a simpler story, we might want to see if we could not preserve the maximum complexity and subtlety of the original in our readings – and perhaps also make sense of its complexity by reinserting the *Timaeus* into its historical context, including the previous attempts

²⁵ See my above mentioned review.

at understanding the universe.

So we need a clear assessment of the respective roles of all candidates as causes to the motions and order of the universe. What is the demiurge and what does he do? The various options in this long-lasting debate have been well documented²⁶. However there is still an ongoing debate between those who want identify the demiurge with the world soul and those who would rather keep it as a separate intellect. On this debate, see the very clear presentations by F. Karfik (2004) and (2007). Karfik brings all positions on the issue of the ontological nature of the demiurge back to three main options represented nowadays respectively by Harold Cherniss (the demiurge as the world soul), Luc Brisson (the intellect as separated intellect) and Mathias Baltes (the demiurge assimilated into the intelligible model – see also the recent defense of this position by Franco Ferrari²⁷). This issue still arouses much interest, and these three long debated options are likely to have more supporters in the future. The recent interest in the ethical dimension of cosmology is raising new stakes in this old debate: Carone (2005) has it that Cherniss' view is more likely to justify such a dimension, because the immanence of the rational causality within the universe is exactly what is needed in order to provide a model for human action – Platonic ethics being fundamentally oriented towards self-transformation: a self-organizing universe is the best ethical model, and a personification under the guise of a craftsman further encourages human beings to make a role-model out of the universe. Carone can locate such causality easily in *Laws X* but more work is needed to establish the same result for the *Philebus*, the *Statesman* and the *Timaeus*, by using, respectively, (1) the «limit» as an immanent principle, (2) Luc Brisson's interpretation of the cosmic phases of the *Statesman's* myth (according to this reading, our phase, under Zeus, would not display disorder, but rather a rational framework progressively informing the cosmos), and (3) an allegorical reading of the *Timaeus*.

Whatever the outcome may be of the debate on the ontological status of the demiurge, an important methodological point has been raised by Karfik (2004 and 2007): the basis for debating what the demiurge actually is or stands

²⁶ See for instance Luc Brisson (1974), p. 55-71.

²⁷ Ferrari (2003)

for is precisely to assess the type of activity he displays and the effects he produces. With these questions in mind Karfik defends the idea that the figure of the demiurge cannot be reduced to either the intelligible model or the world soul. Whichever option one ends up defending, one does need to open the box which Vlastos did not want to see opened, and to ask exactly what the demiurge does when he makes stuff, for instance when he provides the elements with geometrical figures: « it is no use asking how the Demiurge manages to carry out this stupendous operation. We are dealing here with a strictly supernatural event (the event that creates nature and is not itself a member of the sequence of events that constitute the natural order). To offer any account, no matter how conjectural, of the reduction of the material chaos into a beautifully structured cosmos by an extramundane Intelligence would be as futile as an attempt to figure out the means by which a kind of fairy transforms a pumpkin into a coach-and-four »²⁸. There is no way around, in this difficult debate, looking into the details of what exactly the demiurge does before we can decide if an allegorical interpretation of this figure is needed or not, and if so, which one. Paradoxically, it could be on the battlefield of necessity, of immanent causes, of bodies acting upon other bodies, that we could actually decide exactly how much transcendent causes are needed, and which kind of causality. Luc Brisson's contribution to the *Plato Physicus* volume precisely suggests that the close examination of the details of bodily interactions is the basis for assessing the respective role of the various principles at work in the *Timaeus* – just how exactly do physical interactions mix mechanical, paradigmatic, demiurgical, and psychological modes of causality?

The scholarly interest in the subtleties of mechanical causes within Plato's theory is definitely on the rise, and this is an important trend to follow. Maso and Nattali insist on this point in their introduction to the *Plato physicus* volume: several contributions move into the realm of necessity and mechanical causation (see especially Brisson, Viano, Dixsaut, Migliori) and Casertano and Maso assess the link between auxiliary and other causes, including the manner in which their essential disorder is brought to order. To make progress in this direction, one needs to study carefully Plato's description of the many kinds of motion. Karfik

²⁸ Vlastos (1975), p. 70, n. 10. On this matter, also see my contribution « Activité démiurgique et corrélation des propriétés matérielles, *Timée* 55e-56b », in Pradeau (2006) (ed).

(2004) dedicates the second chapter of his second section to the theory of motion in the *Timaeus*: the seven motions presented at 34a2, motions in the precosmic chaos, and what happens to these as they receive mathematical order, and motions of all bodies once the geometrical structure is established. In this context of the newly structured universe, Karfik focuses on the specific laws of motion (and the role of the concept of heterogeneity – *anomalótes* – in the explanation of motion and rest, a heterogeneity that further depends on compression and condensation, themselves caused by the rotation of the universe), and analyzes the degree of autonomy of mechanical motion in the *Timaeus* (there are indeed mechanical causes of motion): this immanent level of physical causation corresponds to the description of motion in terms of activity and passivity (there is motion as long as the heterogeneity of natures allows one element to act upon another). As I have attempted to show in my own contribution to this field, there are rules of transient causation between agents and patients that are at work in Plato's description of bodily interactions – I would also claim that these same rules are at work in the interactions between souls and between cities (there again, the natural and the social, the natural and the cultural can be described as phenomena of the same kind governed by the same kind of laws of interaction)²⁹. Another conclusion noted by Karfik (2004), to which I was also led in my own research³⁰, is that the key to the classification of polyedra in 55e-56a is their degrees of mobility based on their geometrical structures, with these degrees determining the attribution of active and passive roles within interactions. A fuller and more detailed account of Plato's theory of the structure and motion of bodies will both help and be nourished in turn by a wider historical investigation of these matters.

Plato in the context of the history of scientific ideas and writing

Plato needs to be more fully recognized for his role in the history of scientific ideas of the Greeks than has been the case. He is a significant moment in

²⁹ See Mace (2006), p. 163-166.

³⁰ See Karfik (2004) p. 160-163 and Macé (2006).

the history of the classification of mathematical sciences³¹. He bears the testimony of the way in which the Greeks tried to understand the dynamic behaviour of bodies in terms of their geometrical structure. The kind of problems such an attempt raises, from Hesiod's way of revealing the symmetrical structure of the universe by measuring the time an anvil would take to fall from the sky into the depth of the underworld to Epicurus's criticism of Plato's choice of figures in book 14 of his *On Nature*, would find in Plato's physics its central chapter. Studies have been scarce in this area and important books in this field have given Plato too limited a place in this history³². O'Brien's study (1981-1984) on weight remains the model for any investigation of this kind. It is unfortunately a work that stands too much on its own for the time being. We generally need a better understanding of how the concepts and operations used by Plato in his attempt at describing bodily interactions fit into a broader historical perspective, from condensation to homogeneity, classification of motions and speed, and type of structural proprieties emphasized (*oxútes*, *leptótes*, etc). We need to open a wide field of research in this direction, including not only the Presocratics and cosmogony, but also other bodies of literature such as the Hippocratic corpus: Taylor (1911) has shown, in the case of *eídos* and *idéa*, how the Hippocratic authors and the orators are to be credited with the technical use of concepts that are to be found at the center of Plato's philosophy; a few years later Souilhé did the same with the concept of *dunamis*. I have attempted to follow this lead with the concepts of *homalótes*, showing how Plato uses medical concepts to build his physics³³; recent studies on *skhèma* have also broadened our understanding³⁴. Inquiries into the close relationship between medicine and philosophy, a topic for which Vegetti's

³¹ See Bernard Vitrac's « Les classifications des sciences mathématiques en Grèce ancienne » in Macé (2005).

³² Furley (1989) does not devote Plato a chapter of his own : he is either invited in the discussion on the problems related to the earth and the discussion of Anaximander, or in the chapter on Anaxagoras. In Furley (1987) Plato's contribution to the history of atomism is reduced to its critical part – without considering Plato's contribution to the physics of geometrical elements that Epicurus will find important to assess (even if it is with harsh words) : see Schmid (1936) and Leone (1984).

³³ See « L'uniforme et le non-uniforme : schèmes empiriques de la pratique médicale dans la physique platonicienne », in Macé (2005), p. 223-239.

³⁴ Celentano, M.S., Chiron, P. & Noël M. P. (2004)

studies are still seminal³⁵, go on, as van der Eijk, P. J. (2005) shows. We need a further exploration of the global field of comparison set by Diller (1952) between the hippocratics and attic philosophy as a whole.

And we also need to trace the history from Plato onwards, even in fields in which Plato's influence appears unlikely, at first glance, for instance in Epicurean physics, whether critically, to the extent that the discussion with Platonism seems to have been crucial for the Epicureans, or positively, to the extent that Plato seems to have offered conceptual tools to later physics³⁶. Christina Viano, in her paper in *Plato Physicus*, shows how the passage of the *Timaeus* about bodily interactions has influenced book IV of the *Meteorologics* by Aristotle: Plato physicus opens the way for Aristotle chemicus and later developments.

A fuller history of space is also needed. In *Plato physicus*, Denis O'Brien opened the debate about the platonic *khôra* to a wider historical investigation, claiming that several features and oddities in Plato's theory of space and motion could not be explained without reference to Empedocles. It is the only paper in the whole volume that places Plato's theory in a broader context. Anne Merker's book on vision is a good example of how Plato's place within a broader history of science can be re-evaluated³⁷. Merker goes into the details of Plato and Aristotle's theory of vision, without losing sight of their philosophical implications. Analyzing *Timaeus* 45 a - 46 c she reveals Plato's originality, especially in relation to Empedocles as far as the composition and functioning of sense organs are concerned. Merker's study of Plato's use of the optical effects of a mirror has also led her to examine the status of the *khôra* in a different light, and precisely through the comparison of the *khôra* with a mirror³⁸. Bernard Vitrac study on the *Timaeus* also casts a broader light on the use of mathematics by Plato within the context of his time³⁹.

³⁵ See for instance Vegetti (1967) and (1995).

³⁶ See my attempt at finding a legacy of the doctrine of various speeds from the *Theaetetus* in the epicurean physics : Mace (2003).

³⁷ See the review by Thomas Vidart, in Bulletin Platonicien, on line at <http://www.etudesplatoniciennes.eu/bulletins.html>.

³⁸ See Merker (2006).

³⁹ Vitrac (2006).

Going deeper into Plato's philosophy of nature, following him into the many details of the understanding of the power that, to his mind, nature is, we will be more and more able to see how much he fits into the history of scientific ideas, how much of it he received and how much of it he influenced in turn. We might understand in a more precise fashion how much a philosophy draws from a rich comprehension of all sciences, techniques and practices of its time and how much it can also nourish it, as well as subsequent epochs. We might also derive from such inquiries a fresh momentum to deal with vexed questions of the interpretations of the dialogues.

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